

Proceedings of

**The International Conference on Future Technology
(FUTECH 2020)**

**The 3rd International Conference on Innovative
Computing
(IC 2020)**

&

**The 4th International Conference on Big-data, IoT, Cloud
computing Technologies and Applications (BICTA 2020)**

JANUARY 14-17

Ho Chi Minh City, VIETNAM

Korean institute of information Technology(KIT)



The 3rd International Conference on Innovative Computing (IC 2020)

Co-located Conferences

The International Conference on Future Technology (FUTECH 2020)
The 4th International Conference on Big-data, IoT, Cloud computing Technologies and Applications (BICTA 2020)

IC 2020

Proceeding

Ho Chi Minh City, VIETNAM
JANUARY 14-17, 2020

Organized by

Frontier Computing Conference Group

Supported by

Korean Institute of Information Technology(KIIT)

Message from Organizing Committees

The International Conference on Innovative Computing (IC 2020) will be held in Vietnam, Ho Chi Minh City, 14 - 17, January 2020. This event is the 3rd event of the conference series, in which fruitful results can be found in IC2015 (Xiamen, China), IC2016 (Taichung, Taiwan). Each event brings the researchers worldwide together to have excited and fruitful discussions as well as future collaborations. This conference series aims at providing an open forum to reach a comprehensive understanding of the recent advances and emergence in information technology, science, and engineering.

There are two international workshop and international conference are jointly operated with IC2020 at the same time and place, i.e., The International Workshop on Future Technology (FUTECH 2020), and The 4th International Conference on Big-data, IoT, Cloud computing Technologies and Applications (BICTA 2020), which are organized by FC conference group and Korean Institute of Information Technology, Korea Institute of information technology and innovation (KIITI) and SIEC Korea Chapter.

The papers accepted for inclusion in the conference proceeding primarily cover the topics: database and data mining, networking and communications, web and internet of things, embedded system, soft computing, social network analysis, security and privacy, optics communication, and ubiquitous and pervasive computing. Many papers have shown their great academic potential and value and indicate promising directions of research in the focused realm of this conference series. We believe that the presentations of these accepted papers will be more exciting than the papers themselves, and lead to creative and innovative applications. We hope that the attendees (and readers as well) will find these results useful and inspiring to your field of specialization and future research.

On behalf of the organizing committee, we would like to thank the members of the organizing and the program committees, the authors, and the speakers for their dedication and contributions that make this conference possible. In this year's IC2020. We appreciate the contributions from these experts and scholars to enrich our IC2020. We would like to thank and welcome all participants to Vietnam, Ho Chi Minh City. Ho Chi Minh City, formerly known as Saigon, once "The Pearl of the Far East" is the second-largest city in Vietnam. Ho Chi Minh City is a popular tourist destination due to its fascinating culture, classic French architecture, and sleek skyscrapers as well as ornate temples and pagodas. The city is also filled with rooftop bars that overlook Saigon and beyond, while fantastic restaurants offer a combination of French, Chinese, and, of course, local Vietnamese cuisine. We also sincerely hope that all participants from overseas and from Vietnam enjoy the technical discussions at the conference, build a strong friendship, and establish ties for future collaborations.

We send our sincere appreciations to the authors for their valuable contributions and the other participants of this conference. The conference would not have been possible without their support. Appreciates are also due to the many experts who contributed to making the event a success.

***IC2020 Organizing Committees
FC Conference Group
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***January 2020
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Keynote Speaker



Dr. Nigel Lin
Auto-Chlor System
USA

A Journey of Building Extendable Network and Software Architectures for A Traditional Service Business

Abstract

For an enterprise to be successful and sustainable, there must be many effective processes and rules which support the operation of business. Auto-Chlor System is an 81-year traditional restaurant dishwasher services company with more than 950 employees, 62 branches among the United States, and 2 factory plants. As a franchisor, Auto-Chlor System also provides our supports to several nationwide dealers. As the business grows, the traditional manual processes and procedures require the help from technologies to automatize them to keep up business growth. The IT hardware and infrastructure also require adequate solutions to prevent from the growth of the business being restricted by geographic separations among each business units.

During my years of service at Auto-Chlor System, we have successfully built the extensible network and software architectures to support the growth of the business. With unified network hardware and infrastructure, we are capable to support the dynamic requests from the field such as adding, acquiring, or moving a branch. We have simplified these used to be complex processes to easy plug and play solution. We can also provide promptly support to remote users without physically being at the location which greatly reduced the cost required for traveling and local IT staffing. We have also developed our software framework which is not only tailored to our business needs but also extensible to fulfil business requirements. We maintain static release schedule to constantly adding new features and changes based on feedbacks from our users. We also continuously research new solutions to integrate into our existing platform so we don't fall behind in technology.

I hope that through sharing our experience of practically applying technologies in our business. We can exchange thoughts and ideas on how other technologies can be utilized or applied to continuously create positive impacts to traditional businesses, such as Auto-Chlor System.

Biography

Nigel Lin is the Director of Information Services at Auto-Chlor System. He spent 9 years studying computer science and information engineering and received his Ph.D., Master, and Bachelor in Engineering from Tamkang University in Taiwan. After moving to the bay area in 2006, he worked for Microsoft for about a year before he joined Auto-Chlor System as a software engineer. After his success in handheld route accounting and acquisition projects, he moved up to the position of Director of Information Services in 2009. As an IT director, he leads both software and network teams to accomplish several major software and hardware projects, maintain network and system security, and continue researching the best solution which fits the company needs. He believes in the teach and learn philosophy; therefore, in 2016, he began his part time adjunct lecturer career at Santa Clara University. For more info about Nigel, you can visit his linked in profile at <https://www.linkedin.com/in/nigel-lin-71574916>.



A Journey of Building Extensible Network and Software Architectures for A Traditional Service Business

Nigel Lin

Director of Information Services



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Agenda

- About Auto-Chlor System
- Overcome Our IT Changelings
- Building Extensible Information Architecture
 - Network Architecture
 - Software Architecture
- Future Work



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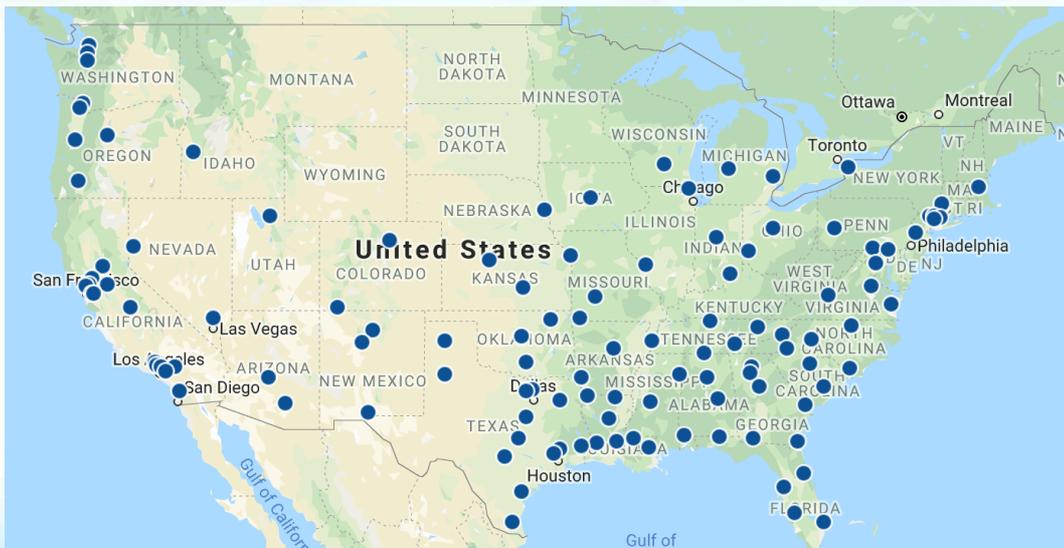
About Auto-Chlor System

- Privately and family owned business
- Commercial dishwasher rental business
- Founded in 1938 in Memphis TN
- Franchise business with 126 branches service 75,000 customers and growing
- More than 1,500 employees
- Yearly business over 300M USD (Only dishwasher rental business)
- Two factories plants manufacture dishwasher machines and chemicals



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Service Locations



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IT Challenges - Network

- Different system layout among branches
- Various network infrastructures
- Many existing security holes
- Inconsistent information in the system
- Performance for servers was not optimal
- Problematic configurations among and lack of documation
- Insufficient system logs for troubleshooting
- No IT asset management



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IT Challenges - Software

- Legacy customized software system
 - Old VB 6
 - Allow incorrect data getting into databases
 - Not extendable design
 - Patching an outsourced software platform
 - DOS based POS system
 - One failed all failed sync system
 - Can't provide sufficient information to serve customers
- Data inconsistency
- Many problematic software tools
- Unnecessary software licenses



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IT Challenges - Human

- Users in different IT knowledge level
- Accustomed to manual processes
- Lack of information exchange
- Afraid to new technologies and changes
- Losing trust in the current system
- Hiding IT problems from IT professionals

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IT Challenges - Others

- Different business units with different business requirements
- Company grows rapidly
- Lack of well-defined IT policies
- The needs to restructure the IS department
- Hard to retain engineers
- IT budget

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Auto-Chlor System Information Services Architecture

- Information services department
 - Network team
(1 manager, 3 engineers, and 1 admin)
 - Software team
(4 engineers)
- Network infrastructure
- Software systems



Network Team

- Maintain data centers
- Build remote support enabled infrastructure
- Provide timely user support
- Ensure network and data security
- Manage IT equipment
- Research and implement new technologies



Data Centers

- Private Cloud Structure
 - Mountain View
 - Physical Servers: 18
 - Virtual Servers: 33
 - Total: 51
 - Memphis
 - Physical Servers: 8
 - Virtual Servers: 15
 - Total: 23

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IS Phone and Data Lines

- 75 M CABLE MODEM: 42
- 50 M FIOS: 6
- 100 M AT&T FIBER: 2
- 3 M AT&T BONDED T1: 1
- 1.5 M AT&T T1: 1
- Phone Lines: 416
- 4G Data Lines: 68
- Cell Phone Lines: 605
 - iPhone: 195
 - Sonim: 410

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IS Equipment

- Thin Client: 409
- Handheld: 458
- Truck Printer: 493
- Phone System: 48
- Laptop: 62
- Computer: 32
- Cell Phone: 605
- Network Router & Switch: 331
- Office Printer: 186
- Skutch: 19



Network System Architecture Overview [BRANCH SATELLITE]



Network System Architecture Overview [BRANCH]

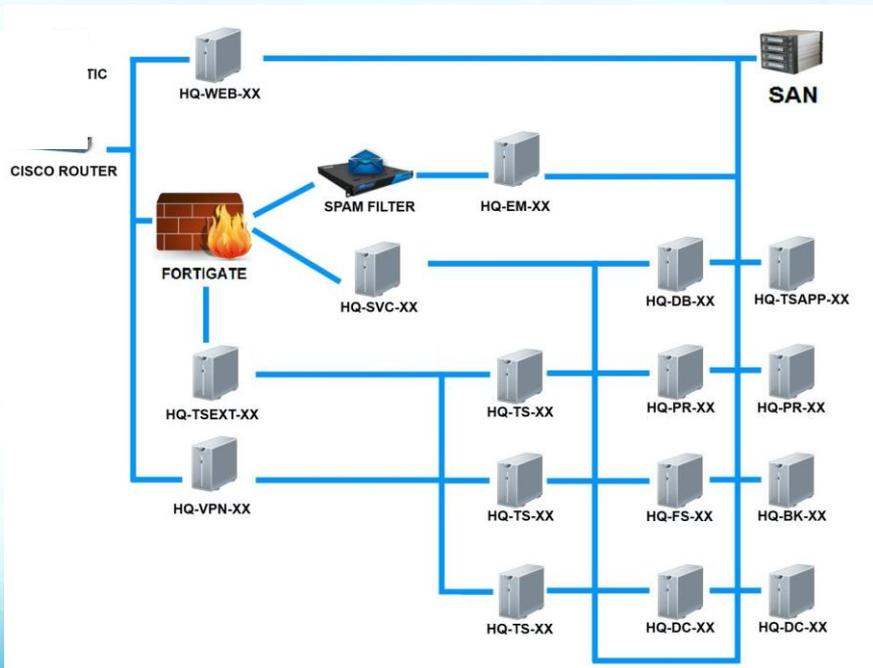


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Auto-Chlor System S Department

1938 YEARS OF SERVICE 2018

Network System Architecture Overview [HQ & MP]

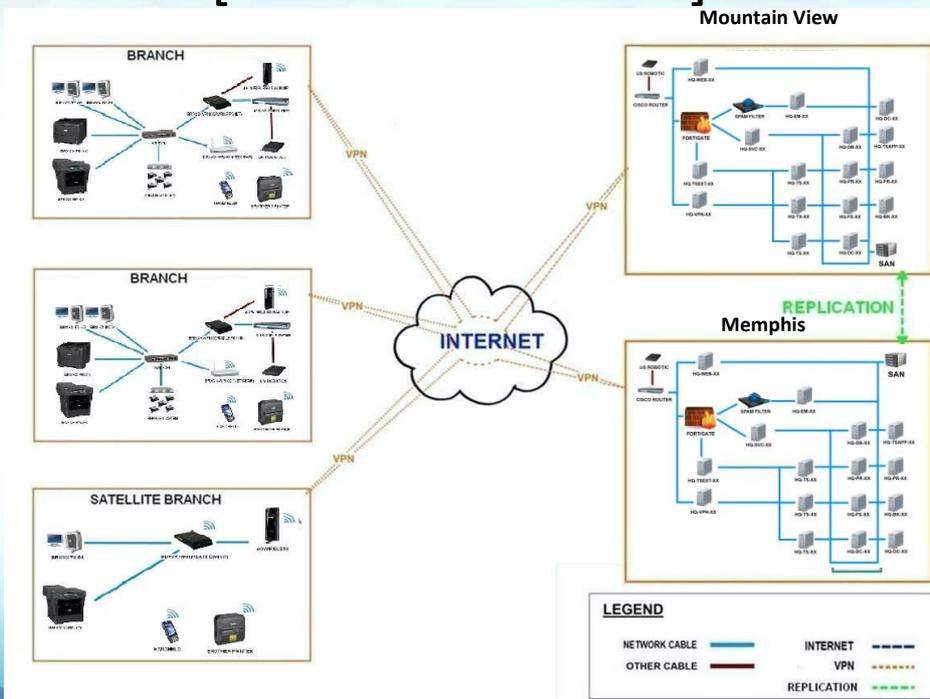


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Auto-Chlor System S Department

1938 YEARS OF SERVICE 2018

Network System Architecture Overview [OVERALL LAYOUT]



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1/27/2020

Auto-Chlor System S Department



Network System Architecture Overview [REMOTE DEPLOYMENT]

- We remotely deploy new branches and their IT hardware
- No need to fly or send IT staff to remote locations for the simple plug and play operations needed to turn up a new site
- Everything is turnkey and preconfigured by the IS Department. Just plug and play once our equipment arrives.
- We source and hire local vendors only for Data and Phone Jack wiring. All other IT functions are done remotely with the assistance from our branch employees onsite acting as our “remote hands”
- Review Kent, Washington Branch



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1/27/2020

Auto-Chlor System S Department



Network System Architecture Overview [REMOTE SUPPORT]

- We remotely support all of our branch locations from the IS Department in Mountain View. Our Infrastructure has been designed in such a way to allow this type of remote support
 - Remote Shadowing of our users for a quicker and better customer service experience
 - Users are also able to Shadow one another in order to remotely help or review items themselves
- We also support all our route drivers out in the field with any type of handheld issues. Often times a simple hard reset of the device is all that is needed, but if a catastrophic error is reported a replacement handheld is delivered the next business day to the branch



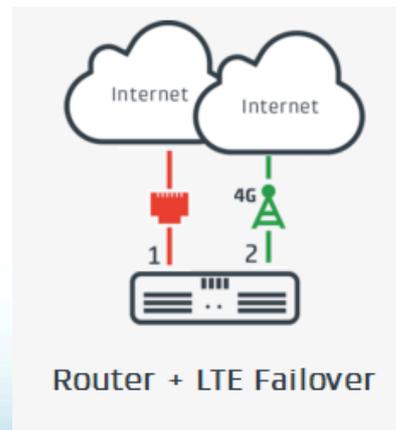
Network System Architecture Overview [HANDHELD AND PRINTER SUPPORT]

- Users would need to call the IS Department for support with their handheld or truck printer
- Most common issues are resolved the within first 3-5 minutes of a call
- Both Handheld and Mobile Truck printer have very robust protection and replacement contracts in place
- We have a direct line to the manufactures for quicker repairs and device RMA times
- Branch receives a certified replacement handheld from the IS Department the very next business day. Branch just needs to ship out their bad unit to the repair center



Network System Architecture Overview [BRANCH CONNECTION FAILOVER]

- Auto-Chlor IS Infrastructure has implemented automatic 4G LTE failover
 - Seamless backup internet for all of our branches. Ensures each branch has a backup internet connection in case their primary internet has an issue or goes offline
 - Also very useful when upgrading or moving branch locations



Network System Architecture Overview [IS SUPPORT MANAGEMENT SYSTEM]

- The Ticket General Module can be used to create new tickets. It is located under TICKET>TICKET GENERAL. Files can also be attached to the ticket for further explanation if necessary
- Once a ticket is created the IS Department will immediately see the ticket request and decide how to proceed with the processing of it
- Commonly handled issues have set procedures and templates already created. When applicable, these templates are applied to incoming tickets. This standardized process enables us to better manage our support procedure and increase our customer satisfaction level
- Ticket updates are seen by the requester throughout the life of the ticket

IS COMPLETE	TO DO ITEM
<input type="checkbox"/>	01 FILL IN REQUIRED DESCRIPTION NAME(S) FROM BRANCH: NEED ACCESS TO BRANCH: NEED ACCESS FROM XXXXXXXX TO XXXXXXXX
<input type="checkbox"/>	02 GET APPROVAL FROM BRANCH MANAGER AT VIS
<input type="checkbox"/>	02_01 ASSIGN TICKET TO THE BRANCH MANAGER AT ACTION ITEMS
<input type="checkbox"/>	02_02 HELLO (INSERT BRANCH_MANAGER'S_NAME), DO YOU APPROVE THIS REQUEST?
<input type="checkbox"/>	03 ASSIGN TO NETWORK TEAM TO SET UP EXCEPTION
<input type="checkbox"/>	03_01 FIND USER IN RA3, ADD VISTING BRANCH TO T
<input type="checkbox"/>	04 REVIEW EXCEPTION SETUP



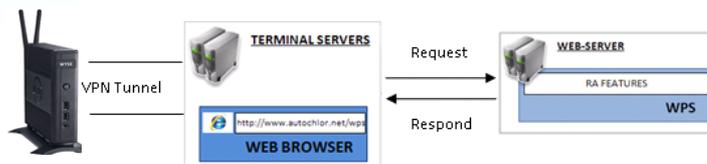
Software Team

- Develop software tailored for Auto-Chlor System business
- Implement software features to automatize manual processes
- Generate reports based on operation requests
- Provide effective data management
- Deploy regular software releases for adding new features and addressing bugs
- Research and integrate other software systems

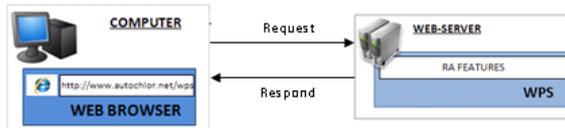


Software Architecture Overview [CLIENT TIER]

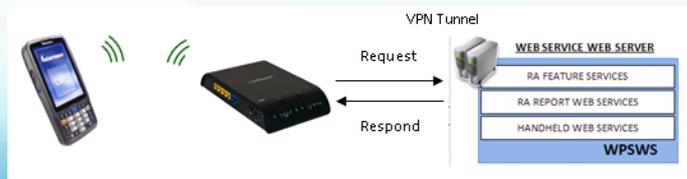
- Terminal Servers:



- Computer:



- Handheld:

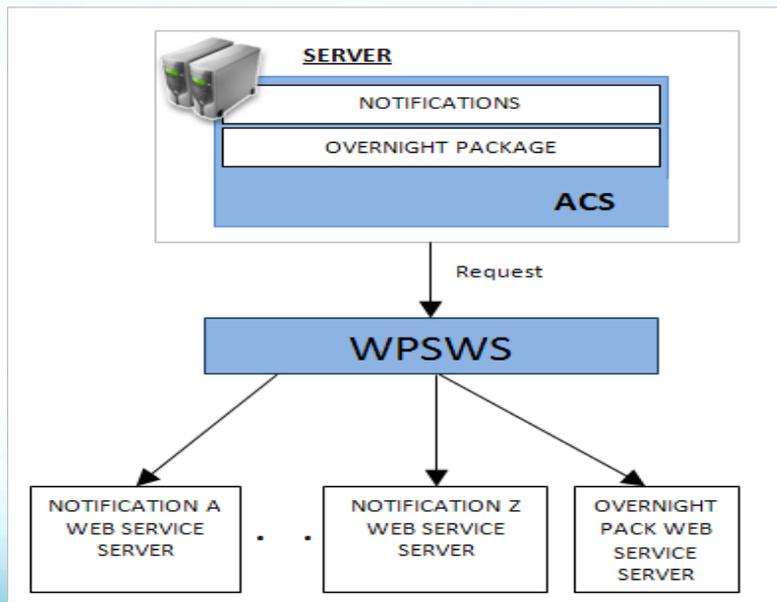


Software System WPS (Web Portal System/RA3)

- IT management and support
- Route accounting
- Approval process
- Around 400 modules
- N-tier architecture



Software Architecture – Application Tier Auto-Chlor Services (ACS)

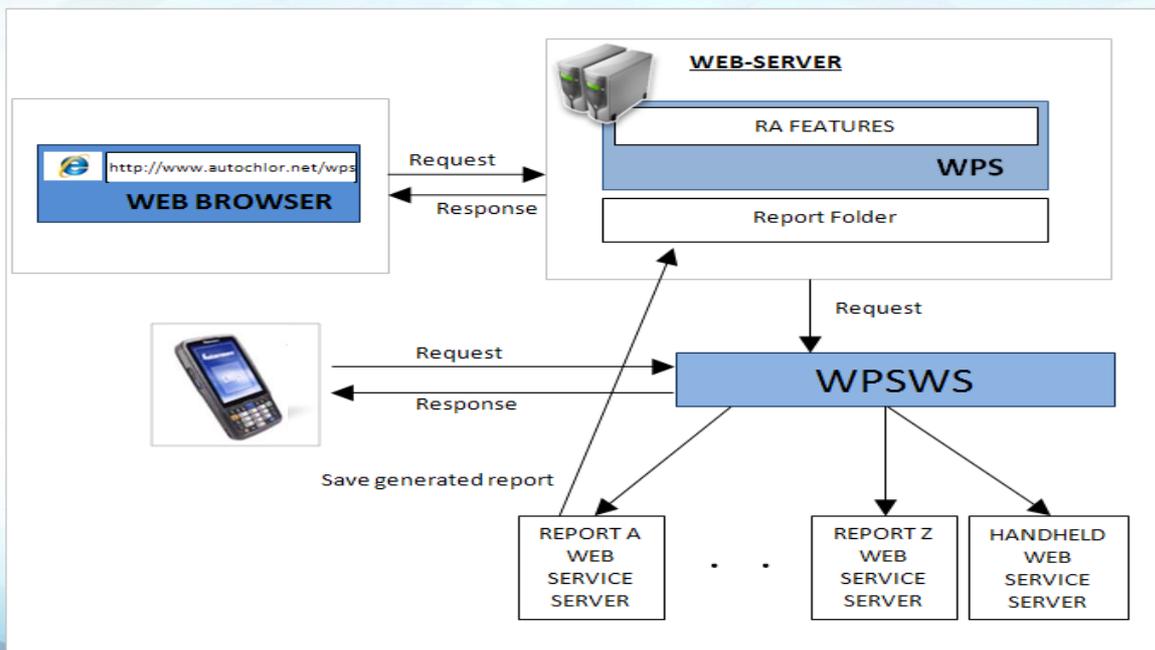


Software System Auto-Chlor Server Service (ACSS)



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Software Architecture – Application Tier Web Portal System (WPS) and Web Services (WPSWS)

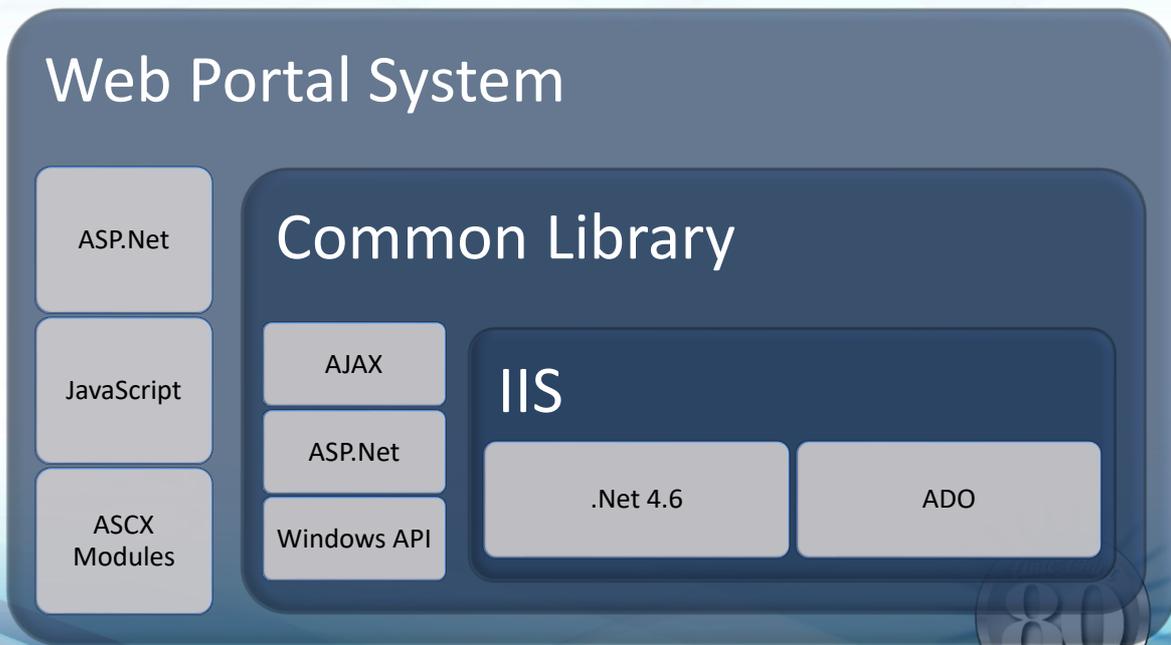


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Auto-Chlor System S Department

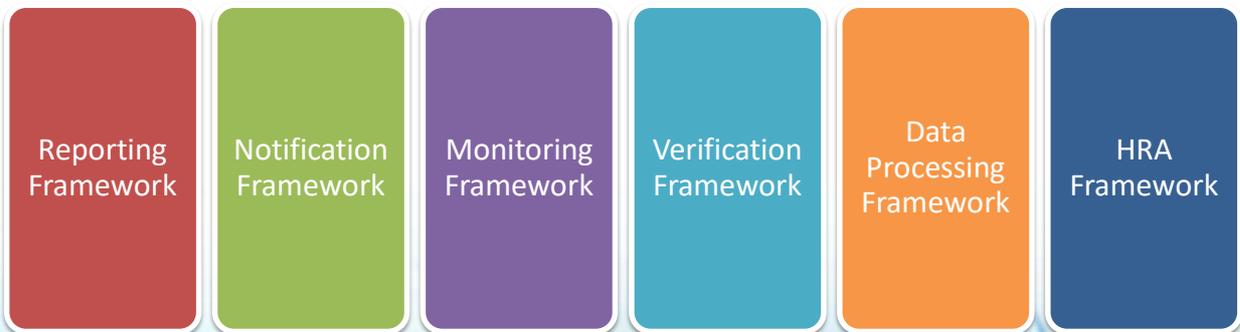


Software System Web Portal System (WPS)



Software System Web Portal System Web Service (WPSWS)

Web Service Interfaces



WPSWS - Report Service Framework

- Generate regular reports based on requests
- Generate overnight reports and print them automatically to every branches
- Utilize .Net Framework RDLC Report Engine
- Standardize all report layout across the system

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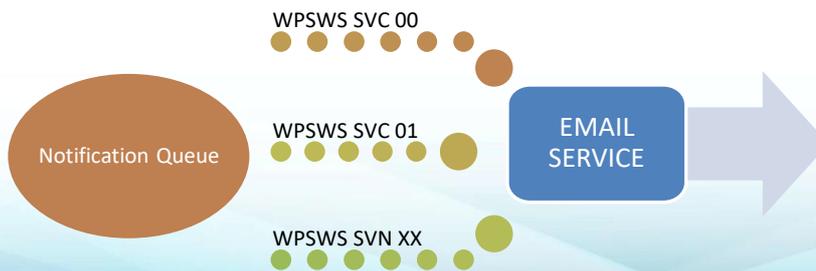
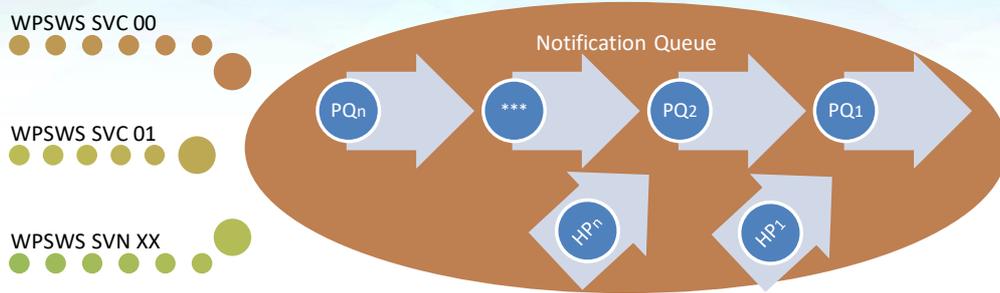
WPSWS - Notification Framework

- Provides 2 major type of notifications
 - Pull Notification
 - Push Notification
- Provides both email and text notifications
- Provides common library functions to be consumed by modules in the system

INFORMATION SERVICES



WPSWS - Notification Framework (cont.)



WPSWS - Monitoring Framework

- Utilizes Windows API to check services status
- Allow ACSS to trigger regular checking for the status of each services
- Generate Auto-Ticket to notify engineers to check problematic services

HOME>TOOLS>SERVICE MONITOR

GO TO SEARCH CONFIG MONITOR

SHOW CONFIGURATION
LAST REFRESH AT: 07/10/2019 06:38:29

SERVER	DISPLAY NAME	NAME	STATUS	LAST CHECK
ELIOT	SOL SERVER (MSSQLSERVER)	MSSQLSERVER	RUNNING	07/10/2019 06:35:27
ELIOT	SOL SERVER AGENT (MSSQLSERVER)	SOLSERVERAGENT	RUNNING	07/10/2019 06:35:30
FROST	SOL SERVER (MSSQLSERVER)	MSSQLSERVER	RUNNING	07/10/2019 06:35:27
FROST	SOL SERVER AGENT (MSSQLSERVER)	SOLSERVERAGENT	RUNNING	07/10/2019 06:35:30
HQ-BK-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-BK-01	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-DB-00	SERVER	SERVER	RUNNING	07/10/2019 06:35:30
HQ-DB-00	SOL SERVER (MSSQLSERVER)	MSSQLSERVER	RUNNING	07/10/2019 06:35:27
HQ-DB-00	SOL SERVER (MSSQLSERVER)	SOL SERVER (MSSQLSERVER)	RUNNING	07/10/2019 06:35:30
HQ-DB-00	SOL SERVER AGENT (MSSQLSERVER)	SOL SERVER AGENT (MSSQLSERVER)	RUNNING	07/10/2019 06:35:30
HQ-DB-00	SOL SERVER AGENT (MSSQLSERVER)	SOLSERVERAGENT	RUNNING	07/10/2019 06:35:30
HQ-DB-01	SERVER	SERVER	RUNNING	07/10/2019 06:35:30
HQ-DB-01	SOL SERVER (MSSQLSERVER)	MSSQLSERVER	RUNNING	07/10/2019 06:35:27
HQ-DB-01	SOL SERVER (MSSQLSERVER)	SOL SERVER (MSSQLSERVER)	RUNNING	07/10/2019 06:35:30
HQ-DB-01	SOL SERVER AGENT (MSSQLSERVER)	SOL SERVER AGENT (MSSQLSERVER)	RUNNING	07/10/2019 06:35:30
HQ-DB-01	SOL SERVER AGENT (MSSQLSERVER)	SOLSERVERAGENT	RUNNING	07/10/2019 06:35:30
HQ-DBH-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-DBH-02	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-DC-00	DNS SERVER	DNS	RUNNING	07/10/2019 06:35:04
HQ-DC-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-EM-00	MICROSOFT EXCHANGE INFORMATION STORE	MSXCHANGES	RUNNING	07/10/2019 06:35:27
HQ-EM-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-EM-00	WORLD WIDE WEB PUBLISHING SERVICE	WSSVC	RUNNING	07/10/2019 06:35:30
HQ-EMH-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-FS-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-FS-01	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-00	LANSAFE POWER MONITOR	LANSAFE PM	RUNNING	07/10/2019 06:35:28
HQ-HOST-00	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-01	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-02	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-03	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-04	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-05	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-HOST-07	SERVER	LANMANSERVER	RUNNING	07/10/2019 06:35:06
HQ-PR-00	PRINT SPOOL FR	PRINT SPOOL FR	RUNNING	07/10/2019 06:35:29



WPSWS – Verification and Data Processing Framework

- Verification Framework
 - Verify data in the system to make sure data integrity
 - Standardize the service implementation to allow easy additional data verification
- Data Processing Framework
 - Allow massive data checking and importing
 - Serve as interfaces for integration of other systems



INFORMATION SERVICES

WPSWS – HRA Framework

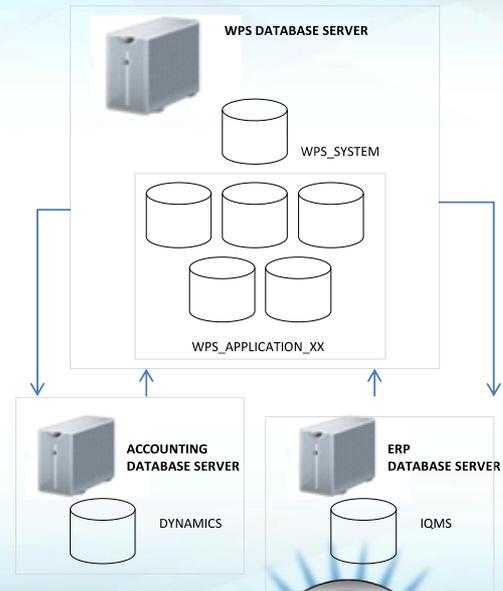
- Generate HRA offline database
- Handle data transfer between HRA and WPSWS
- Perform data integrity checking for data collected from HRA
- Store HRA data into backend database



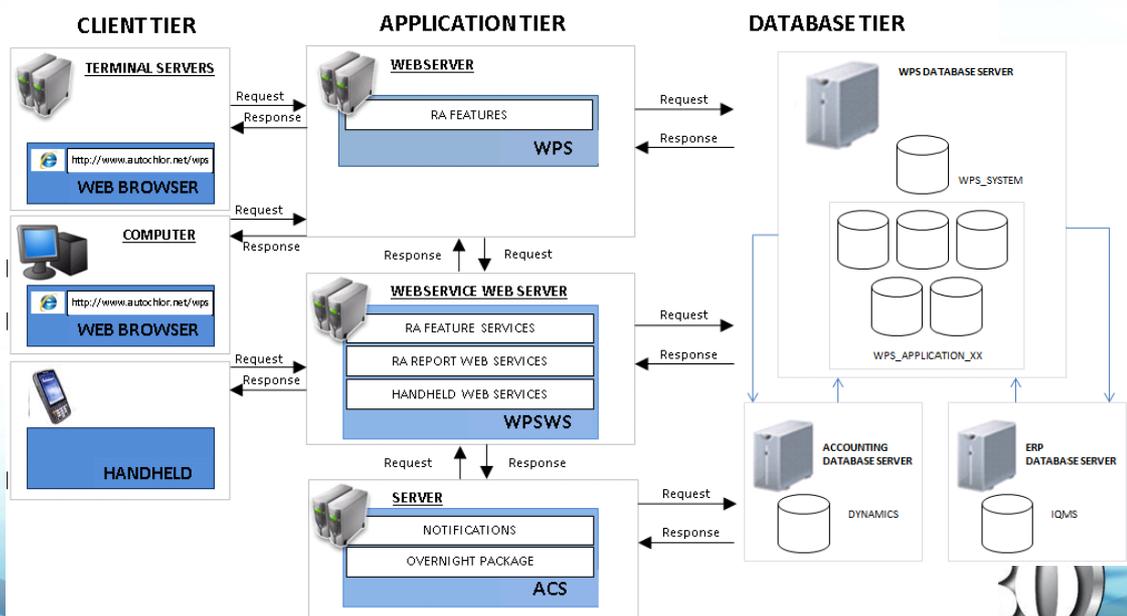
INFORMATION SERVICES

Software Architecture – Database Tier

- Different database sources
 - Microsoft SQL Server
 - Oracle Server
- Extendable Architecture



Software Architecture – Overall Layout



Features of Automated Processes

- Formalized rules
- Consistency
- Unified presentation
- Without gray areas
- Reduce human errors
- Increase data accuracy
- Ensure security



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Automated Processes via WPS

- Batches
- Recap
- Reroute
- Write-off
- EOP
- Customer SDS
- Load Sheet
- Email Invoices and Statements
- EDI
- Multi-Unit Agreements
- Price Update



INFORMATION SERVICES

Auto-Chlor Information Structure

Unified Service Information

Auto-Chlor WPS (Web Portal System)

RA

HRA

Dealer Service
Information

Branch Service
Information

Handheld Service
Information

INFORMATION SERVICES



Future Work

- Provide our successful framework to dealers for integration
- Balance between data accessibility and security
- Extend software features from internal users to outside customers
- Integrate more tools from the market
- Improve look and feel for our software UI
- Apply Machine Learning and AI to analysis company sales data

INFORMATION SERVICES



Q & A



Study on Battery Operation Mode changing in Islanded Microgrid

Park bum-yong¹, Lee hee-jin²

^{1,2} Dept. of Electronic Engineering, Kumoh National Institute of Technology,
Korea

¹bumyong.park@kumoh.ac.kr, ²jinlee@kumoh.ac.kr

Abstract. The battery must maintain the frequency and voltage of the microgrid system when stand-alone operation. In addition, the battery must provide the active and reactive power required by the system in parallel with the diesel generator. When the operating mode of the battery changes suddenly due to a generator accident, large frequency and voltage variations occur in the microgrid. This large change can lead to the loss of distributed generators and lead to power outages. Optimized feedback controller can reduce the effects.

1 Introduction

Microgrids with distributed generators (DGs) require the ability to continuously power the load even under abnormal conditions such as generator failure. The battery should operate in constant voltage constant frequency (CVCF) mode to maintain the normal frequency of the power system without generators. When the generator is restored and connected to the system, the battery supplies the grid with the necessary active and reactive power (PQ) control. As a result, microgrid systems require control ability to reduce system impact on mode changing so that it can operate stably in PQ and CVCF control modes [1], [2]. To control the microgrid system, it is modeled as Markovian jump systems (MJSs) that is appropriate to represent a power system subject to sudden system variation. This paper proposes the feedback controller obtained from Lyapunov function and stabilization conditions using an appropriate weighting method.

2 Simulation results

Figure 1 shows the frequency, voltage, active power, and reactive power when the battery operation mode changed. The battery operates for 0-15 seconds in CVCF mode and 15-30 seconds in PQ mode. In 30 seconds, the generator is accidentally disconnected and the battery switches back to CVCF mode. The frequency changes greatly when changing from the battery operation mode to the generator operation mode and vice versa. Depending on the time of the accident, the system may move to an unstable area when the generator is connected, causing the system to collapse.

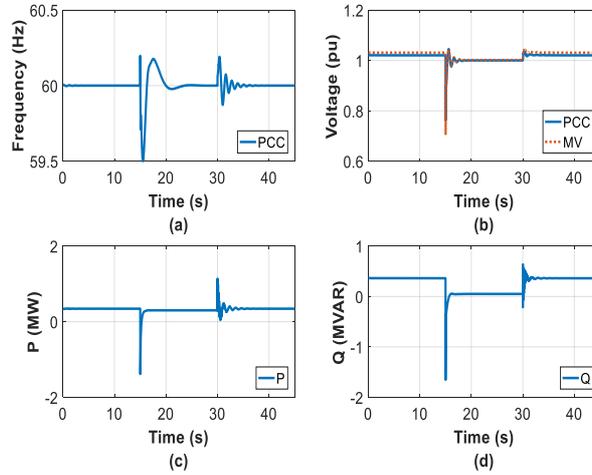


Fig. 1 Simulation results when changing the mode of the battery
 (a) frequency, (b) voltage, (c) active power, (d) reactive power

3 Conclusion

The disconnection of the generator causes the battery is switched from PQ mode to CVCF mode, which can lead to power outages in small microgrid systems. The microgrid system is modeled as MJSs to represent the system subject to sudden mode change. The proposed feedback controller can solve the problems.

Acknowledge

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2016R1D1A3B03934501).

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Single Object Detection and Tracking from Videos Using Convolutional Neural Networks

Lee Dong-Hyun

Dept. Of Electronic Engineering, Kumoh National Institute of Technology, Korea
donglee@kumoh.ac.kr

Abstract. This paper presents integrated Convolutional Neural Network (CNN)-based single object detection and tracking framework. The CNN-based object classification and detection methods are suitable for static images while not directly applicable for videos. On the other hand, the model-free visual object tracking methods cannot detect an object until a ground truth bounding box of the target is given. The integrated algorithm successfully combines the tracker and detector in real-time with high accuracy. The evaluation results with Object Tracking Benchmark (OTB) dataset demonstrates the effectiveness of the proposed framework.

1 Introduction

In recent years, deep CNN-based object detection algorithms, such as YoloV3, have shown successful results in object detection tasks [1]. Although they provide excellent results on still images, they cannot be directly applied to object detection from videos since they are not trained to deal with challenging situations in video object detection such as motion blur, occlusion, and object deformation. The model-free visual object tracking (VOT) task is another challenging area that CNN-based methods have gained significant attention, such as SiamRPN [2]. However, they cannot start tracking any objects until the ground truth bounding boxes of the targets are provided. This paper proposes the integrated CNN-based single object detection framework that utilizes the advantages of CNN-based detectors and trackers.

2 Proposed Algorithm

The proposed framework consists of three modules, object detection module, object tracking module, and integration module. The object detection module is trained with the target object images for the single object detection. On the other hand, the object tracker uses pre-trained CNN layers for robust object tracking against motion blur, deformation, and illumination change of the target. The integration module monitors the detection result from the detection module and if the target is detected with high confidence score, it initializes the tracker by providing the cropped image of the target to the tracking module. The integration module keeps tracks of the confidence score of the tracker output and if the score is less than a threshold, it reactivates the detection

module to detect the target around the area of the image where the target was last tracked.

3 Experimental Results

The proposed framework uses YoloV3 [1] as the detector and SiamRPN [2] as the tracker. It is evaluated by comparing the average success rate (ASR) and intersection over union (IoU) with the detector-only approach using OTB dataset [3]. In the case of the proposed framework, the integration module initializes the tracking module when the detection module first detects the target with 0.9 IoU with the ground truth bounding box. If the estimated bounding box at the current image frame has higher IoU than 0.5, it is regarded as success. The experiment results in Table 1 shows that the proposed framework outperforms the other two approaches.

Table 1. Performances of different frameworks in OTB dataset.

Framework	ASR (%)	IoU
Detector-only	0.55	0.59
Proposed	0.78	0.69

3 Conclusion

The proposed framework successfully combines the state-of-the art detector and tracker using the integration module. The experimental results demonstrate the effectiveness of the proposed framework.

Acknowledge

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korean government (MIST) (No. 2019R1F1A1040709)

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An Effective Use of BERT for Keyphrase Extraction

Deok Jin Seo¹, Yeonsoo Lim¹, and Yuchul Jung¹

¹Department of Computer Engineering, Kumoh National Institute of Technology (KIT)
61 Daehak-ro, Gumi, Gyeongbuk, 39177, South Korea
406023@naver.com, yslim6168@kumoh.ac.kr, jyc@kumoh.ac.kr

Abstract. Keyphrase extraction is a fundamental, but very important task in NLP that map documents to a set of representative words/phrases. However, state-of-the-art results on benchmark datasets are still immature stage. As an effort to alleviate the gaps between human annotated keyphrases and automatically extracted ones, in this paper, we introduce our on-going work about how to use Bidirectional Encoder Representations from Transformers (BERT) model for extracting meaningful keyphrases (KPs) of scientific research articles. Moreover, we compare our fine-tuning approach other KPs extraction methods using two different datasets (i.e., WWW and KDD) in computer science domain.

1 Introduction

Keyphrases (KPs) extraction can be defined as “the automatic selection of important and topic phrases from the body of a document” [1-2]. Due to its widespread uses by researchers and publishers, various studies have been conducted on the automatic extraction of KPs using various methods. However, the KPs extraction task is far from solved and the performances of existing approaches are worse in comparison to many other NLP tasks.

Recently, the Bidirectional Encoder Representations from Transformers (BERT) model shows promising performances in various NLP tasks including KPs extraction [3]. Moreover, BERT provides fine-tuning technique which transforms the existing pre-trained BERT model into a fine-tuned model which performs well on the target dataset or domain. In the experiments, we’ve confirmed that the fine-tuned BERT outperforms other popular sequential labeling techniques by a large margin.

2 Proposed Methods and Experiments

BERT, basically, trains a language model based on large scale plain text corpora, such as wikipedia, news, and books. To address the shortcomings of uni-directional language representations, the left and right contexts are coordinated together in all layers so that deep bi-

directional representations can be pre-learned even for uncorrected data.

We are interested in employing transfer learning due to the lack of training data in KPs extraction task. Especially, fine-tuning is one of transfer learning which transforms existing architecture for new purpose. It involves adding an untrained layer at the end and then optimizing the layer weights for the task-specific objective. This reduces the task-specific parameters as much as possible, and allows the pre-trained parameters to be changed in small increments by learning downstream tasks.

In this study, fine-tuning technique on the pre-trained BERT model was used to fine tune the parameters to the target dataset. In particular, we compared the KPs extraction accuracy results (i.e., F1-score) with Conditional Random Field (CRF) [4] and Bi-directional LSTM-CRF techniques [5] that are well-known as sequential labeling techniques as shown in Table 2. For the fine-tuning, we used two different data sets (e.g., KDD and WWW) [6] composed of abstracts of conference papers in computer science domain as in Table 1. In experiments, we split each dataset into 80% train and 20% test. In the fine-tuning, the learning rate was fixed as $5e-5$.

Table 2. Data Statistics of KDD/WWW dataset

Dataset	# of Abstracts	# of Train Data (80%)	# of Test Data (20%)
KDD	755	604	151
WWW	1331	1065	266

Table 2. Experiments with KDD/WWW dataset

Dataset	CRF	Bi-directional LSTM-CRF	Fine-tuned BERT
KDD	24.03%	32.42%	40.65%
WWW	29.12%	32.78%	36.94%

Table 2 summarizes the experiments in terms of how the fine-tuned BERT works better than other sequential labeling techniques. It shows that the possibility of accuracy improvements can be increased up to about 4% and 8% for WWW and KDD, respectively, compared with Bi-directional LSTM-CRF, the most recent deep learning approach.

3 Concluding Remarks

In this paper, we summarized our on-going work for advanced keyphrases extraction from scientific articles. We've confirmed that our fine-tuning approach based on the pre-trained BERT model outperforms that of existing supervised learning techniques (e.g., CRF, Bi-directional LSTM). As our future work, SciBERT [7] and a large amount of computer field datasets (i.e., KP20k dataset) will be used for further research on BERT based optimization.

Acknowledge

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (No. 2018R1C1B5031408)

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Software Architecture for High Trustworthy Cloud CDM

Yunhee Kang¹, YoungB. Park², JaeHyuk Cho³

¹ Div. of ICT, Baekseok University, Korea,

² Dept. of Software Science, Dankook University, Korea,

³ Dept. of Electronic Eng., Soongsil University, Korea

¹yhkang@bu.ac.kr, ²ybpark@dankook.ac.kr, ³chojh@ssu.ac.kr

Abstract. In order to hurdle the diversity of structure and vocabularies among data sources in hospitals, CDM(Common Data Model) plays a role as one of the information assets that can be collaboratively utilized among them in a distributed research network. This paper describes a scheme for access control to deliver data written in CDM in a cloud CDM. We mainly focus on the identity management of a security system required in the cloud CDM. In this paper, we define the CDM operation and design a software architecture in the cloud environment for handling the CDM information resources among hospitals on the cloud. The designed architecture employs a distributed ID and a blockchain for the access control. It can be used to support the decision making for building the cloud CDM.

1 Introduction

In recent years, medical services have shifted from treatment to the prevention and the management of diseases. The importance of the use of medical record is emerging for the efficient health management of patients. In order to hurdle the diversity of structure and vocabularies among data sources in hospitals, CDM(Common Data Model) plays a role as one of information assets that can be collaboratively utilized among them in a distributed research network[1-3].

The main purpose of this paper is to reduce barriers of sharing EMR((Electronic Medical Record) data across a cloud CDM network and to provide trustworthiness when delivering EMR data and manipulating it by diverse research groups. The pipeline to data from the CDM format into the cloud CDM network is required to meet reliable data delivery with data integrity among parties with the alliance relationship.

This paper describes a scheme for access control to deliver data written in CDM in a cloud CDM. We mainly focus on the identity management

of a security system required in the cloud CDM. We define the CDM operation and design a software architecture for handling the CDM information resources among hospitals on the cloud. The software architecture employs a self-sovereign ID and a blockchain for maintaining the distributed ID. It can be used to support decision making for building the high trustworthy cloud CDM.

2 Related Works

The CDM is a declarative specification, and definition of standard entities that represent commonly used concepts and activities across business and productivity applications [3]. It can be extended to observational and analytical data that play a role as data source in disparate databases. To handle the problem caused by the diverse structures of those information systems in hospitals, the concept of changing each hospital data into a CDM, which is the same format, and conducting various clinical studies based on the CDM. Data extracted from EMRs are stored in different relational database schemas. To build a system for handling CDM, it needs to define metadata for creating one model that accommodates any relevant type of observational data and a conceptual model to allow researchers to develop analysis methods that are be portable across data sources. Using the CDM format is critical for efficient data exchange across organization in the network, given the diversity of organizations in a CDM network.

A blockchain is a linear form of a distributed ledger composed of immutable blocks of data, each block containing a list of transactions and a unique reference to its predecessor block[4-6]. It is commonly considered to be a specialized form of a distributed database.

Distributed ledgers are a multi-purpose technology in the digital world that are specifically designed to be shared across network of multiple sites, geographies or institutions. Blockchains offer the ability to create unique (sometimes scarce) digital assets.

3 The design of blockchain based Cloud CDM

We assume that a hospital participating in the cloud CDM issues an X.509-based public key-based (PKI) certificate. The hospital plays a role as a Certificate Authority(CA) and signs the identity of the hospital's administrator to the CDM utilization data. X.509 is a kind of asymmetric key cryptography with private key and public key for a

principal. The pair of keys is used for representing the principal's ID. CDM networks issue X.509-based public key certificates as CAs (or root CAs) and provide them as CDM network administrator IDs. The CDM Network Administrator ID signs CDM utilization data. The ID pair is assumed to be maintained in the blockchain for reliable data transmission. Digital identity is progressing from a non-user controlled and centralized model to a fully user-controlled and decentralized model of digital identity. Distributed ID is used for handling ID management, which is referred to as self-sovereign identity (SSI)[7]. A CDM is the data asset of individual hospitals participating in the cloud CDM network. Medical data records are converted to the CDM standard, encrypted and signed using the hospital administrator's private key and the CDM network's public key, and then transmitted to the CDM network. Transactions are authenticated with public-key digital signatures. In this process, the cloud CDM decrypts the hospital administrator's public key and the CDM network's private key to verify the integrity of the data, and then stores the flawless transmission data in the repository. In this process, the decrypted transmission data is post-processed by converting the vocabulary based on the CDM metadata. All CDM related transactions are stored in the decentralized blockchain. Figure 1 shows the software architecture for cloud CDM.

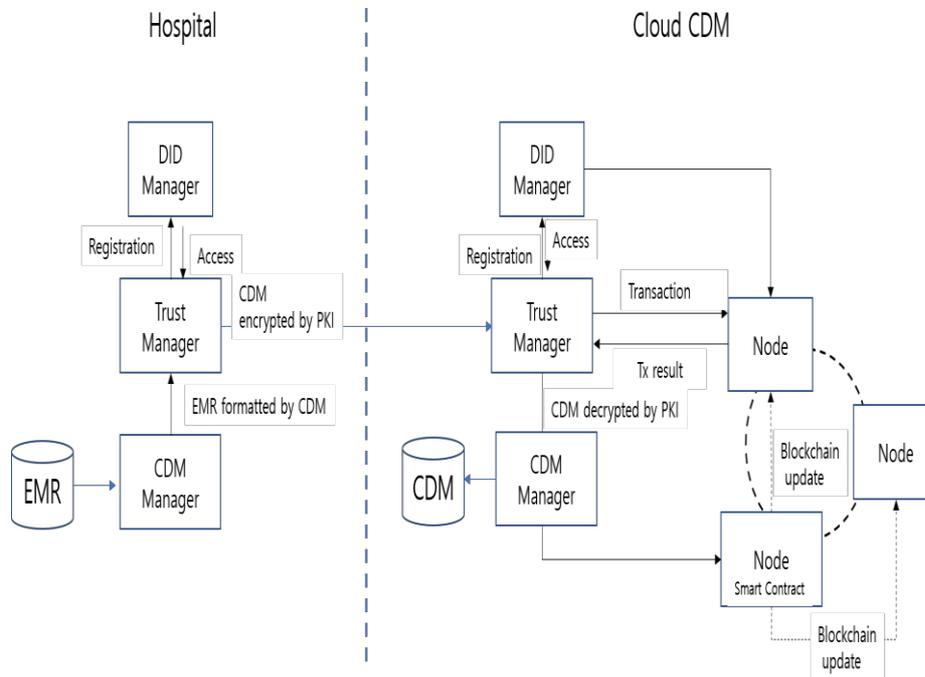


Figure. 3 Software architecture for cloud CDM

CDM is represented as a digital asset concerned in the blockchain. The participant of the blockchain network includes a CDM consumer, a CDM provider and a service broker. The service broker plays a role as a mediator that preserves a trustworthy delivery of CDM between a CDM consumer and a CDM provider. In the CDM blockchain, the transaction can be considered as three operations related with CDM. To access the CDM blockchain permissioned represented as a node in Figure 4, X.509 is used for defining the format of public key certificates. When a certificate is signed by a trusted certificate authority, or validated by other means, someone holding that certificate can rely on the public key it contains to establish secure communications with another party, or validate documents digitally signed by the corresponding private key in a hospital.

In the cloud CDM environment of the proposed architecture, it is necessary to establish an environment for reliable data access and audit of access. The proposed cloud CDM can provide secure and lightweight CDM data and build a trust environment for the provided data. As part of ID management in a service broker, user-controlled

identity system like distributed ID can be used for maintained ID issued by CA in a CDM provider and a CDM consumer.

4 Conclusion

CDM for data sharing and utilization of medical institutions requires the access to patient medical information and is used for disease research and customized medical care. In order to obtain meaningful results in research network-based clinical studies on various patient data in hospitals, information assets need to be shared and be utilized. The cloud CDM provides interoperability for the participation of multiple hospitals and serves as an information-based research for customized, user-centered healthcare. However, reliable management of safe and transparent medical information of personal information is required. The cloud CDM model proposed in this paper applies distributed ID and blockchain technology for secure access control that occurs during CDM conversion and medical records access for the joint use of hospital data.

Acknowledge

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Implement of Image Classifier with Convolution Neural Network in FPGA

Lee chang-yong¹, Kim young-hyung², Lee yong-hwan^{3*}

¹ Dept. Of Electronic Eng., Kumoh Nat'l Institute of Tech., Korea

² Dept. Of IT Convergence, Kumoh Nat'l Institute of Tech., Korea

^{3*}corresponding author School Of Electronic Eng., Kumoh Nat'l Institute of Tech., Korea

¹lcy5200@kumoh.ac.kr, ²kic126@kumoh.ac.kr, ^{3*}yhlee@kumoh.ac.kr,

Abstract. Deep learning is used to process data with convolutional neural networks to detect specific objects or classify classes from images. In most previous studies, convolutional neural networks are implemented using software programs such as c-language and Python frameworks, and FPGAs are sometimes used only in the form of accelerators. In this paper, the convolutional neural network is wholly implemented using Verilog HDL. The 3D convolutional neural network has disadvantages of complex structures and take a long time to calculate. Thus, the system is based on 2D convolutional neural networks to simplify calculations and speed up processing. In addition, the system implements skip connections, pipelines and parallel processing structures when processing data to process the data and get the results faster.

1 Introduction

Deep learning has gained popularity and application in many areas, and it is also widely used when processing images. In the field of image processing, CNN (Convolutional Neural Network) is widely used. Nowadays, CNN is implemented using the Python framework with GPU(Graphics Processing Unit)[1]and it is often used to detect specific objects or to classify images. Two main methods of class classification are used: 3DCNN and ConvLSTM (Convolutional Long-Term Memory). Both methods are efficient for image processing, but have the disadvantage of taking a long time and complicated structure. To overcome the shortcomings of 3DCNN, this paper intends to add a structure that complements accuracy with 2DCNN based system. In many papers, the FPGA(Field Programmable Gate Array) [1] is only used as an accelerator. However, our 2DCNN based systems are implemented fully using Verilog HDL(Hardware Description Language), and results are obtained by training and testing the data. For implementation with Verilog HDL, the calculation process has been

simplified. It is also proposed that data are processed in parallel pipeline with the skip connection[3] to increase the processing speed of 2DCNN based systems.

2 System Structure

In general, the depth of CNN greatly affects the determination of class classification accuracy. However, due to the resources of the FPGA, the depth of the network needs to be limited. Thus, in this paper, CNN is implemented using three convolution layers and two fully connected layers.

The basic structure of the system in this paper is as follows. The input images are reduced in size and go through the three-stage convolution layers and max pooling layers. The convolution layer computation has a parallel processing structure. Input data of the convolution layer is loaded from memory at the same time in five kernel operations. The resulting data are obtained simultaneously by processing the operation from the loaded data. The multiplication operation of the kernel of the convolution layer and the local area is implemented using shift computation. The layer computation at each stage is designed as pipeline structure, which can reduce computation time. The output data is classified into classes through two fully connected layers. In addition, to speed up the training, look-up table is used to create the data base, and then have the skip connection structure.

3 Conclusion

In this paper, CNN was fully implemented as an FPGA. In order to increase the operation speed, shift operations were used in kernel operations to minimize multiplication. In addition, parallel processing structures were used for each Convolution Layer operation, and pipeline structures were used for the entire layer operation, enabling rapid data processing.

Acknowledge

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Weighted Median Filter Architecture Based on the Sparse Window Approach

Jongkil Hyun¹, Younghyeon Kim², Junghwan Kim³, Byungin Moon⁴
^{1,2,3,4} School of Electronics Engineering, Kyungpook National University, Korea
¹26712isjk@knu.ac.kr, ²young1993@knu.ac.kr, ³jh5746@knu.ac.kr,
⁴bihmoon@knu.ac.kr

Abstract. The weighted median filter (WMF) is widely used for disparity refinement in stereo vision. Various studies have been conducted to implement the WMF as hardware. In particular, the separable weighted median filter (sWMF), which reduces complexity by separating the 2-dimensional WMF into two 1-dimensional WMFs, has been proposed for implementation as hardware. By improving the sWMF, this paper proposes an architecture that uses fewer hardware resources than the sWMF.

1 Introduction

Because the weighted median filter (WMF) can eliminate noise efficiently while preserving edge areas, it is widely used for disparity refinement in stereo vision [1, 2]. Various studies have been conducted to improve real-time performance of the WMF by hardware implementation. In general, implementing the WMF as hardware is difficult because its complexity tends to increase by $O(r^2)$ as the window radius r increases [1, 2]. To efficiently implement the WMF as hardware, the separable weighted median filter (sWMF) has been proposed [1]. The main idea of the sWMF is to divide the 2-dimensional WMF into cascaded 1-dimensional (1-D) horizontal and vertical WMFs to reduce the computational complexity to $O(r)$. In this paper, by using the sparse window approach [3], we propose an architecture that uses fewer hardware resources than the sWMF while maintaining the complexity $O(r)$.

2 Proposed Architecture

Increasing the window size of the WMF, as applied to disparity refinement of stereo vision, tends to decrease the disparity error rate. As the window size increases, however, the hardware complexity of the WMF increases as well. Thus, this paper proposes an architecture in which the horizontal WMF adopts the sparse window approach. The proposed architecture reduces hardware resources or decreases the disparity error rate by using the sparse window with horizontal size m that provides a similar effect to the original window with horizontal size $2m-1$.

As shown in Fig. 1(a), the proposed architecture consists of a 1-D horizontal weighted median filter (HWMF), line buffers, and a 1-D vertical weighted median filter (VWMF). Unlike the sWMF, the proposed 1-D HWMF uses a sparse window to find the weighted median value. Fig. 1(b) shows the module to generate the horizontal sparse window. The disparity and image inputs to the 1-D HWMF are split into even or odd windows depending on their x coordinates, and then each window is sent to the corresponding sorter. To sort the disparity values, the 1-D HWMF and 1-D VWMF use linear sorters, each of which consists of a sorting basic cell (SBC) array [4]. Similar to the sWMF, the weight calculator computes the weights based on the difference of values between the center pixel and the others in the window of the original image. The weight calculator also accumulates each weight in order by using an adder tree. It then sends the accumulated weights and the total weight sum, T_w , to the median selector. The median selector compares each accumulated weight to the $T_w/2$, and generates a string of 0's and 1's by giving a "0" if the accumulated weight is smaller, and a "1" if it is equal or larger. The position of the first "1" in the string indicates the position of a disparity selected as the median value. The main difference between the 1-D HWMF and 1-D VWMF in the proposed architecture is that the sparse window approach is applied in the former and not in the latter. In addition, the 1-D VWMF should be implemented by including several line buffers. Except for these, the operations of the 1-D VWMF are almost identical to those of the 1-D HWMF. For simultaneous read and write operations, the line buffers are constructed with dual-port RAMs.

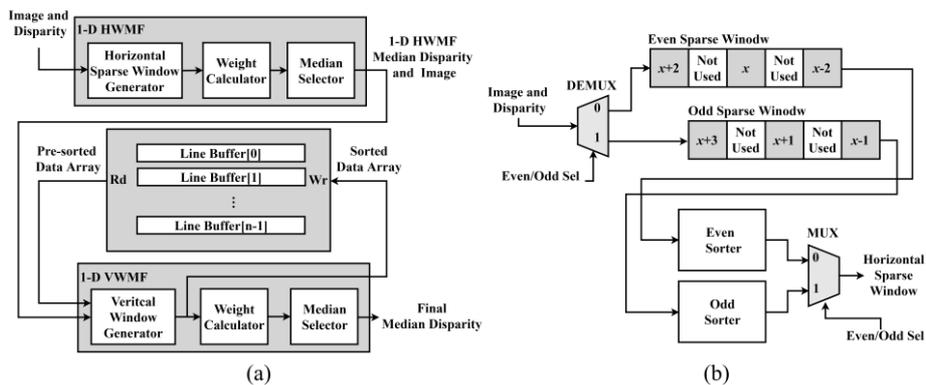


Fig. 2. Proposed architecture: (a) overall architecture; and (b) horizontal sparse window generator.

Table 3. Comparison of synthesis results between the proposed architecture and sWMF.

Architecture	Window Size	Slice LUTs	Slice Registers	DSP48Es	Block RAM
sWMF	39×39	12,200/203,800	15,813/407,600	0/840	55/445
Proposed	21×39	13,668/203,800	8,319/407,600	0/840	58.5/445
	39×39	22,268/203,800	11,688/407,600	0/840	58.5/445

3 Experimental Results

The proposed architecture was implemented on a Xilinx XC7K325T FPGA to be compared with the sWMF. Both architectures used 148.5 MHz as the working frequency and 128 as the disparity range. The maximum video format for both architectures is 1080p@60Hz. Table 1 shows the comparison of synthesis results between the proposed architecture and the sWMF. In the proposed architecture whose window size is 21×39 , the horizontal sparse window is made by selecting sparsely 21 pixels among 41 horizontal pixels. In this case, when compared with the sWMF, the proposed architecture reduces the number of Slice Registers by nearly half while slightly increasing the hardware resource usage of Slice LUTs and Block RAMs. In the proposed architecture whose window size was 39×39 , the hardware resource usage of Slice LUTs increases but the disparity error rate can be decreased.

4 Conclusion

In this paper, we proposed a hardware-friendly architecture for the WMF using the sparse window approach. The proposed architecture can reduce the hardware resource usage as compared with the sWMF by generating horizontal sparse windows. Because of this advantage, the proposed WMF architecture can be widely used for disparity refinement in stereo vision. In future work, we will evaluate the disparity refinement performance of the proposed architecture.

Acknowledge

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Service Gateway between Interface Modules of Dehumidify Dryers and a Monitoring Server in a Plastic Smart Factory

Un Gu Kang, Byung Mun Lee
Dept. of Computer Engineering, Gachon University, Korea
ugkang@gachon.ac.kr, bmlee@gachon.ac.kr

Abstract. It is needed to control at real time for a dehumidification process to plastic materials in order to reduce defected productions. In this paper, We proposed a service gateway to provide control services for dehumidify plastic materials according to priorities after receiving five types of data from multiple dehumidify dryers in real time and considering factors such as moisture content of plastic raw materials. It will be an intelligent service gateway model to control multiple dehumidify dryers at a manufacturing for a plastic injection molding in a smart factory.

1 Introduction

If the drying conditions of the plastic raw materials is not kept constant, the defective product will be manufactured during a plastic injection molding process [1]. Typically, the drying process must be carried out in a dehumidifying dryer connected to the injection molding machine, before they are introduced into one injection molding machine. However the plastic raw materials become humid depending on the type of materials or various conditions in the process of distribution and/or supply of them. Therefore, it is necessary to measure how much they have moisture and control the humidifying dryer to reduce them in real time.

It has been progressing the researches and developments which convert from factory automation to the smart factory [1,2]. One of them is the interface module, which it is measured five data, such as dew point, temperature, air volume, motor overload status, and valve operation status, from dehumidify dryer inside, and transmits to the monitoring server [1]. However, most injection molding systems have their own dehumidify dryer and are cooperated each other to manufacture products in the process. Small-size factories use about 10 dehumidify dryers to manufacture products, while large-size factories use dozens of dehumidify dryers to produce them. Therefore, there is a need for a service gateway that collects, analyzes, and transmits the data measured by the dehumidify dryer to the server efficiently.

We define and propose a service gateway to transmit measured data and control data between the interface modules and a monitoring server in this paper. Moreover, the service gateway needs priority-based processing to analyze them as soon as it receives the measured data and to control the dehumidify dryer in real time without a command from the server so that defects can be immediately reduced.

2 Service Gateway

A plastic manufacturing process takes place in several factory buildings, and many dehumidify dryers work in each building. As shown in Figure 1, the dehumidify dryers are operated in several buildings such as SF₁ and SF₂, and several service gateways are responsible for collecting and analyzing data between the interface modules for dehumidify dryers and a monitoring server.

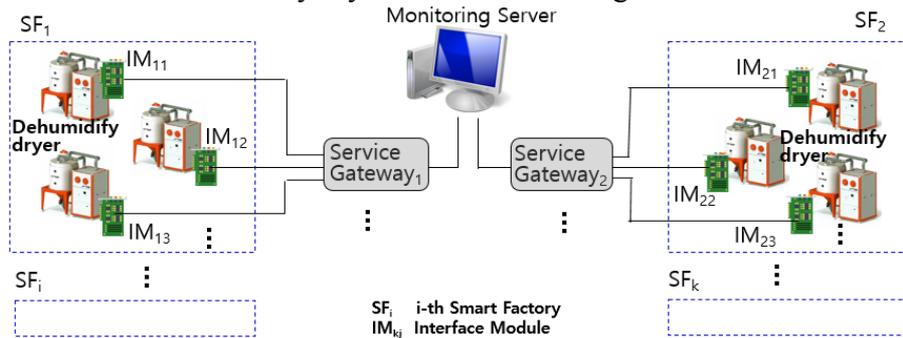


Figure. 1. System environment around service gateways

The functions required by the service gateway in such an environment are the real-time transmission and reception of measured data, analysis of measured data, alarm control over moisture, sensor modules management, failure recovery, untransmitted data management, and log management

3 Conclusion

Humidification management for plastic materials is important to reduce defective products. In this paper, we proposed a service gateway model that can control the dehumidify dryer through real-time data measurement and analysis.

Acknowledge

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A Study on the Shared Service Quality Factors in China's Non-face-to-face Auto Insurance Market

Kwak young-sik¹, Han kang-il², Koo ja-kyung³, Nam yoon-jung⁴, Pak ji-young⁵,
Hong jae-won⁶

¹ Entrepreneurship Research Institute, Gyeongnam National University of Science and Technology, Korea

² China and Korea Simultaneous Interpretation, University of International Business and Economics, China

³ Managing Director, Cheil PengTai, China

⁴ President, Vino Consulting, Korea

⁵ Dept. of Business, Gyeongnam National University of Science and Technology, Korea

⁶ Dept. of Global Trade, Gyeongnam National University of Science and Technology, Korea

¹yskwak@gntech.ac.kr, ²h546911@naver.com, ³dandy.koo@cheilpengtai.com, ⁴jean@vinoconsult.com, ⁵xhddid@gmail.com, ⁶jwhong@gntech.ac.kr

Abstract. The purpose of this study is to develop a model to measure the quality of service encountered by customers in the event of a car accident after insurance purchase by non-face-to-face and to identify the importance of service quality components to customer satisfaction in China car insurance market. As a result, we found that four factors (driving use service, promptness, human service, document processing) were significant except vehicle additional service.

1 Introduction

China's car insurance including face-to-face and non-face-to-face is a large market worth \$ 103 billion in 2016 [2]. Where, non-face-to-face includes online sales and telemarketing sales. It is a high-growth market with a market size of \$ 83 billion in 2014, a growth of 13% in 2015, and a growth of 9.8% in 2016 (Table 1).

Table 4. Chinese Car Insurance Market Size

Year	2014 (billion \$)	2015 (billion \$)	2016 (billion \$)
Total Market Size	83	93	103
Face-to-face	62	69	82
Non-face-to-face	21	24	21

2 Literature Review

The characteristics of these existing studies are as follows. First, the service quality model of face-to-face car insurance in Chinese insurance market conducted by Chinese researchers is based on the five service quality components of Parasuraman, Zeithmal, and Berry (PZB) [1-2]. Second, since PZB (1988), Chinese researchers had developed an industry-specific service model by claiming that the service quality model is different for each industry. However, they have not developed a specialized model of the car insurance market. The service quality of the insurance company can be divided into the pre-purchase phase and the post- purchase phase [3], and the insurance purchase phase and service execution phase [4].

3 Research Proposition

Research question 1: What are the insurance service components of non-face-to-face in case of an accident in China?

Research question 2: What is the relative importance of the service quality component of non-face-to-face car insurance to customer satisfaction in case of an accident in China?

4 Empirical Analysis

We conducted surveys and collected 246 samples in five regions in China. And exploratory factor analysis was performed to identify the service quality components. As a result, 12 measurement variables were developed. Based on these components, we confirmed the importance of service quality components to customer satisfaction in the event of an accident in China's non face-to-face auto insurance market.

5 Conclusion

These results suggest that it is important for insurance companies to take immediate action for customers when an accident occurs. On the other hand, the impact of value added service for car maintenance factor on customer satisfaction is not significant, because these components (Free exchange of consumable, Seasonal car management service, Special contract of warranty expansion) are not items that need immediate action in case of an accident.

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A Real-time System to Predict Photovoltaic Power Generation of the Desired Time Section

Yongsu Kim¹, Sanghyun Lee², Howon Kim³

^{1,2,3} Dept. Of Electrical and Computer Engineering, Pusan National Univ., Korea
¹dkgogog0329@gmail.com, ²jdsd2233@gmail.com, ³howonkim@gmail.com

Abstract. The problems of fossil fuel depletion and global warming have been growing recently because of the increase in energy consumption and greenhouse gas emissions. Photovoltaic energy has gained much attention as future energy to solve these problems with its eco-friendly and unlimited energy sources. To operate solar power management efficiently, the prediction of solar power generation needs to be accurate. This study proposes a real-time photovoltaic power generation prediction system consisting of the high accuracy forecast module based on LSTM. The proposed system provides high availability by predicting the solar power generation of the desired time section instead of the fixed time point.

1 Introduction

In recent years, energy consumption and greenhouse gas emissions have been continuously increasing. As a result, fossil fuel depletion and global warming problems have been emerging. To solve these problems, photovoltaic energy comes into the limelight which is eco-friendly and has unlimited energy sources. For efficient operation and improved economic efficiency in managing photovoltaic energy, accurate prediction of solar power generation is required.

Photovoltaic power generation is difficult to predict because solar power is affected by various factors such as weather conditions and facility status. Many studies for predicting solar power generation have been conducted by applying machine learning and deep learning techniques that can effectively analyze and predict complex data. The existing methods for solar power generation use various machine learning techniques such as SVM, FOS-ELM, ARIMA, ANN [1,2,3]. However, these studies have weaknesses of prediction methods that cannot predict the solar power generation of the desired time section. In this study, we propose a method to predict hourly solar power generation of the desired time section that brings high accuracy based on LSTM. In addition, we introduce the system that predicts photovoltaic power generation in real-time connecting with the solar power plant.

2 Proposed System

The proposed system architecture is composed of a data processing module, an insolation forecast module, and a power generation forecast module. Data processing module process power plant data and weather information data. Power plant data includes the power generation and the insolation, and weather information data includes temperature, humidity, cloud cover, and ultraviolet (UV) index in the power plant area. The forecast modules consist of the insolation forecast module and power generation forecast module, both of them use Long Short-Term Memory (LSTM) [4,5] to learn the time series characteristics of the data well. The advantage of using LSTM is that it is possible to predict the time series data of the desired section instead of the fixed time point. In this study, weather historical data and weather forecast data of Dark Sky API [6] were used to predict solar power generation.

However, since there is no insolation data that is most closely related to solar power in the weather forecast data, we first constructed the insolation forecast module to predict the insolation through weather variables. The insolation forecast module contributes to improving the accuracy of solar power generation prediction.

The overall process of the proposed system is as follows. First, the data processing module receives the power plant data in real-time and performs data preprocessing so that the forecast modules can learn power plant data and weather information data. Second, the insolation forecast module predicts the insolation using weather forecast data such as temperature, humidity, cloud cover, and UV index. Finally, the power generation forecast module predicts the solar power generation using predicted insolation and weather forecast data.

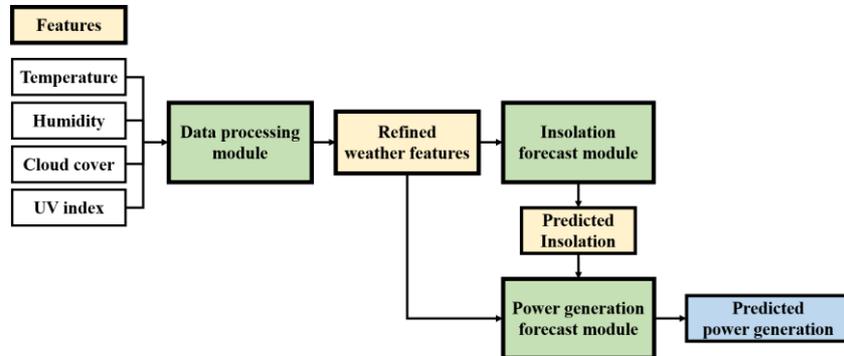


Figure 1. The proposed system architecture for solar power generation prediction

3 Conclusion

This paper proposes the real-time photovoltaic power generation prediction system using weather forecast data. The proposed system has an advantage of high availability to predict the solar power generation of the desired time section by constructing the forecast modules as LSTM. Recently, solar power business is growing faster than ever. Our results provide high-accuracy solar power generation forecasting function for solar power business so that it is possible to plan the power generation operation efficiently. In the future, we plan to conduct further research to improve the accuracy of solar power generation forecast using satellite images and various deep learning methods.

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A Case Study on the Multipath Interference Phenomenon for Airport Facility

Cho Kwang-sik¹, Moon Jeong-il², Kwak Yoon-sik³

^{1,2}Civil Aviation Training Center, KAC, Korea

³Dept. Of Computer Eng., Korea National University of Transportation, Korea

¹kscho@airport.co.kr, ²wow6802@naver.com, ³yskwak@ut.ac.kr

Abstract. In this paper, in which was studied fa generated by the obstacle (reflector) or imbalance terrain and analyzed the distortion of the ILS signal. By utilizing of computer simulation technology method for Nav aids system, analysis and the result of the interference of the characteristics of the detected multipath interference are described. This paper addresses Category I (CAT I) performance prediction of the Instrument Landing System (ILS), Glideslope and Localizer, with analyzing the Nav aids signal interference based on the existed surrounding obstacles including the new planned apartment complex that is located off the end of runway threshold and test parameters were verified on the basis of the analysis of the simulation results.

1 Introduction

In this study, the distortions of the nav aids information by the interference signal that is caused from the apartment buildings planed, construction cranes and existing obstacles on the extension of the airport runway are simulated and analyzed using the computer simulation method.

Based on the analysis of the results, we draw a conclusion that the instrument landing facilities currently in operation satisfied with the CAT I performance requirements. Computer based simulation program is used as the basic judgment of the effects of radio interference. We use the collected data [1] for the computer simulation test program.

2 ILS and Interference of radio waves

The functions, categories, installation site criteria, installation standards and obstacles were described in connection with the instrument landing system (ILS). ILS provides information to induce aircraft to land safely in bad weather conditions such as low visibility and low cloud height.

The configuration of the ILS is composed of LLZ as shown in Figure 1 (LOCALIZER : provide information of the runway center line), GP (GLIDE PATH : provide of 3 ° information), and MB (Marker Beacon) facilities that is compose of IM (Inner Marker), MM (Middle Marker) and OM (Outer Marker). [2] [3]

/

Figure 1. ILS System Configuration

General theory of reflection and diffraction theory of radio wave based on the given the existing environment of the airport were studied. We used the complex Scattering Model (scattering propagation prediction program) also the ILS receiver characteristics mounted on the aircraft to receive the ILS space modulated signal and receiver filtering technique were considered to the computer simulation programming.

3 Conclusion

We carried out 3 types of simulations to the construction cranes to be used in the apartment construction planed. As a result, large crane 290HC format was found to exceed the height of the permission of the obstacle. However, Model of the middle height of the crane and the topless crane HYD C100T (LTM-1095), have been classified as a site usable in. Under the conditions which all of the cranes are working at 10 ° direction, simulation flight is implemented as on the assumption of the worst case. All result parameters are in international standards.

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A Study on the Multi-Component Analysis of Social Entrepreneurs to Improve Organizational Effectiveness

Son Jung-hwan¹, Kim Mi-Hee², Kim Sung-soo³

^{1,2} The master's course, Yonsei Graduate School, Korea,

³Dept. Of Intellectual property, Mokwon University, Korea

¹onlycity1@gmail.com, ²perple1217@naver.com, ³sskim@mokwon.ac.kr

Abstract. This study aimed to analyze the effects of leadership on role stress, communication, and organizational culture as factors of social enterprises; to do this, path analysis was performed to determine factors for leadership, role stress, organizational culture, communication, and organizational effectiveness of social entrepreneurs. Unlike the finding of the literature review that persistence and growth of social entrepreneurs may depend on capabilities of leaders and managers, this study found that an enterprise can improve its organizational effectiveness through its members' organizational culture, communication, and role stress.

1 Introduction

The policy-based support for and research on social enterprises, whose importance is emphasized with economic growth at the national and international levels, tends to be on the constant increase and a lot of relevant research is published. Glynn (2000) and Zilber (2002) found that social enterprises might have inherent limitations in terms of market competitiveness. This is because social enterprises have two different theoretical logics in terms of organizational management. Since social enterprises need to seek social values related to education, employment, welfare, and environment as well as economic values in the same way as general competitors in the market, they cannot but be less competitive in the market. It was also reported that enterprises' activity of fulfilling social responsibilities could cause them to become less competitive in the market (Hayek, 1944).

In addition, as emphasis tends to be placed on the importance of organizational effectiveness to achieve the goal of sustainable development and growth for social enterprises, a lot of research has been conducted to present the existential values of organizations (Kim, 2014)

This study aimed to overcome these limitations, determine organizational effectiveness for growth and sustainability of social enterprises, and analyze the multiple factors and causal relations for social entrepreneurs. To do this, an analysis model was presented with leadership, role stress, communication, and organizational culture adopted as factors of social entrepreneurs, and the excellence of the research was verified through the analysis of the inter-factor relations.

2 Method and Analysis

This study intended to analyze the factors for organizational effectiveness of social entrepreneurs and the effects of their leadership, organizational culture, communication, and role stress on organizational effectiveness.

To do this, leadership was set as an independent variable, organizational culture, communication, and role stress at social enterprises were set as parameters, and organizational effectiveness at social enterprises was set as a dependent variable.

On the basis of the model, inter-variable relations are hypothesized to test for significance.

H1. Social entrepreneurs' leadership would significantly affect organizational effectiveness.

H2. Social entrepreneurs' leadership would significantly affect role stress.

H3. Social entrepreneurs' leadership would significantly affect communication.

H4. Social entrepreneurs' leadership would significantly affect organizational culture.

H5. Role stress would significantly affect organizational effectiveness.

H6. Communication would significantly affect organizational effectiveness.

H7. Organizational culture would significantly affect organizational effectiveness.

3 Conclusion

This study analyzed the path of organizational effectiveness through leadership, communication, organizational culture, and role stress on the basis of the characteristics of social enterprises seeking social and economic value creation in officials and employees of social enterprises at the national level. The path analysis obtained the following results and suggestions :

Transformational leadership as a sub-variable of leadership and role stress were crucial factors for organizational effectiveness of social enterprises. It is therefore necessary to develop competence programs for social entrepreneurs to improve transformational leadership; most of all, priority should be given to the development of programs for officials and employees of social enterprises to reduce their role stress.

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Wire Removal and Recognition on Circuit Elements on Electronic Schematics

Si Jongwook¹, Kim Munnyeon², Kim Sungyoung³

^{1,2,3} Dept. Of Computer Engineering, Kumoh National Institute of Technology, Korea
¹tgs03087@naver.com, ²moonnyeon@kumoh.ac.kr, ³sykim@kumoh.ac.kr

Abstract. While new electronic schematics may need to be created, existing electronic schematics are often reused. It is a very tedious process to redraw the schematic by hand to recreate the drawings that exist in printed form on paper. It would be very convenient if existing drawings drawn on paper could be automatically recognized and digitized without user intervention. In this paper, we present a method of detecting wires and recognizing several important circuit elements from existing electronic circuit diagrams. This paper is a preliminary study to analyze existing electronic schematics and convert them into PSpice's script code.

1 Introduction

All electronic products used in daily life are composed of electronic circuits. In order to make a single electronic product, a circuit diagram is required at the design stage, which is composed of various circuit elements and wires. We can use software like OrCAD's PSpice to create the schematics. The software can not only create electronic schematics but also simulate them.

When using schematic software, the schematics are completed by selecting and placing the required elements from the library containing the circuit elements and connecting them with wires. In the case of PSpice, the complete electronic schematic is stored using script code. The same result can be achieved by writing script code instead of drawing a schematic during the schematic creation phase.

While new electronic schematics may need to be created, existing electronic schematics are often reused. It is a very tedious process to redraw the schematic by hand to recreate the drawings that exist in printed form on paper. It would be very convenient if existing drawings drawn on paper could be automatically recognized and digitized without user intervention.

There are some previous studies to automatically recognize circuit elements [1-4]. However, these methods do not perform analysis on existing schematics but rather concentrate on recognizing circuit elements or texts that exist within schematics. In this paper, we present a method of separating wires and recognizing several important circuit elements from existing electronic circuit diagrams. This paper is a preliminary study to analyze existing electronic schematics and convert them into PSpice's script code.

2 Wire Removal on Electronic Schematics

The existing circuit diagrams are input as images. For the input images, the noise removing step is performed and then lines corresponding to the wires are detected and removed.

Edge detection is first performed to detect wires, and then morphological operation is performed on the results. The purpose of the morphological operation is to minimize the effects of text and symbols in the wire detection step. The morphological operation blurs the circuit elements and texts while keeping the lines intact. Finally wire detection is performed using Hough transform. Figure 1 shows the result of wire detection and removal.

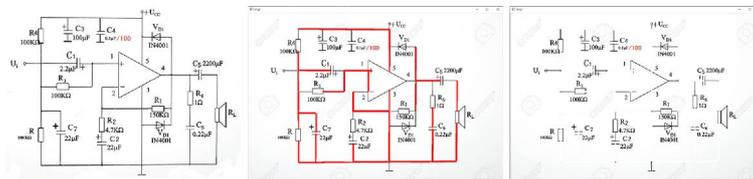


Figure 1. The result of wire detection and removal. Left image shows input schematic image. Middle image shows the detection of wires and right image shows the schematic after removing detected wires

3 Recognition of Circuit Elements

Recognition of circuit elements is performed using YOLO. First of all, we trained the 26 most frequently used elements. The type and number of the elements used to create the YOLO model are shown in Figure 2.

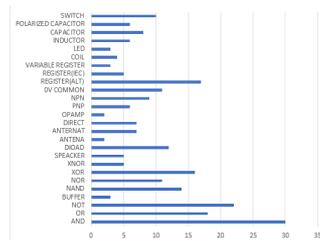


Figure 2. The type and number of the elements used to create the YOLO model

Figure 3 shows the recognitions of circuit elements on unseen schematics. The recognition result is not high yet because we do not use enough training data.

However, recognition results for relatively large numbers of AND, OR, and XOR gates provide high accuracy.

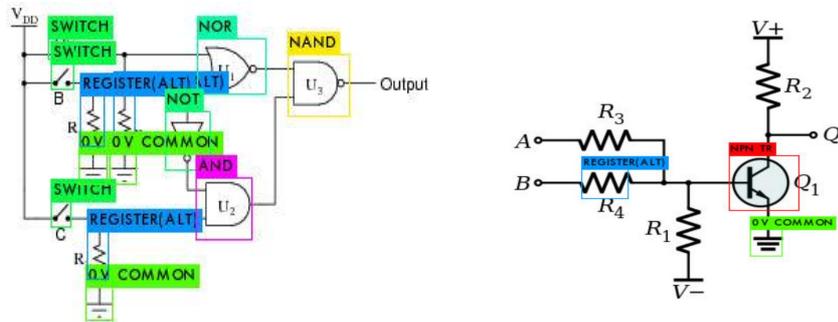


Figure 3. The recognition results of circuit elements on electron schematic. The left image shows the case where the recognition is successful for all the circuit elements, and the right image shows the case where it does not.

4 Conclusion

In this paper, we presented a preliminary study to analyze existing electronic schematics and convert them into PSpice's script code. This study includes detecting wires and recognizing several important circuit elements from existing electronic circuit diagrams. The wires could be detected accurately in the circuit diagram, but the recognition on the circuit elements was not yet accurate due to overfitting. We will extend this result to develop a system that effectively analyzes electronic schematics.

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Development Status and Trend of IoT Communication Technology

Zhenhua Liu

Hefei University China Hefei 230601

jsn.bourn@gmail.com

Abstract. In the context of the modern information age, the development of Internet of Things (IoT) communication technology is slowly emerging. Today, IoT communication technology is widely used in people's daily life and work. IoT communication technology is the product of a new era, and it realizes the communication between objects. It will have many changes in the future, and its development must be constantly innovated. This paper mainly elaborates on the development status and trend of IoT communication technology, and explores the future direction of IoT communication technology through the introduction of the IoT and the application of IoT communication technology in life based on the current development trend of IoT communication technology.

Keywords: Internet of things, Communication technology, Development status, Trend

1 Introduction

In the context of modern information technology, IoT communication technology is slowly changing our lives and work, which makes our lives more convenient. In terms of communication between people, between things, the IoT has a very large space for development^[1]. The development of IoT communication technology is of great significance to the future and to the present. The following is a discussion of the development and future trend of IoT communication technology from several aspects.

2 Introduction to the IoT

The rise of the IoT is caused by people's understanding of information technology, and it is slowly being accepted by people. The IoT is a kind of network information that shares and transmits information between two objects through the Internet of Things technology. There are many technologies involved in the IoT technology, such as modern information technology, sensory information technology, identification information technology, and communication information technology^[2-5]. These information technologies are technologies that are integrated with the IoT, which is also the reason why the IoT can arise. It is a combination of information technology.

Rural Retirement Destination Project Recommendation and Project Development Based on Big Data Analysis

Yue Wang¹ and Haisen Lin² (✉)

¹ College of Business Administration, Jilin Engineering Normal University, Changchun 130012, China

² College of Landscape Architecture, Changchun University, Changchun 130022, China
(✉) Corresponding author: 51386781@qq.com

Abstract. With the rapid development of the social economy and the continuous improvement of living standards, people are more concerned about the living conditions of the elderly. As young people are more busy with work, empty-nest families are gradually increasing. Therefore, the traditional home-based pension is not suitable for the old age of today's elderly, and with the booming tourism industry, the combination of the elderly's old-age life and tourism has become a hot spot of current research. This paper firstly reviews related works and literatures on tourism and old-age care for the elderly through literature search and web search, and studies the rural tourism pension through window analysis, Euclidean distance method and rasterization method. The target election index is calculated by using the analytic hierarchy process to calculate the index of the tourism pension suitability evaluation.

Keywords: Tourism pension, Rural tourism destination, Tourism project development

4 Introduction

After the end of the Second World War in 1945, a large number of soldiers returned to the country, resulting in baby boomers worldwide in the following years. After 2005, the number of people born in the baby boom has reached 60 years old. The number of elderly people around the world is increasing year by year. The phenomenon of aging population has quietly appeared and expanded rapidly around the world. According to the sixth population survey, the number of elderly people in China has reached 170 million, accounting for 13% of the country's total population. It is expected to reach 350 million by 2030 and 400 million by 2050. This means that every ten people in China will have one elderly person. In the case of an aging population problem, the way of providing for the elderly has become a hot issue in today's society. Tourism pension is to let the elderly with the needs to leave their homes in the short-term or long-term way of tourism. According to their own preferences and economic ability, they can choose the destination of tourism and pension, so that they can travel in different places and can also support the elderly. A new model of old-age care. This type of retirement can allow older people to travel, travel, vacation, and migrate to a

more comfortable environment for specific needs such as visiting relatives or recuperation, or for a short or long-term migration to avoid the cold and heat.

With the rapid and stable development of China's economy, people's income has also increased, and their living standards have gradually improved. Savings, pensions, and endowment insurance have provided economic security for the elderly in their later years. This provides an opportunity for the elderly to travel. economic basis. With the improvement of living standards, the elderly are getting healthier. According to the Chinese Academy of Social Sciences Population Survey, the average life expectancy of mainland Chinese is 72 years old. For a long time, enjoy the old age [1-3]. With the development of society and the progress of the times, people's concepts will change accordingly, and the acceptance of new things will be faster and faster. When they are young, they have the idea of playing, have no time, but have enough time to enjoy after retirement. Life, the elderly are willing to try some new, alternative ways of providing for the elderly. In addition, due to the busy work of young people, the number of empty-nest families has gradually increased. The elderly are lonely, boring and unattended in their later years. The traditional home-based pension is no longer suitable for the old age of today's elderly. Many cities have tight old-age resources, and the beds in nursing homes such as nursing homes are tense, and the conditions in nursing homes are mixed. Modern and convenient transportation facilities have brought great convenience to people's travel. The development of telephone and Internet has brought people and people closer together, which provides realistic possibilities for the development of tourism and pension. Under such a background, tourism pension has gradually become an important way of providing for the elderly beyond the traditional methods of home-based care and community pension.

Choosing a suitable tourist destination with a high index is of great significance to the elderly [4]. Appropriate destinations can enrich the lives of the elderly, improve the quality of life of the elderly, and benefit the physical and mental health of the elderly. After the urban old people retire, they are liberated from their jobs. Due to the narrowing of the role-changing activities and the reduction of social interactions, the scope of activities is limited to family, community or elderly activity centers, and the traditional family model of children and grandchildren gradually disintegrates with children. The increasing number of elderly people living separately makes the mental state of the elderly, such as loneliness, depression, and impatience, unable to be released. In the long run, physical illness will increase. Under the premise of good health, sufficient time and material prosperity, high-level spiritual enjoyment has become their goal. Tourism pension can enable the elderly to enjoy the natural scenery, appreciate the beauty, explore cultural monuments and appreciate the culture of different places in the process of providing for the elderly. Feel the customs, get the aesthetic pleasure, and cultivate the sentiment. At the same time, the beautiful scenery and environment-friendly places can achieve health care and other effects, and the elderly's body can be greatly improved. In the process of tourism and old-age care, the elderly can also interact with people from different classes, ages, occupations and beliefs to meet friends, not only enhance social interaction, but also help the role of the elderly to adapt and enrich the color of life and enrich the inner world of the elderly. Second, the development of tourism pension can promote the development of all aspects of society. Developing tourism pensions can increase employment opportunities and ease employment pressure [5-6]. China is a country with a large

License Plate Character Segmentation Algorithm in Intelligent IoT Visual Label

Honglin Xie

College of Information Engineering, Shandong Yingcai University, No.2, Yingcai Road, Jinan, Shandong, P.R. China, 250104
xiehonglin0@126.com

Abstract. One of the most important core technologies in intelligent visual Internet of Things is visual labeling technology. It identifies, understands, and classifies the content in a video or image, "tags" it, and displays the contents of the label information corresponding to the identified object. In the Intelligent Visual IoT vehicle Visual label production process, including: access to vehicle images, license plate positioning, license plate correction, character segmentation, character recognition and other processing, and finally identify the license plate number to provide the most important vehicle information for the vehicle Visual label. This paper mainly focuses on the research of character segmentation algorithm for intelligent Visual IOT vehicle visual label making, and puts forward some better improved algorithms through the experiment, comparison and analysis of three character segmentation methods of horizontal projection, template matching and c-mean clustering analysis. For example, a given type of class center method is used in clustering analysis, and the steps of upper and lower boundary detection are added to template matching and clustering analysis.

Keywords: Intelligent visual internet of things, Vehicle visual label, Character segmentation algorithm, Clustering analysis

5 Introduction

Intelligent vision Internet of things is an upgraded version of the Internet of things[1]. Its core technology is intelligent visual labeling system. Visual tags are the identification, understanding, and classification of content in images and videos. [2] Visual comprehension or image processing and computer vision technology is used to complete the implementation of such functions. The difference between visual labels and RFID tags [3] is that objects can be identified over longer distances using visual labels, which is the most striking difference between visual and RFID tags, breaking the limits of distance and range, and there will be no confusion when multiple objects appear at the same time, because each object should have a unique label. This label is a virtualized label, and we label the specified object and store it in a database for intelligent visual IoT system calls and matches. [4]

Analysis of the Communication Characteristics and Audience Usage Requirements of Animation Apps

Chuang Chen

Zhengzhou institute of industrial technology, Zhengzhou, Henan, China
474500630@qq.com

Abstract. With the development of animation art and technology and the innovation of the mobile Internet and mobile terminals, the spread of the animated film carrier has experienced film, television, Internet and new media era, animation class APP is based on mobile Internet technology, mobile phone, PAD, such as portable mobile terminal as the carrier, to spread and animation playback software system, animation class APP which has a broad market prospect can update animation series, meet the demands of popularization and personalized audience, etc. Through the study on the communication of animation apps and the media use needs of audiences, the development strategy of animation apps is proposed, which is of positive significance to optimize the structure and content of animation apps and provide more high-quality animation content.

Keywords: Animation APP, Communication characteristics, Use demand, Communication characteristics

6 Introduction

Animation apps are based on the mobile Internet and can only be used as communication media on mobile phones, pads and other devices to provide applications related to animation. Animation apps have the common functions of general mobile apps^[1]. However, as the video and audio broadcasting platform of animation content, animation apps can update animation series in real time, provide uploading and downloading of original animation cartoons, support online interaction and discussion of audiences, and have ancillary functions such as content recommendation and social networking.

Animation film media times of media, television, network medium and mobile media period, the four kinds of media have been accompanied by the development of technology and innovate ceaselessly, move the birth of new media, both technically and in the media means for the rapid development of the animation has provided a broad space, animation APP as a product of mobile media period, with its powerful propagation force and animation resources, has broad audience base and huge market value At present, tencent animation, quick to see cartoons, guqi animation, bilibili animation and other well-known animation apps, in China has achieved good

development, objectively speaking, to master the dissemination characteristics of animation APP, the development of animation APP has an important role.

7 Communication Characteristics of Animation Apps

2.1 Comprehensive and Personalized Communication Content

Animation apps face a wide range of audiences, which leads to a variety of ways for audiences to obtain animation resources. Those who are loyal to animation pay attention to the update of animation resources they are concerned about, and their demands are strong and persistent. As general audiences, animation resources are only a part of their preferences. Such audiences have weak and arbitrary demands for animation resources^[2-5]. According to different audiences' demands, animation apps present comprehensive and personalized communication contents.

Personalized animation APP, such as hundreds of thousands of cold jokes, killer eidur gudjohnsen, etc., these animated APP generally depends on the development of a good comic or animation works, for the convenience of the audience is convenient access to specific animation resources, personalized animation class APP to provide real-time updates of a specific animation resources, activity promotion, surrounding the structure is simpler, the audience is usually a fan of manga, durable, can be said to be detailed the animation of the APP. Comprehensive animation apps provide real-time updates of domestic and foreign animations, and open up fan communities. Audiences can have interactive discussions while watching animations, and upload their original cartoons to the APP for display, which can meet the one-stop needs of audiences

2.2 Professionalization and Popularization of Communication Subject

Animation is a comprehensive audio-visual art, art is part of the superstructure, making animation requires specific professional learning, animation designer need to master animation modeling theory, the motion law and related technology, animation from planning to the final rendering before attention need to experience the complex design process, so the spread of animation class APP's main body has the characteristics of specialization, the main body of this type of communication is animation practitioners, including the design of the animation itself and animation and derivatives of the promotion personnel, these communicators understand animation features,

The popularization of the main body of communication is another characteristic of the main body of communication of animation apps^[6-8]. This popularization is manifested in the context of flat development of mobile media, which lowers the threshold for the development of mobile APP. The general public can also establish their own APP and upload their own animation works through some preset procedures.

The professionalization and popularization of communication subjects exist at the same time, which is conducive to the spread and development of animation apps, the flattening of mobile APP development and the popularization of digital media, so that more audiences can participate in the original activities of animation works and the creative ideas can be quickly transformed into commodities.

Global Citizenship Education: Conceptual Model for Community Knowledge Construction via Information and Communications Technology (ICT)—Big Data and Blockchain-based Application

Yoonil Auh¹, Hae-Gill Choi²

^{1,2} Dept. of Computer and Information Communications Engineering
Kyung Hee Cyber University, Korea

¹yoonil@khcu.ac.kr, ²hgchoi@khcu.ac.kr

Abstract. Big data and Blockchain technologies are widely recognized to have the potential for innovation across the learning continuum. This paper proposes a conceptual model that extends traditional e-learning practice by capitalizing on significant features of these new technologies and applying them to modeling an e-learning platform for the non-formal learning community (e.g., lifelong learners, non-profits, corporations, government, the military). Global Citizenship Education is used to illustrate the conceptual model design because the subject is largely offered for the diverse community of learners, and topics are often open-ended. The authors also discuss current research trends of e-learning platform design.

1 Introduction

1.1 E-learning Platform

The advancement of ICT, standardization of learning platform and e-learning has opened the gateway to lifelong learning opportunities for all sectors of industry [1, 2, 3, 4, 5]. The acceptance of e-learning has rapidly grown since the launch of Massive Open Online Courses (MOOCs), which has unofficially endorsed e-learning as a viable option for education. In addition, community knowledge development through open learning has been scaled worldwide. Examples of community e-learning open platforms that were designed to promote community knowledge construction include the: Great Britten's FutureLearn (available at futurelearn.com/), Chana's XuetangX (available at xuetangx.com), the U.S. based - Udacity (available at udacity.com), Kadenze (available at Kadenze.com), France Université Numérique (FUN) (available at fun-mooc.fr/), India's SWAYAM (available at swayam.gov.in), Italy's EduOpen (available at eduopen.org), Japanese JMOOC (available at www.jmooc.jp/en), Korean KMOOC (available at kmooc.kr), Korean Military M-MOOC (available at mnd.nhi.go.kr/), Mexico's MexicoX (available at mexicox.gob.mx/), Latin American MOOC (available

¹ Author

² Corresponding author

at <https://miriadax.net/login>), Learning Community MOOC of GyunggiDo Province (available at gseek.kr), and Red Crescent MOOC (available at ifrc.csod.com) [6, 7, 8, 9]. According to the UNESCO Institute for Statistics [10], the demand for higher education has been growing as universities compete globally to attract students. One indicator of the interest in tertiary education is the growth in enrollment of MOOCs since their 2012 launch. By the end of 2018, the number of people accessing MOOCs had reached 101 million users [11], and this ubiquitous open-learning movement is shifting the paradigm of how people learn and access education[12].

Despite criticism of “MOOCs Hype” [13, 14] MOOCs have continued to increase social expectations for education and to shift the landscape of tertiary education worldwide. In response, e-learning platforms continue to innovate the learning platform to serve its millions of diverse learners and enrollments continue to grow. In comparison, worldwide online learner participation consists of a broader and more culturally diverse population than it was a decade ago [15]. Economic dislocation is accelerating the needs of continuum for general background remediation and domain-specific skills acquisition in response to the new industrial revolution. Hyper-connectivity, smart learning tools, and advanced social networks, which are reshaping how we think, learn, and work, can affect the development of the skills necessary for the future[12]. While a handful of e-learning platform vendors are redesigning to meet the needs of learners (e.g., Coursera, edX, Moodle, Blackboard), much of the current e-learning technology system is based on technology that was employed two decades ago (i.e., fixed-time, prepackaged and modularized contents, linear learning, test-based, user-led discussion boards, static contents—video, image, and documents). Technology innovations — artificial intelligence (AI), Big data analytics, Blockchain, robotics, 5G technology— and their applications in the industry sector have surged in response to the Fourth Industrial Revolution and these innovations have had ripple effects on the education sector for potential applications for e-learners.

This paper proposes a conceptual model for designing an e-learning platform that features the applications of key technologies of Big Data and Blockchain that offer greater flexibility, adaptability, customized contents, customized feedback, and personalized learning experience. The objective of the conceptual model serves:

- to clarify what is known about the application of new technology for the e-learning platform;
- to explore linkages and usefulness for improving current e-learning platform design; and
- to provide a descriptive model and integration of key technologies of Big Data and Blockchain into the platform design that promotes community knowledge construction for open-ended subjects.

The value of the proposed model lies in describing the specifications of integrated technology that correspond to the research of past and present. The model is designed for an open-ended learning subject exemplified by Global Citizenship Education (GCED), however, the uses of this platform are not limited to this group of learners. The proposed conceptual model is illustrated graphically with predefined properties of

Big Data and Blockchain technological concepts that can be populated and integrated [16]. The scope of this paper represents the e-learning system based on a literature review of the subject that consists of classes of technology currently in operation.

1.2 Global Citizenship

ICTs are central to both formal and non-formal education, and, likewise, global citizenship education (GCED) plays a more and more critical role than in the past. In 2012, the UN Secretary-General launched the Global Education First Initiative (GEFI). In 2015, UNESCO included, along with access to the quality of education, GCED in the Sustainable Development Goal on Education [17]. GCED is not about learning the survival skills in an increasingly globalized world, but about understanding the core values of non-discrimination, respect for diversity, and solidarity for humanity [18]. Therefore, the subject is interdisciplinary. While the modality of teaching global citizenship can occur in any form or shape, because its learning areas address human rights, social justice, democracy, environment, cultural preservation, and gender issues, the pedagogical approach is holistic and open-ended. Therefore, the focus of learning and assessment is in the process of learning, not on the outcomes. While education models for disseminating GCED surged after the announcement by UNESCO, the provision of GCED with ICT remains limited compared to other subject areas. It was largely non-formal institutions, typically non-government organizations (NGOs), that offered GCED as a subject. In support of UNESCO, the Asia-Pacific Centre of Education for International Understanding (APCEIU) developed the GCED Online Campus (available at www.gcedonlinecampus.org). The campus provides GCED-related courses, guest lectures, and related materials accessible for all. Online Campus is considered one of the core e-learning resources other than UNESCO. As part of literature review-based research, a trifecta analysis was conducted for the online campus for its desirability, usability, and viability. The summary of findings and conclusions for desirability of the GCED online campus are the following:

- capitalizes on the benefit of the UNESCO brand name for its content credibility;

- serves as a one-stop learning hub for GCED-related resources; and

- provides a cost-effective approach to disseminating GCED information and learning services at a global level.

The GCED online campus is linked to external resources as well as social media tools for the learning community to promote cognitive engagement and guided exploration of related topics on global citizenship. Social media include Facebook (Followers: <600

Total Likes: <700), Twitter (Followers: <1700), and YouTube (Subscribers: <100). Despite the endorsement of the campus by UNESCO, the world's largest organization, its activity log and public attraction remain challenges questioning its ability to function as intended. While the site is easy to use for quantified objectives, it remains minimal in numbers of site visits and resource material. Analysis of its usability and viability follows: (1) namely fewer attendees than desired, (2) uses of static instructional

models - i.e., a series of linear information; (3) limited learning activities provided; (4) no learning assessments provided; (5) low traffic generated perceived low subject value compared to other skills-based courses available on the web (e.g., computing-related skills); (6) no grounds for providing learner support; (7) no grounds for providing social networks among the learners and learning community other than web links to the external sites; (8) English is the working language for learning (two intro videos were offered in Spanish); (9) no instructional and learning activity to be integrated at a local level; and (10) no support process on guiding the learners to the step. The GCED online campus is a bill-board-like website for general stop-by audience. Indeed, it is challenging to implement sound instructional strategies and provide customized and tailored learning content for the learners with the currently available e-learning platform. The following section discusses research trends on e-learning platform design, focused on personalized community knowledge construction, increasing the learning experience for non-formal learners and addressing some shortcomings of the current learning platform for e-learning.

2 Literature Review: Learning Platforms of Current Research

The following section discusses research trends on e-learning platform design, focused on personalized community knowledge construction, increasing the learning experience for non-formal learners, and addressing some shortcomings of the current learning platform for e-learning. As the internet has found its usefulness in education, e-learning platforms have evolved in multiple phases [19]. The tools used in e-learning services today have been packaged into a unifying software system, making them into a learning management system (LMS) [20, 21]. Table 1 identifies current tools in LMS:

Table 5. The tools of LMS

Group	Activity	Tools
Instructor	Course management, document distribution, access to activity log and documentation.	Content storage, hyperlinks, on-site integrated content editing tools (PPT, Excel, Words), communication tools (discussion board, chat, videos, video conferencing, message board, and whiteboard.
Subject matter experts (SME)	Content creation.	Authoring tools, e-library, content storage, database, search tool.
Students	Access to learning materials.	

		Hyperlinks, PPT, document files, communications tools (discussion board, chat, videos, video conferencing, message board, whiteboard.
Administrators	E-learning management.	Database, digital storage, student information system(SIS), learning record store (LRS*) course registration, tracking and reporting system.

*Repository for learning records collected from connected systems where learning activities are conducted.

As the demands for online education have scaled-up worldwide, a specific sector for the e-learning platform industry has emerged, one that focuses on developing learning features that promote learner engagement at a new level and job-based learning and performance improvement. The platform models available today can be categorized as a learning management system (LMS), learning experience platform (LXP), and do-it-yourself learning platform (DIY). The following section outlines the key components of the three categories of platforms.

2.1 Learning Management System

A Learning Management System (LMS) is an administrator-driven web-based learning system that communicates with the Student Information System (SIS). LMS, once viewed as a revolutionary technology for education, it is seen today as where learners are limited in their control of learning because the system was designed with the traditional brick-and-mortar education mindset, e.g., the pace of the course based on fixed time, linear learning, static contents, and seat-time of each learner. Common features of their LMS are content authoring, learning management, content library, portals for extended tools, test bank, social network, and course completion system [20]. The capacity of current LMS is viewed as a repository for PowerPoints, course contents, videos, and exams [21,22] and the learners are expected to proceed with the prepared material linearly as the administrators programmed on their timeframe [23]. An LMS is designed largely based on the current schooling system operating on rigid, static teaching and learning practices. LMS has served its purposes for the past two decades, but as we enter the second decade of the millennium, the demand for learning is shifting from traditional didactic to constructive to learning-flexible to just-in-time, to personalized customized contents based on a learner's skill set, skills need, and interests. The LMS nevertheless continues to struggle to meet the demands of learner's learning satisfactory [24, 25] and such has pushed for further advancement of the learning platform.

2.2 Learning Experience Platform/System

A Learning Experience Platform/System (LXP) is considered the next-generation technology [26] where it serves as integrated online learning solutions aimed at improving organizational and individual performance. An LXP is a learning platform designed to provide a personalized, social, in-workflow learning experience that goes beyond the traditional LMS [27, 28]. The LXP operates on three layers - Experience Layer, Course Layer, and Data Layer - and operates based on xAPI (Experience API) as illustrated in Fig. 1 [29]. The xAPI is an open-source API that uses JavaScript Object Notation (JSON) for its data format [29] that is developed for learning technology which it makes it possible for e-learning software to speak to each other in a manner that records and tracks all types of learning experiences [30].

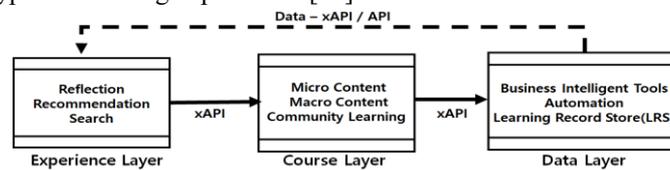


Fig. 1. Learning Experience Platform (author's rendition adapted from HT2Labs [29]).

The learning features of LXP include the platform to identify and address skills gaps in its learning community or organization through interconnected data analysis of organizations within and outside sectors of similar organization performance [31, 32].

This type of connectivity enables gathering and applying data effectively to measure the impact of an organization and to move away from the traditional top-down approach to training. Thus, the new self-directed and autonomous approach creates a new level of learning culture[33]. LMS and LXP may be used for different learning goals and objectives. However, as demand for and need for e-learning increases, the general design concept of the learning platform is shifting to LXP as demanded by corporate, industry, government, public sectors, non-government organizations, military, and lifelong institutions. An LXP example is LinkedIn Learning (available at www.linkedin.com/learning). LinkedIn Learning was launched in 2018 and offers personalized online classes through bringing together the expert-led content from Lynda.com. In LinkedIn Learning, the learning is based on a data-driven curator mechanism that provides professional insights and social experiences to create and to facilitate personalized and interactive learning. Through data analytics, LinkedIn Learning combines the content, learning activity data of a learner to create personalized course and makes recommendations based on insights from LinkedIn's network.

2.3 Do-It-Yourself Learning Platform

Do-It-Yourself Learning Platform (DIY) is a new direction for learning platform development. Here, vendors provide central platform services for users to create content on a provided website or to download the program and publish it on their website as illustrated in Fig. 2. DIY platform is designed for the freelancer, small business, non-profit organization, and local public office, for example, to develop online courses on their own and reduce administrative costs [21].

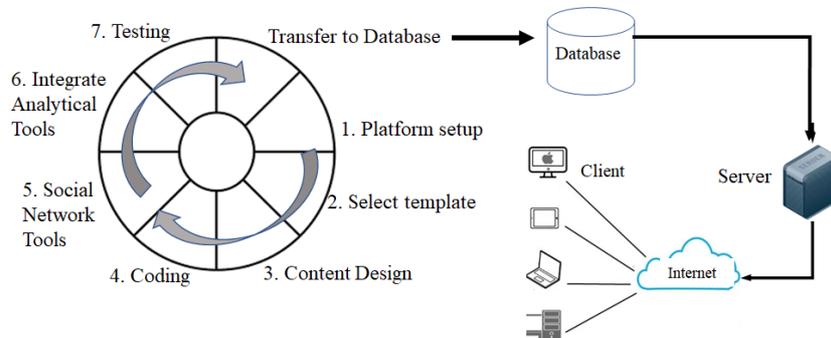


Fig. 2. DIY Authoring and Web Content Dissemination (author's rendition).

This platform is cost-effective and easy-to-use, designed for freelancers, small business owners, and non-profit organizations to develop online courses on their own and reduce much of overhead costs [21]. DIY is typically used for creating short tutorials on skill-based training, or for mentoring services (e.g., text and video-based or live and on-demand webinars) that can easily be published in the online marketplace. The DIY platform provides a multitude of content-design templates for diverse users as well as online tutorials for developers. Some notable DIY platform vendors are SimTutor, DIY (diy.org), Diyguru (diyguru.org), GSEEK (gseek.co.kr), Eliademy (eliademy.com), Teachable, Ruzuku, Thinkific, and WizIQ. Academic course content creators often use WizIQ because it is equipped with a multitude of plug-ins for learning management software such as Moodle and Sakai. Most DIYs are designed to create courses and publish them easily in the online marketplace. In addition, as a part of the DIY category, Open source e-Learning platforms (OLP) and Open-source Learning Software (OLS) are available.

2.4 Open-source e-Learning Platform and Learning Software

While Open-source e-Learning Platforms (OLP) and Open-source Learning Software (OLS) fall under the DIY category, OLP requires IT specialists to modify and implement it for the uses for the organization. OLP is equipped with standard e-learning tools found in LMS, including course management, social networking, assessment, and file backups [6, 9]. Currently available OLPs are Claroline, Coursebuilder by Google, Moodle (Modular Object-oriented Dynamic Learning Environment), ATutor, Eliademy, Forma LMS, Dokeos, ILIAS, Opigno, Sakai, OLAT, and Open SWAD. Among these, Moodle focuses on technology that aims to improve educational quality by responding to users' demands.

2.5 Summary

A review of current research indicates that learning platforms are focusing on accessibility, interoperability, personalization, analytics, advising, and expert system-based learning assessment where teaching and learning methods are incorporated with computer algorithms to analyze and assimilate all interactions from the learner and deliver customized resources and learning activities to address the needs of each learner [34, 35, 36]. The changes of learning platform design due to the paradigm shifts in education are occurring in all sectors except academic institutions. The shifts are not to

instructors, content, and pedagogical experts, but to a system that is ready to unpack and use, a system that is ready-made and flexible enough to allow customization for various types of learners and learning activities. The uses of traditional LMS continue in academics because the schooling system has for the most part not changed.

3 Methodology

The research presented here focuses on designing a conceptual model that integrates Big Data and Blockchain technology in the learning management system (LMS) to be used for community learning for non-traditional learners. This study relied mostly on an extensive literature review that considered the historical background of the LMS and the issues of current LMS design specifically. The study specifically focuses on three areas: (1) clarifying what is known and applicable technology for designing an improved e-learning system; (2) exploring the usefulness of Big Data and Blockchain technology for improving the current e-learning platform design; and (3) providing a descriptive model by illustrating the integration of key technologies into the conceptual e-learning platform model that promotes community knowledge construction for the open-ended subject. The literature review employed mixed methods to increase its trustworthiness. Two methods are the eight-step Systematic Literature Review of Information Systems Research (SLRISR; Fig. 3) by Okoli and Schabram [37] and the four-step Qualitative Interpretive Meta-Synthesis (QIMS, see Fig. 4) by Aguirre and Bolton [38]. The applied methodology is derived from the design-evaluation pattern described below.

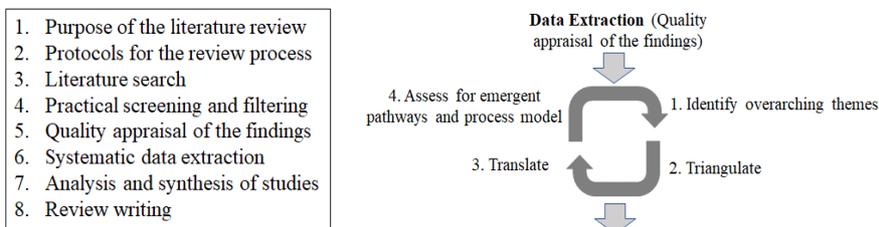


Fig. 3. SLRISR. Fig. 4. QIMS. Source: Author’s rendition. adapted from Aguirre and Bolton [38]

These two methods were used because they are widely used in literature review—SLRISR, in information systems literature review guided by the clearly structured eight-step guide; QIMS, in conducting a calculated and coherent approach to analyzing data across qualitative studies [38]. In this study, however, SLRISR was used as the framework and the steps 5, 6, and 7 was incorporated into QIMS to increase trustworthiness of literature review (Fig.5). This systematic process of integrating and interpreting relevant data across qualitative studies provides a unique and important contribution to reducing the gap between research and practice while providing a framework to explain a body of qualitative research and deepen understanding of a particular issue [39]. The meta-synthesis research approach is widely used in other fields. The integrated-mixed-synthesized method can be a far more practical tool that ensures the effectiveness of research in information technology for the application of

yet-to-be-tested new technologies in e-learning platform design.

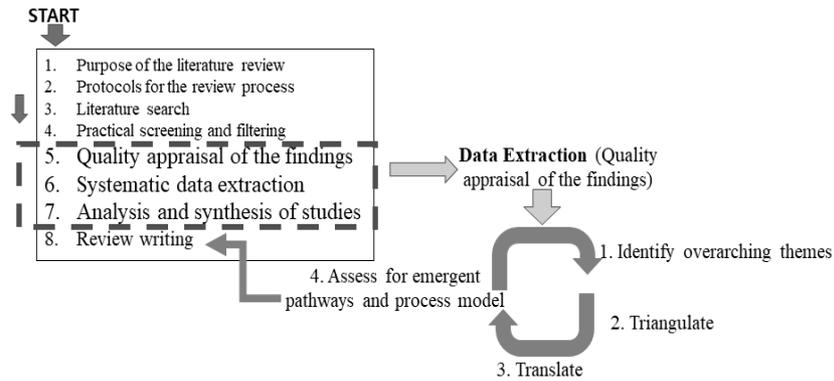


Fig. 5. Our SLRISR combined with QIMS model (author's rendition).

4 Applications of Big Data and Blockchain in Education

The utilization and incorporation of new technology in the education sector, however, historically lagged more than any other sectors. While the demand for education has grown worldwide and more learners are taking online courses, the integration of new technologies has been minimal, kept at a safe distance so as not to disrupt traditional schooling infrastructure. Now, the education market is demanding the incorporation of advanced technology to enhance learning. This section discusses the applications of Big Data and Blockchain in learning platform design to promote learning.

4.1 Big Data Application in Education

Data-driven decision-making is more commonly practiced now than in the past. While such decision-making has been practiced in business and industry, the education sector has lagged in implementing it. Although teachers have used data about students to inform their instructional decision-making since the early movement to formalize education [40], teachers have seldom incorporated data resulting from standardized tests or other data sources [41]. However, in recent years, using various measurements of standardized test data has become an accountability requirement in the schools. The practice of accountability has been increasing in schools and, as a result, motivation and incentive for data-driven decision-making have increased.

The integration of Big Data analytics into education has only occurred in recent years, but have become a huge interest for contemporary educators [42, 43]. Data feeding on Big Data offers educational institutions the potential to better serve learners and proactively address their learning needs through data analysis to identify student strengths and deficiencies and to apply those findings to their practice [40, 41]. With the application of Big Data analytics, adaptive learning technology may be applied to divert students at risk to spend time on their weak topics while continuing to keep pace with the rest of the class [44]. This is an important resource for ensuring that learners

maintain adequate learning performance through promoting student engagement. Various analytical methods can be applied for Big data analytics such as Basic Statistical Method, Information Visualization, Classifiers, Cluster analysis, and Association Rule Mining [45, 46].

4.2 Blockchain-based Applications in Education

Blockchain technology was introduced during the first decade of the new millennium, first as a peer-to-peer ledger for registering the transactions of Bitcoin cryptocurrency [47]. Blockchain was designed to increase security and data integrity by creating a decentralized network of peer nodes. While the literature on Blockchain application in education has increased, it is still fragmentary in the uses of technology. Technology, however, has the potential to offer significant contributions to quality control in the education sector - e.g., used in certificates management [48, 49], competencies and learning outcomes management [48, 49, 50], evaluating students' professional ability [49], securing collaborative learning environments, enhancing students' interactions in e-learning, and supporting lifelong learning infrastructure [36, 51, 52, 53].

The potential for Blockchain technology for education is significant for data security, cost efficiency, increased quality of student assessments, data access, and integrity, enhancing accountability and transparency, identity authentication, enhancing efficiency for records management, and enhancing learners' interactivity [54, 55, 56]. While most institutions have a server of their own, more organizations today are shifting to cloud storage for cost-saving. And Blockchain storage may well be the next shift in trends. Nevertheless, the application of Blockchain to education is still as new and unexplored as the internet once was.

4.3 Blockchain and Big Data—Complementary Technologies

The key to Blockchain technology is ensuring data quality. Data quality is ensured by a chain of blocks that do not allow corrupted data on one computer to enter blocks on other machines by matching the equivalent data held by the latter [57]. The Blockchain also has the capacity to store structured and unstructured data, which makes Blockchain the choice for Big data integration to increase the security and integrity of data stored in Big data [58, 59]. Furthermore, Blockchain technology helps prevent possible data leaks by allowing access to data only with multiple permission from other points in the network [48].

5 Conceptual Model for the Next eLearning Platform

This section discusses a conceptual framework based on the synthesis of the literature review. Then the conceptual model of an e-learning management system with the application of Big Data and Blockchain technology is proposed and illustrated.

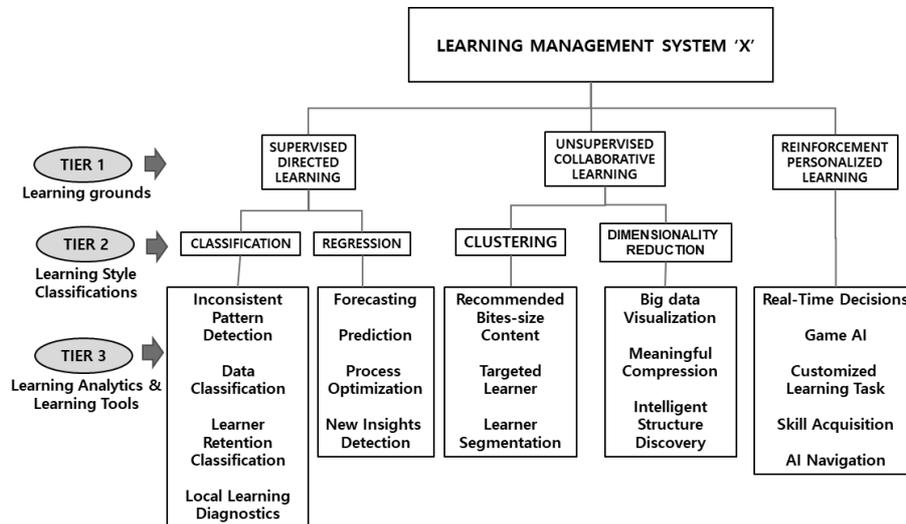


Fig.6. LMS-x Architecture and Tier Hierarchy (author's rendition).

For the purpose of the study, the model was named LMS-x. The model proposes a three-tier platform design with three subsections. Fig.6 illustrates the relationships among each tier and structure hierarchy of the LMS-x as well as provides descriptive functional relations: Tier 1 is divided into three learning grounds: (1) supervised and directed; (2) unsupervised and collaborative; and (3) reinforcement and personalized. Tier 2 consists of four learning-style classifications and functions and they are separated by clustering, dimensionality reduction, classification, and regression; and Tier 3 consists of learning tools. The learning tools interact and communicate between machine and learner, learner-to-learner mediation via machine, or a machine to a machine. Learning analytics involved in the tools are grouped under each learning ground. Each learning tool and functions are organized and described below (Tables 1–3).

Table 6. Learning analytics and learning tools - Supervised and Directed learning.

Tier 1: Learning Ground	Tier 2: Learning Style Classifications	Tier 3: Learning analytics & learning tools
Supervised and Directed learning	Classification	Inconsistent patten detection (learner, learning community), data classification, learner retention classification, and local learning diagnostics. Forecasting, prediction, process optimization, and
	Regression	

**new insights
detection.**

Table 2. Learning analytics and learning tools - Unsupervised Collaborative learning.

Tier 1: Learning Ground	Tier 2: Learning Style Classifications	Tier 3: Learning analytics & learning tools
Unsupervised and Collaborative learning	Clustering Dimensionality Reduction	Bite-size contents based on learners' needs analysis, identifying targeted learners for the contents, and learner segmentation. Local/global information visualization (Big Data and local servers), meaningful compression, and intelligent structure discovery.

Table 3. Learning analytics and learning tools - Reinforcement and Personalized learning.

Tier 1: Learning Ground	Tier 2: Learning Style Classifications	Tier 3: Learning analytics & learning tools
Reinforcement and Personalized learning	Not Applicable	Real-time decisions (based on the learner action). AI-based games, Customized learning activity, Reinforcement learning, Information excavation from the internet based on learner needs analytics.

As described in table 1-3, the LMS-x consists of three-tier learning grounds. The next section outlines the functional details of each tier.

5.1 Supervised and directed learning ground

The supervised and directed learning environment is led and facilitated by an

instructor(s) as in any typical e-learning setting. In addition, a set of algorithms is involved to facilitate and enhance the individual learner where it learns the labeled dataset generated from the learner's current and past learning activities to direct and facilitate learning. Classification and regression (Tier 2) are used in the supervised and directed learning environment to provide advance analysis of learner activities in supervised and directed learning.

Two critical data analytics are executed and administered in Tier 2: classification (Fig.7) and regression (Fig.8). Qualitative and quantitative data are classified to detect inconsistent learning patterns, click-stream analytics, learner retention analysis, and local and global learning diagnostics (comparative analysis) - i.e., predictions are made by classifying data into different categories e.g., types of learner, remedial learner. Regression analysis is used to examine the relationship between two or more variables that are continuously being generated and fed into the system, i.e., the system predicts a value for an input based on the learner's past data. The variables are generated by the learner's learning activities, instructor(s), and machine. Analysis should provide detailed insights on forecasting, predicting, and processing paths to further improve, optimize, and detect new insights into future services.

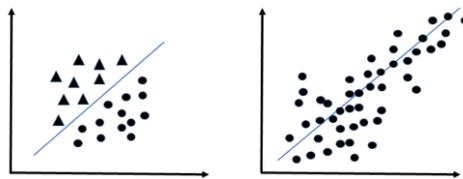


Fig. 7. Classification. Fig. 8. Regression.
(author's rendition).

5.2 Unsupervised and collaborative learning ground

The unsupervised and collaborative learning environment is designed to promote a meaningful, engaging, and collaborative learning experience for the learners. In the proposed model LMS-x, the capacity for the system to intervene and facilitate the direction of learning is offered to the learning community. While collaborative activity takes place, a set of algorithms facilitates learning by providing bite-sized contents found in open library sources chosen by the analysis of learning activity related to the topic. This support directs discussion activity among learners to be a dynamic and fruitful collaborative learning experiences, as well as an understanding of the community's learning patterns for future reference and design of instructional strategies.

For Tier 2, two critical data analytics functions used are clustering (Fig.9) and dimensionality reduction (Fig. 10). Clustering is considered the most critical element of unsupervised learning that deals with the data structure partition in unknown areas [60]. Clusters result from data mining to group a set of digital objects into similar categories where it is used for the machine learning, pattern recognition, image analysis, information retrieval, and data compression [61]. Through clustering, bite-sized contents can be identified based on the learner's

needs analysis. Learners can be targeted to provide remedial and reinforced learning or to administer learner segmentation [62]. The learner segmentation renders customized services to learners to identify drop-outs, to form and align special communication methods to each learning group to increase the sense of belonging, and to increase the learning satisfaction of the learner and learning community. The clustering outcomes produce customized and personalized learning based on the learner's needs analysis.

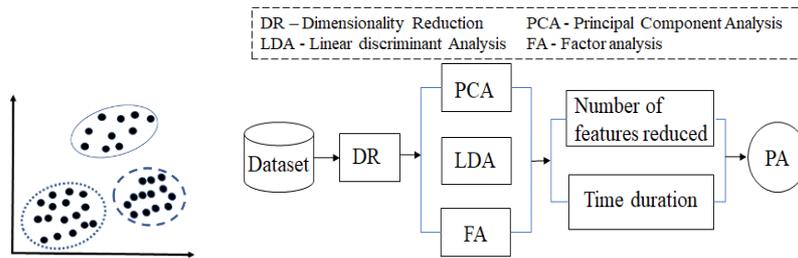


Fig.9. Clustering. Fig.10. Architecture of Dimensionality Reduction (author's rendition).

5.3 Reinforcement and Personalized Learning

Reinforcement and personalized learning ground is provided for self-improvement and remedial study. Reinforcement and personalized learning offer customized learning tasks and the acquisition of skills necessary to succeed in learning the subject or topic. Gamification is used in this learning environment. The learning activities are driven by game elements with goal-setting strategies where the learner must complete a level in order to proceed to the next or digressing to another learning path until the user acquires learning cues to achieve the learning objectives before moving to the next level. Fig. 11 illustrates the conceptual drawing of the LMS-x hierarchical structure of the tiers 1, 2 and 3. The conceptual design illustrates a more efficient and effective learning management system model by drawing on the existing understanding of the respective problem domain [63]. In a search of the improved concept model design for community knowledge construction for the open-ended subject with the applications of Big data and Blockchain, the model provides conclusive evidence for the future LMS design in terms of approachable and completeness over a broad scope.

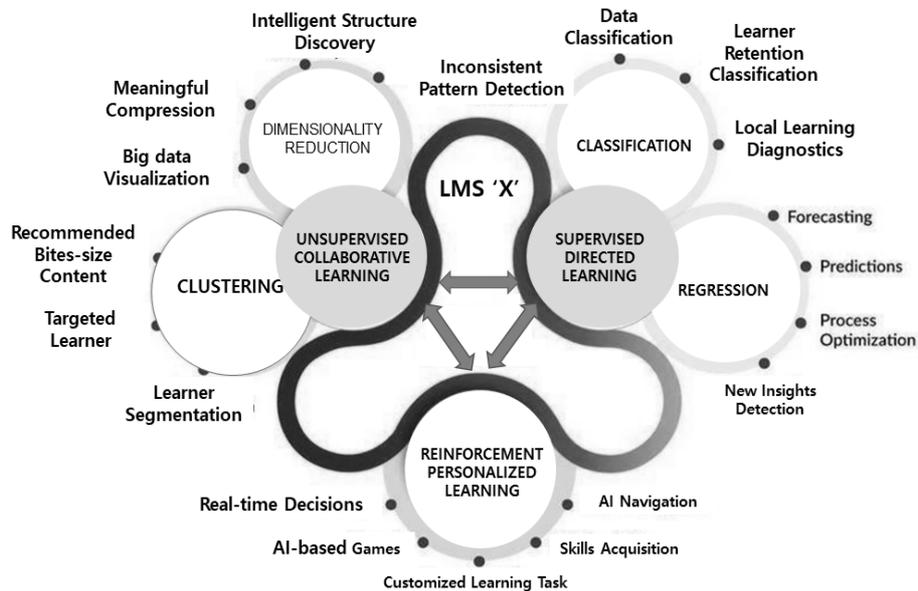


Fig. 11. LMS-X Learning Environment (Machine Learning template modified) (author's rendition).

5.4 Data Flow in Conceptual Model

Fig.12 illustrates the data flow from seven components in the proposed conceptual model. The components are smart media, cloud technology, Big Data, external content-sharing servers, Blockchain, and local servers. Noted in order to illustrate the clarity of the data migration process, cloud storage comes before migrating data into Big Data. Data flow from:

- 1 to 2 - smart media devices to the cloud;
- 3 to 5 - Big data to Blockchain;
- 4 to 5 - external content repository servers (content-sharing) to Blockchain, e.g., Open-Source Library, Open Educational Resources (OER), Open CourseWare (by MIT);
- 5 to 6 - Blockchain to data analytics system then to the learner; and
- 7 to 3 - learner-, instructor-, and machine-generated data flow into the local server then back to Big data.

The feasibility of the data flow cycle was illustrated from a holistic perspective, however, aligning and feeding external data into LMS-x may be limited due to the infrastructural complexity of the process that may involve content-sharing agreement, copyrights, and ownership agreement, information integrity, and information security.

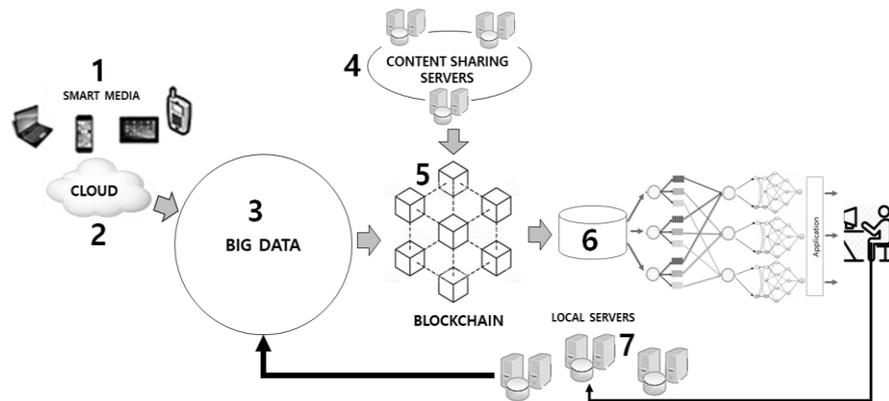


Fig.12. Data Flow in Conceptual Model (author's rendition).

5.5 The Conceptual Model LMS-X Global View

The goal of LMS-x is to optimize the e-learning experience by capitalizing on Big Data analytics and Blockchain technology to advance e-learning experiences to a new level. Fig. 13 illustrates the structural layout of LMS-x that validates the relationships among external and internal functions as well as global data flow.

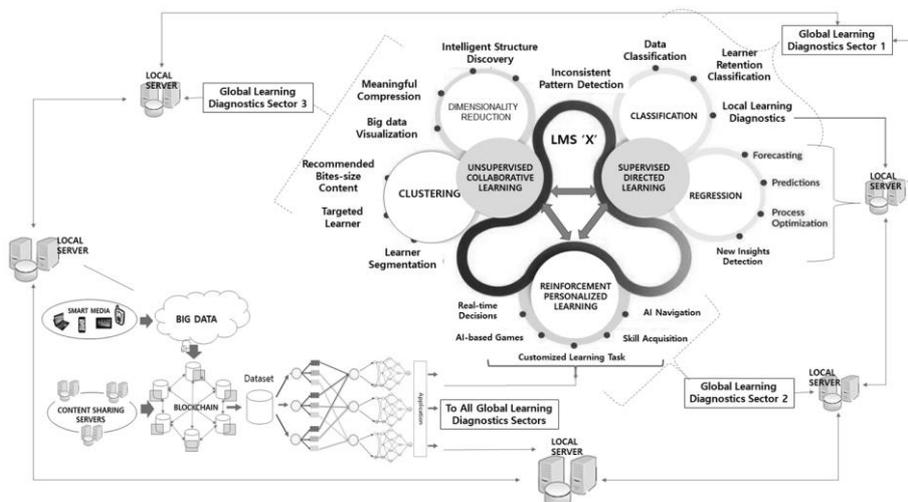


Fig. 13. Global View of LMS-x (author's rendition).

6 Conclusion

This paper reviews the need for the application of Big data analytics and Blockchain technology in a learning management system to enhance the learning experience for

open-ended subjects to enhance community knowledge construction and education of non-traditional learners. The model is proposed in response to worldwide increasing numbers of online learners. In a search of the improved concept model design, the model provides conclusive evidence for the future LMS design in terms of approachability and completeness over a broad scope; therefore, this research provides the following contributions within the research scope - (1) clarified what is known and applicable technology for designing an improved e-learning system; (2) explored linkages and usefulness of two new technology for improving the current e-learning platform design; and (3) provided a descriptive model illustrating the integration of key technologies into the e-learning platform design to promote community knowledge construction for the open-ended subject. The value of the proposed model lies in describing the specifications of and illustrating the potentiality of integrating the new technology which is concerned with “new combinations of digital and physical components to produce novel products”[64].

While the study foresees new research opportunities, this article considers two potential limitations. The proposed conceptual model was designed based solely on the literature search and this may potentially pose two issues: (1) LMS-x may have perceived to be too generalized for yet to be explored technologies; and (2) a question may be raised whether the design requires an advanced level of topical specialization. Both observations may lead to an opportunity for the next step of research. Considering that this is an exploratory study for providing the recommendation of improving current LMS with new technologies, the article appropriately demonstrated the constructive approach to conducting and constructing a conceptual model, where it was based on design principle on providing a foundation for the application’s implementation and documentation [65].

One important lesson learned was that an open and adaptive methodological approach, the so-called integrated-mixed-synthesized method, in the literature review tends to be highly effective and critical for constructing a new concept for designing an innovative artifact, instead of limiting it to a guideline or framework. Also, the knowledge gained from the research is that the applications of two technologies in the education sector are uncharted, in the process of being tested, and still on trial for customizable application for uses in the education sector.

While these new technologies have the potential to provide benefits, it is important that institutions understand their own needs, infrastructure, resources, and limitations. Conclusions are drawn on the importance of integrating new technologies that provide innovative solutions for the platform design for community knowledge construction that was not possible with the prior learning management system. One area of future work is to conduct exploratory tests of some of the proposed design concepts, as well as to identify the challenges for the feasibility of the aforementioned technologies in current educational settings. The proposed model responds to the worldwide increases in numbers of online learners. It provides a possible solution that incorporates new technologies for improving the current LMS. The integration of new technologies could

engage students and increase the effectiveness of teaching by enabling more accurate predictive measures as well as more accurate measurement of student performance.

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Design of an Academic Expert Search System on Spark

Choi do-jin¹, Lee hyeon-byeong², Bok kyoung-soo³, Yoo jae-soo⁴
^{1,2,4} Dept. Of Information and Communication Engineering, Chungbuk National University, Korea

³ Dept. Of SW Convergence Technology, Wonkwang University, Korea
¹mycdj91@cbnu.ac.kr, ²lhb@cbnu.ac.kr, ³ksbok@wku.ac.kr, ⁴yjs@cbnu.ac.kr

Abstract. The existing academic search services provide papers by field, but do not provide experts by field. Therefore, researchers should judge experts in each fields by analyzing the papers on their own. In this paper, we design an expert search system based on papers that have been published in the academic societies. The academic expert search system is based on a big data processing platform, Spark to handle a large amount of data in academic fields.

1 Introduction

The papers in a particular academic field is one of the important materials to judge the domain expertise of a researcher. We can decide researchers as the experts of a particular field if they have a lot of citations and papers of the field. In order to study a new field, researchers refer to papers that have been published in the past. To find the published papers, they exploit the several academic search services[1]. The academic search systems provide diverse information related to papers such as a paper title, author information, publications, publication year, citation information, and recommending related articles.

In this paper, we design an academic expert search system utilizing articles information provided by various academic search services. The proposed system stores massive paper information and analyzes the stored data based on a big data processing platform such as Spark[2] to find experts. Our system provides not only the expert search but also the keywords search. Furthermore, it provides various information such as a relationship among experts, expert's articles, the most popular papers in a specific field, the delegate society on the field, and the hot topics of the search keyword.

2 Design of the Academic Expert Search System

In order to analyze massive articles, we utilize big data processing platforms. The proposed system automatically extracts field information using the paper title, and we

provide the expert search service by measuring expert scores. To efficiently process the big data, we exploit a big data processing platform, Spark.

Figure 1 shows the overall architecture of the proposed system. Our system consists of the data collection module, ontology, the data management module, the expert analysis module, and the service module. The data management module stores the raw data and the analyzed data provided by the expert analysis module that performs three analyses. The association analysis constructs the relationship network of researchers. The statistics analysis consists of the journal statistics analysis and the hot topic analysis. Finally, we provide various services such as keyword/user name search, relationship among experts, hot topics, and statistics service through the user interface.

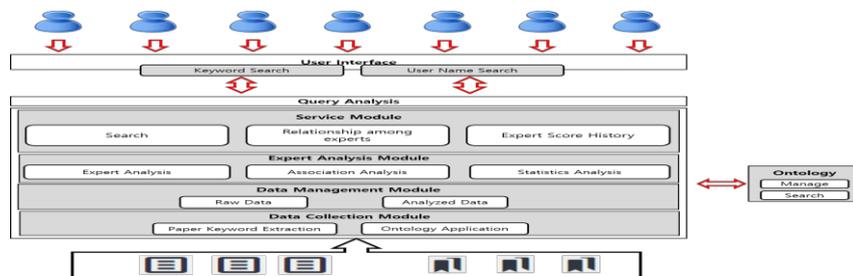


Figure 2. The architecture of the proposed system

3 Conclusion

In this paper, we have designed an academic expert search system utilizing articles information. We have utilized big data platforms to handle a large amount of data in academic fields. Our system provides not only the expert search but also keyword searching with various information such as relationships among researchers, expert's papers, the most popular papers, the delegate journals, and hot topics.

Acknowledge

This research was supported by Next-Generation Information Computing Development Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Science, ICT (No. NRF-2017M3C4A7069432) and the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. 2019R1A2C2084257).

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Indoor Localization Scheme based on Neural Network and Kriging Algorithm

Boney Labinghisa¹, Dong Myung Lee²

^{1,2} Dept. of Computer Engineering, Tongmyong University, Republic of Korea

¹blabinghisa@yahoo.com, ²dmlee@tu.ac.kr

Abstract. Wi-Fi indoor positioning system is known to be based on the received signal strength indicator (RSSI) measurements and the fingerprinting by matching the measured data with the database. This paper utilizes the use of access points (APs) in the indoor environment without costing additional hardware. Kriging algorithm is introduced to increase the total access points which gives benefits by making the database more granular. Another aim is the study of applying Deep Learning Neural Network (DNN) in Wi-Fi fingerprinting using RSSI. The proposed scheme which utilizes both the neural network (NN) and Kriging algorithm was able to perform the standard Wi-Fi fingerprinting without having difficulties in generating a fingerprint map. The result of a simple location estimation test achieved an accuracy of 97.14% which shows that applying NN and Kriging can improve indoor localization.

1. Introduction

In this paper, Wi-Fi fingerprinting using received signal strength indicator (RSSI) approach is applied together with machine learning classifier like k-nearest neighbor (k-NN) which determines location by calculating and ranking the fingerprint distance measured at the unknown point and the reference points in database. Even with the advantage of using Wi-Fi fingerprinting it also has its disadvantage due to distance variation and human body interference in RSSI values [1]. Studies of adapting Deep Neural Network (DNN) in Wi-Fi fingerprinting was also conducted to provide a simpler and low effort solutions [2-3]. The proposed scheme uses less parameters for tuning and is adaptable to a various conditions and algorithms. Machine learning also provides a set of weights and biases once the system is trained which does not require the database to be accessed every time a fingerprint is needed. Server is no longer needed for exchange of data and may be exclusively run on mobile devices [4].

2. Proposed Scheme

A. System Model

The localization scheme proposed in this paper collects the RSSI of wireless APs with applied Kriging algorithm as seen in Fig. 1. The main idea of the Kriging algorithm is to use known measurements to formulate a function for yielding an unbiased estimation with the minimum error variance at unobserved locations, and the function is determined by the semivariogram.

B. Neural Network Wireless Fingerprinting

RSSI values is collected from various access points at a certain point to create a database of a radio map. The points where RSSI values are recorded are labelled as reference points and are called fingerprints in the database. During the offline training phase, the system collects the RSSI values as fingerprints to be considered as features after training for the NN, and this features are used to make a positioning model. During the online positioning, the system receives real-time data from a network interface card and then predicts where the person is located.

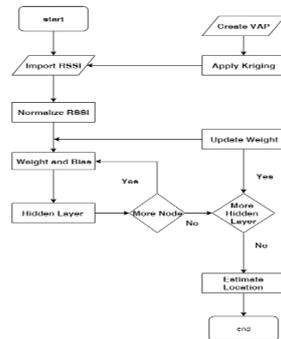


Fig. 1. Overall system flow of the proposed scheme.

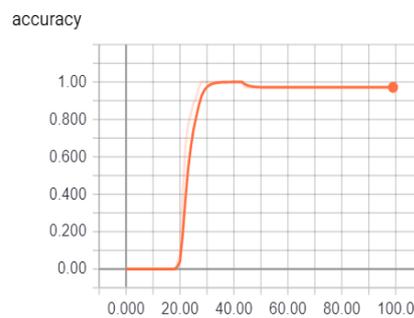


Fig. 2. Accuracy graph of the proposed scheme.

3. Experimental Results and Analysis

An accuracy of 97.14% in the proposed scheme was acquired after running the NN system as seen in Fig. 2. It took 100 steps to achieve the high performance value. Though this result is a tested only on a simple fingerprinting method, and further studies is to be done by conducting more experiments and comparisons with other existing DNN systems, this paper accomplished the desired outcome.

4. Conclusion

This paper proposed a NN for fingerprint indoor localization using Wi-Fi RSSI. The NN system made use of ReLU for activation function and MSE for the loss function. In the preprocessing stage, only 20 RPs were affixed in the test environment but was increased to 30 RPs after Kriging algorithm was applied. This created a denser fingerprint map database. Normalization of the RSSI was also done to make the linear relationship between data and avoid fluctuations in RSSI values. The result of a simple location estimation test achieved an accuracy of 97.14% which shows that applying NN and Kriging can improve indoor localization.

Acknowledgement

This research was funded by the Ministry of Trade, Industry & Energy (MOTIE) and the Korea Institute for Advancement of Technology (KIAT) under the R&D Rediscovery Project (P0010209).

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A Study on Order Logic of Logistics Applying Artificial Intelligence and Internet of Things

Gwan-Hyung Kim², Park Sang-Hyun¹, Kim Ho-Chul¹, Oh Am-suk¹
¹ Dept. Of Digital Media Engineering, Tongmyong University, Korea
² Dept. Of Computer Engineering, Tongmyong University, Korea
¹asoh@tu.ac.kr

Abstract. Logistics standards are systematic solutions for efficient inventory management and timely supply of products, and address complex logistics management problems arising from a wide range of logistics volumes. The existing logistics management system initially focused on production plans to increase the efficiency of production, but more recently it is gradually standardizing on demand in the supply-oriented logistics paradigm. In this paper, to achieve optimization of logistics standards in response to complex logistics environment changes, we are going to study order methods for artificial intelligence and Internet of Things logistics standards.

1 Introduction

Currently, manufacturers form vertical integration with directly related suppliers and manufacturers based on the production process. Vertical integration reduces unnecessary costs by facilitating decisions between producers, suppliers and distributors [1]. However, there was a problem with the manufacturing supply chain, which was difficult to manage effectively as the products were produced in conjunction with various vendors and in collaboration with different classifications of industries [2]. Technology with ICT Development as the sophistication progresses, the overall production process has developed into a partially optimized form. This has increased partial efficiency, but the complexity of it makes it difficult to connect with each other, leading to the fatal problem of information disconnecting between processes [3].

2 Logistics based on Artificial Intelligent

T In this paper, an advanced and intelligent Internet of Things-based supply network management system is proposed to improve the visibility, safety and efficiency of the supply chain based on the Internet of Things technology. Figure 1 shows a schematic of an Internet of Things supply chain management system, and the proposed sitem consists of an automatic order/receipt system, an automatic inventory management system, and an appropriate inventory yield system.

- Automatic order/order system: Web-based system that shares real-time product data such as production plan information, order information, delivery information, quality decision information, inventory status with suppliers.
- Automatic inventory management system: Automatic inventory management (incoming/shipment) system based on the Internet of Things sensor
- Optimal inventory calculation system: Ordering safety stock through pattern study of products

Automatic order/order system is a web-based system that shares real-time product data such as production plan information, order information, delivery information, quality decision information, inventory status with suppliers. Support timely delivery and efficient inventory management of suppliers through information among linked supply network management systems. Automatic inventory management system provides inventory tracking and management from parts warehousing to product production. Utilizing Internet of Things devices, it automatically synchronizes the inventory quantity of the products in storage before the location of storage, and the inventory quantity after work. An Internet of Things device is a tag-type device that can be detached from a production product or storage box

3 Conclusion

In this paper, a supply network management system based on the Internet of Things is proposed. The supply network management system based on the Internet of Things was composed of automatic order/order system, automatic inventory management system and proper inventory calculation system. Through this process, it is possible to link data on entire supply network and utilize IoT devices and big data to track and manage inventories and manage appropriate inventory levels.

Acknowledge

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A study for Drowsy Driving Detection and Prevention System

Seok-Woo Jang¹, Byeongtae Ahn²

¹ Department of Software, Anyang University, Korea,

² Liberal and Arts College, Anyang University, Korea

¹swjang7285@gmail.com, ²ahnbt@anyang.ac.kr

Abstract. Recently, the casualties of automobile traffic accidents are rapidly increasing, and serious accidents involving serious injury and death are increasing more than those of ordinary people. More than 70% of major accidents occur in drowsy driving. Therefore, in this paper, we studied the drowsiness prevention system to prevent large - scale disasters of traffic accidents. In this paper, we propose a real - time flicker recognition method for drowsy driving detection system and drowsy recognition according to the increase of carbon dioxide. The efficiency of the drowsiness prevention system using these two techniques is improved.

1. Introduction

According to statistics of KoROAD on traffic accidents in the recent 5 years, driving while drowsy has been one of the most important factors of traffic accident, and its mortality rate is more than 2 times higher than other traffic accidents [1]. As a solution to resolve these problems, it is possible to reduce the mortality rate of such traffic accidents by detecting and preventing the driving while drowsy. Therefore, studies for detecting and preventing the driving have been actively researched in academic fields [2] [3].

2. System Configuration Diagram

The configuration diagram of the drowsy driving detection and prevention system in this study mainly consists of three stages. The first step is an input part and it consists of sensors, microphones and cameras. The second step is a internal module part and it consists of STT, drowsiness prevention, internal environments and entertainment. The final step is the part of this project, and its system configuration diagram represents the whole configuration diagram of this project.

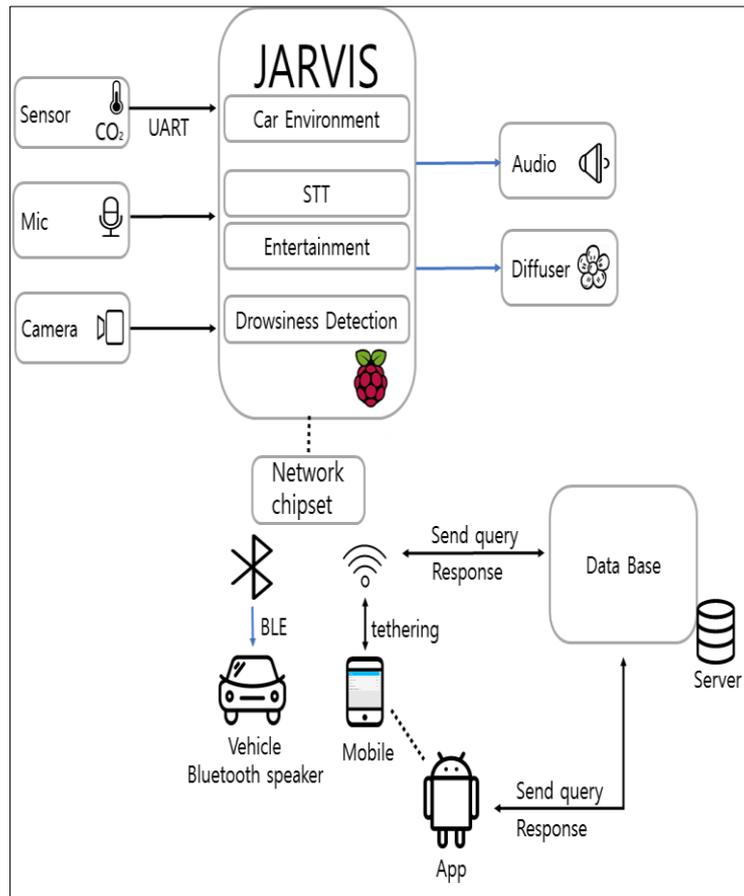


Figure 1. Structure of System

Figure 1 represents the system configuration diagram. The following items summarizes the system configuration diagram.

3. Conclusion and Future Work

This study designed a system to detect and prevent drowsy while driving. In addition, it developed and tested actual cases based on the design. It used Python and C language for its developmental environment, and it used Raspberry Py 3, infrared camera, speaker, microphone, carbon dioxide sensor, Galaxy S4, and the automobile model, Sonata. In the future, it plans to build a system that is linked with the application on the smart phone and check the real-time reaction rate through actual testing. Finally, it will develop the application not only on Android but also on iOS environment for further development and inter-working.

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A Study for Smart Contract Management System based on BlockChain

Byeongtae Ahn
Liberal & Arts College, Anyang University, Korea
ahnbt@anyang.ac.kr

Abstract In this paper, we developed a blockchain-based contract management platform that manages on-line contracts that inevitably contain offline procedures. A transaction that inevitably involves an off-line process is a transaction in which a law becomes effective only after the contract is signed, the contract is written, and the agency is notified. The feature of this system utilizes blockchain to store and manage contract information and contract. When the contract is stored and managed by the blockchain, it is impossible to forge the contract because the contract is stored on the trust-based network.

1. Introduction

Various contract fraud problems are constantly occurring. In order to prevent contract fraud, contracts are usually carried out in accordance with procedures, but various frauds are being mass-produced to exploit the loopholes of the procedures. In real estate contracts, contracts are usually signed through third-party brokers to prevent fraud. But fraud is also a result of the lack of credibility of third-party brokers. Therefore, in this paper, for the purpose of solving this problem, data stored and managed in the blockchain cannot be forged. And blockchain can build a P2P trust-based network to manage data securely without a broker. Section 2 proposes a schematic diagram of this system, and Section 3 proposes a conclusion and future tasks.

2. Smart contract management system

The system manages contracts through the blockchain, allowing them to manage contracts securely and reliably online. Registering a transaction on the platform to manage the contract does not have the same legal effect as reporting to the agency, but just being managed on the platform can be notarized. Therefore, a trading company using this system can prove that the trading company makes the contract transparent to customers who want to use the trading company. And from the customer's point of view, fraud can be prevented simply by making a contract with a company that manages the contract on the MITION platform.

Figure 1 shows the schematic of the system.

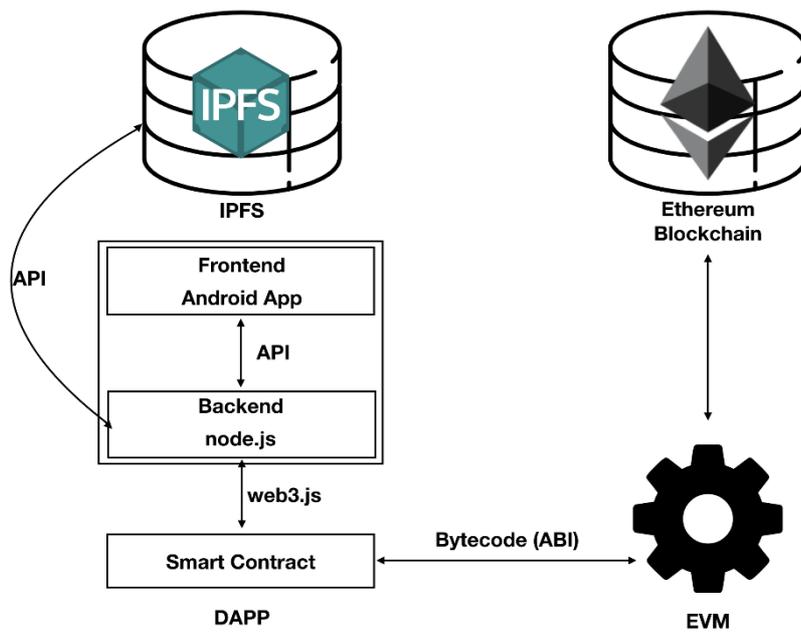


Figure 1. Diagram of System Structure

The schematic of this system developed Android app, node.js server, smart contract, and used Ethereum blockchain and IPFS. The smart contract is used as an interface for storing and accessing the Ethereum blockchain from the server. To access IPFS, access it through API provided by IPFS.

3. conclusion

In this paper, we have developed a system that enables online contract management and is able to discriminate forgery and tampering. However, after making a contract and drawing up a contract, it is necessary to connect with a national agency, but there is no practical connection.

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Knowledge Sharing and New Product Development in Pharmaceutical Industry

Yoonkyo Cho

Dept. Of International Trade and Economics, Hansung University, Korea
ub11cho@gmail.com

Abstract. The purpose of this research is to find factors that affect new product development. In the pharmaceutical industry, firms develop new drugs based on knowledge sharing among scientists using many types of collaboration. We used patents and scientific journals as two types of collaboration that affect new drug development. The results show that those two factors have positive effects on new product development. We found that scientific articles play a critical role in the sharing of knowledge among scientists who work in different institutions and in the facilitating of new drug development.

1 Introduction

When firms develop new products, they collaborate with other firms, research institutions, universities, and so on. In the pharmaceutical industry, collaboration is a prevalent phenomenon because new drug development requires the investment of a huge amount of knowledge, skill, capital, and scientific manpower [1,4,5]. Therefore, new product development in this industry makes knowledge sharing inevitable. However, knowledge sharing sometimes brings about inefficiency in new product development. Thus, this study examines whether knowledge sharing among scientists in pharmaceutical firms affects new product development.

2 Theoretical Background

Knowledge facilitates innovation at different points along the value chain [2]. A higher level of knowledge sharing among scientists has a positive effect on new product development because the wide range of knowledge proves synergistic. Therefore, the duration of new product development becomes shorter. In contrast, an increase in the number of scientists leads to collaboration inefficiency because it causes redundancy of knowledge. Therefore, the duration of new product development becomes longer. Thus, we expect that the level of knowledge sharing has an inverted U-shaped relationship with new product development.

If a scientist has a high level knowledge stock, the scientist has more specialized knowledge related to the drug than other scientists. The higher the level of scientists' knowledge stock for the drug, the stronger the positive effect of knowledge sharing is

on new product development. Therefore, we expect that more scientists' knowledge stock will accentuate the inverted U-shaped effect of knowledge sharing on new product development.

3 Methodology

We have new drug information from the United States Food and Drug Administration (FDA) and patent information on new drugs from United States Patent and Trademark Office (USPTO). The dependent variable of this research is new product development. We measured it as the number of new drugs approved by the FDA in a given year. Our independent variable is scientists' knowledge stock. We measured it using the number of patents applied for by the scientists related to the drug and the number of the scientists' articles published by scientific journals. To estimate the model, we used OLS regression.

4 Conclusions

Scientific publication is an index for technological competition [3]. The authors emphasized the role of scientific publication in firms' battles for market dominance. We examined how competitive conditions shape firms' propensities to publish scientific articles about their innovations. Also, scientific papers are mostly published by a variety of authors who belong to different organizations. Therefore, we viewed scientific publication as collaboration for facilitating innovation to succeed in technological competition as an alternative to alliance or M&A. Our contribution in this research is that we showed that scientific publication is a critical factor enabling pharmaceutical firms to develop new drugs.

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A Strategy of Selecting Blocking Approaches Using Major Image Features

Byeongtae Ahn¹, Seok-Woo Jang^{*2}

¹ Liberal and Arts College, Anyang University, Korea

^{*2} Dept. of Software, Anyang University, Korea

¹ahnbt@anyang.ac.kr; ^{*2}swjang7285@gmail.com

Abstract. In this paper, we propose a strategy to dynamically generate and select appropriate mosaic blocks by analyzing the features of the input color image to effectively cover the target area that needs information protection. To this end, the proposed method first detects the region of the target including personal information through deep learning. Then, in order to effectively block the detected target region, the most appropriate method is selected from the three mosaic methods in consideration of internal features included in the image.

1 Introduction

The proliferation of smart phones equipped with digital cameras, which are easy to use and excellent in performance, has created an environment where anyone can capture images regardless of time and place [1]. In addition, the video content is posted publicly on a web site or freely shared in chatting rooms. Of course, it is good to share the images useful to each other, but the problem is that the images are spreading and distributing in a state where even the part containing personal information which is not desired by the user is exposed. Therefore, recently, the necessity of research on methods of automatically finding the target area representing important personal information in a color image and naturally masking the detected area using a blocking process has been raised [2].

2 Blocking Strategy Using Image Features

We detect the target object containing personal information from the image using deep learning [3]. Then, to block the detected object, a mosaic generation method suitable for the object is dynamically selected by utilizing the features of the image. Finally, the detected target is blocked using the selected mosaic generation method. Figure 1 shows the overview of the proposed target object blocking algorithm.

In this paper, we use three mosaic processing methods to hide the target area. First, as one of the most popular methods, the block is constructed using the color average value of the region corresponding to the extracted target object. Second, a block is generated to form a mosaic

by randomly selecting color values of pixels included in the extracted target object region. When mosaic is generated in this manner, it is difficult to estimate the shape of the extracted target region. Third, a method generates a block forming a mosaic by randomly generating a color value. This method has a disadvantage in that blocks having unpredictable colors are generated, so that the area where the mosaic is located and the surrounding area are somewhat unnaturally constructed. In this paper, by utilizing the feature information of the image extracted in the previous step to the maximum, the mosaic processing method which is determined to be suitable for the input image is dynamically applied among the three mosaic processing methods mentioned above.

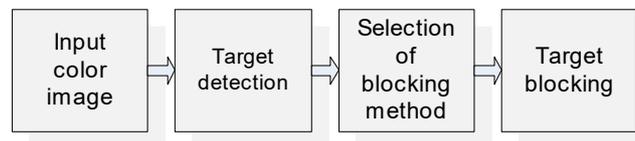


Figure 1. Overall flow of the suggested method

3 Conclusion

In this paper, we proposed a strategy that effectively blocks the target object using the features of the input color image. Experimental results show that the proposed approach detects and dynamically blocks target objects with personal information exposed from the input image.

In the future, we will apply the blocking selection algorithm proposed in this paper to other color images captured in more diverse environments to verify the robustness of the algorithm. In addition, to improve the accuracy of the proposed algorithm, we plan to include more various kinds of features not used in this study.

Acknowledge

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A Study on Education Program Development for Promotion Creativity and Personality Based on Visual Contents and Digital Curation System

Youn Jeong-Jin¹, Jeong Su-Jeong², Lee Kang-Hoon³, Kim Byung-Man^{4*}
^{1,2}Dept. Of Early childhood Education, Tongmyong University, Korea, ³Dept. Of Early childhood Education, Pusan National University, Korea, ⁴Dept. Of Early childhood Education, Kyungnam University, Korea
¹jjy@tu.ac.kr, ²crystal06070@naver.com, ³darkengal@nate.com, ^{4*}bmkim@kyungnam.ac.kr

Abstract. This study aims to develop an independent class model and system that can nurture converged talent with creative solutions to tasks in future social life and the right personality and judgment. To this end, C-crepe was developed for creative and character digital curation system, and C-check evaluation system, which is an evaluation tool, was developed. It also developed C-mooc educational content, which is a very open class. Finally, we have enhanced the function of the C-curation system.

1 Introduction

In the era of the Fourth Industrial Revolution, it is necessary to foster the ability to create future-oriented values by integrating technologies from various fields. To this end, the importance of education for promoting creativity and humanity is emerging [1-2]. This ensures the benefits of information exchange, use and access, and offers a variety of media (films, animations, documentaries, comics, commercials) and themes of ego identity (occupation, religion, politics, philosophical lifestyle, friendship, heterosexuality, gender roles, Leisure activities will be used to open up new horizons of creativity and character education by drawing macro convergence between disciplines. Therefore, the purpose of this study is to develop an independent learning model and system that can cultivate convergent human resources who have creative solutions to the tasks of this era and the challenges of future social life.

2 Research Contents

The research of this study as follows. First, it will develop contents for creative and character education, a digital curation system, to promote creativity and personality of university students. Second, a class model is developed to enhance the creativity and character of college students. Third, creative evaluation tools are developed and applied

to assess the creativity and character of university students in a reasonable manner. Finally, large open classes for university students are designed and opened.

3 Results

The results of this study are as follows. First, the concept of creativity and humanity was re-established to develop creative and personality education contents. In this study, the virtues of the core values of personality education in the Personality Education Promotion Act reflecting the linkage with elementary, middle and high schools and the needs of the times, filial piety, honesty, responsibility, respect, consideration, communication, and cooperation, were reorganized into eight virtues. In addition, we sought the convergence of educational contents and strengthened the fusion contents through digital storytelling of culture and art. Second, the creative and personality classes were spread using online. Through digital storytelling in C-crepe educational contents, we have introduced new instructional models to induce learners to improve their class commitment. The possibility of proposing and utilizing C-crepe educational contents for creativity and character education of convergent future talents can be enhanced. Third, experts in various fields, including class analysis specialists, culture, arts, creativity, personality specialists, and field experts, participated in the development of professional evaluation scales. Lastly, we developed a class model and class plan for the C-mooc open literacy course applying online interactive elements and a teaching manual for instructors.

4 Conclusion

Through this study, we were able to secure educational effects such as creative problem solving ability through art, reflective reflection on life, understanding of society and history, and fostering community consciousness.

Acknowledge

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Deep Learning-based Biometric Image Generation

Samuel Lee¹, Gye-Young Kim^{*1}

¹ School of Software, Soongsil University, Korea

¹lsme8821@ssu.ac.kr; ^{*1}gykim11@ssu.ac.kr

Abstract. In this paper, we propose a new method of synthesizing a fingerprint image with a desired fingerprint form by adding a conditional section that uses fingerprint form information as input to GAN, a data generation model using deep neural networks. In particular, FingerNet, a neural network structure for fingerprint image synthesis, is newly developed, fingerprints are synthesized using only the shape information of the fingerprint from the developed deep neural network structure, and the synthesis accuracy of the synthesized fingerprints is compared.

1 Introduction

Recently, biometric technology has been usefully used for identification in the financial and security fields [1]. In particular, the fingerprint recognition technology has advantages in that it is easier to acquire information from the user, no rejection, and excellent security than other biometric technologies [2]. The fingerprint recognition process consists of five stages: fingerprint image acquisition, image enhancement, fingerprint thinning, feature extraction, and feature comparison. Currently, most of the researches on vulnerability analysis of fingerprint recognition technology are conducted in the stage of fingerprint image acquisition, but the research on feature extraction and later stages is also very important. In this paper, we introduce a new technique for synthesizing fingerprint images using a deep neural network algorithm.

2 Fingerprint Synthesis Using Deep Learning

Unlike conventional methods, deep neural networks have the advantage that the model learns itself and extracts optimized features, and the performance increases in proportion to the amount of data. Typical data generation models using deep neural networks include GAN (Generative Adversarial Network) and VAE (Variable Auto Encoder). GAN is more unstable than VAE in learning, but it has the advantage of outputting clearer and better quality images than VAE.

In this paper, we propose a new method of synthesizing a fingerprint image with a desired fingerprint form by adding a conditional section that uses fingerprint form information as input to GAN, a data generation model using deep neural networks. In particular, FingerNet,

a neural network structure for fingerprint image synthesis, is newly developed, fingerprints are synthesized using only the shape information of the fingerprint from the developed deep neural network structure, and the synthesis accuracy of the synthesized fingerprints is compared. Figure 1 shows the overall flow chart of the proposed method.

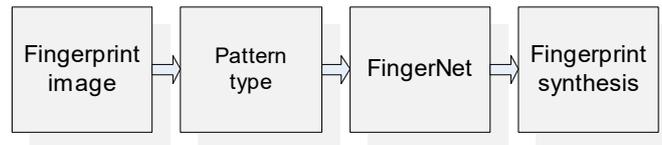


Figure 1. Overall flow of the suggested method

The structure of FingerNet proposed in this paper consists of three convolution layers and one fully connected layer. All layers except the output layer use ReLU as an activation function. In addition, the convolutional layer has a kernel of size 4×4 and is performed by moving two pixels.

3 Conclusion

In this paper, we proposed a new method for synthesizing fingerprints using fingerprint pattern information and deep learning. Experimental results show that the proposed approach synthesizes fingerprints accurately.

In the future, it is planned to improve fingerprint synthesis using line features as well as shape features used in the proposed method. Also, we will verify the robustness of the implemented algorithm by testing the proposed algorithm using a variety of sample data.

Acknowledge

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Blockchain-based Efficient Cloud Big Data Processing Technology

Yoon-Su Jeong¹, Byeong-Tae Ahn^{2*}

¹ Dept. Of Information and Communication Convergence Engineering, Mokwon University, Korea

² Liberal & Arts College, Anyang University, Korea
¹bukmunro@mokwon.ac.kr, ²ahnbt@anyang.ac.kr

Abstract. The importance of big data processing technology has been increasing recently with the increasing use of cloud services using mobile devices (such as mobile phones) that are not connected to the Internet. However, end-users are increasingly demanding the reliable delivery of big data related to cloud services. This paper proposes a technology for blockchain-based data processing that can improve the quality of big data services offered in the cloud environment. The proposed technology improves the quality of service by attaching attribute information created using color keys to the front of the blockchain so that it can reliably distinguish the blockchain of big data processed in the cloud environment. The proposed technology uses different color-key-based attribute information, so it can effectively handle the data that is processed in different cloud environments.

1 Introduction

As bitcoin has been applied in a variety of cloud environments recently, the need for blockchain technology has been gradually expanding to various industries centering on corporate software. In particular, cloud services are gaining popularity as global IT companies (IBM, MS, etc.) include blockchain in software development platforms [1]. Miller et al. technique describes how to improve efficiency in various industries by integrating IoT and blockchain [2]. Tesla et al. technique has proposed a blockchain-based platform for IoT to provide control over resource distribution [3]. However, there are problems that are not explicitly described in terms of the performance of blockchain systems (expansion, decentralization, security, or latency).

In this paper, we propose technology for block-chain-based data processing that can improve the quality of the service of big data that users receiving cloud services can send and receive through various communication media. Proposal technology adds color keys to the blockchain of big data to prevent third-party malicious use of Big Data

in a cloud environment to preemptively block double replication of Big Data.

This paper is composed as follows. Chapter 2 proposes cloud big data processing technology using color key information, and finally Chapter 3 summarizes the results of this paper.

2 Cloud Big Data Processing Technology with Color Key Information

Cloud Big Data services used in cloud environments are delivered in a variety of groups according to user needs. However, there is a problem that clouds big data services currently in operation cannot be safely delivered without special policy support, as they operate under the user's access rights. In this paper, ID attributes and access policies among users' big data information in the cloud environment were treated with blockchain, and PIDs, user rights management, etc. were treated with non-blockchain. The cloud big data being used in the proposed technology has features that can be applied in many ways, regardless of the architectural characteristics of the cloud. Proposed technologies limit third-party access to cloud big data illegally by hierarchically applying and managing color key information in clustered big data through a double-parallel matrix used for blockchain processing. The color key information applied to cloud big data is layered, and the privacy information of all n users is configured to be comparable $n(n-1)/2$ times. The reason for this is to organize cloud Big Data information in a hierarchical manner.

3 Conclusion

Blockchain technology has recently been applied to cloud environments to improve the reliability and efficiency of big data used in cloud environments. In this paper, blockchain-based data processing technology is proposed to improve the service quality of big data used by users receiving cloud services. The proposed technology aims to preempt double replication of big data by adding color key information to the blockchain in a way that prevents third parties from using it maliciously. The proposed technology has features that can be easily applied to various cloud environments by using different color-key-based attribute information in conjunction with blockchains. In addition, the proposed technique can easily synchronize between users and servers because critical information processed in a cloud environment is run in the background.

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A Hybrid Saliency Model for Distant Target Detection

Kyung Joo Cheoi

Dept. of Computer Science, Chungbuk National University, Korea
kjcheoi@chungbuk.ac.kr

Abstract. In this paper, a hybrid saliency model for distant target detection is proposed. The proposed model extracts multiple features by bottom-up manner, trains some of the extracted features, and uses the trained features as biasing information when detecting targets. When a training image is input, some of the features that are selected to train in the process of extracting and combining the basic features of the training image by bottom-up manner, and these features are trained and accumulated in the model as a trained data. When the image containing the targets that should be detected is input into the model, pre-trained features are used in the process of extracting and integration of the features of the input image in order to adjust specific values in the feature maps.

1 Introduction

Many studies to find a specific object in the image have been conducted in various ways. As one of the methods, research has been conducted to find objects by imitating the selective attention concentration, which is a part of the human eye processing function. When human processes the input image information, the gaze first goes to a certain part of the image and processes from this part. We call this mechanism as selective attention. Many studies of selective attention have shown that humans combine various features of images to determine the area of attention[1]. The feature of the image is such as color, brightness, direction, motion, etc. that the human receives as an eye stimulus. When these features are combined to determine where to look, the object recognition process is performed based on the information in this area.

In the early years, the feature combinations to find these specific areas were studied focusing on the parts of the human unconscious[2]. However, this approach has a limitation that the unconscious part of the image may not necessarily be the object we want. To overcome these limitations, research based on top-down attention has been conducted[3]. This study differs from previous studies in that it reflects the high-level knowledge of a person when the gaze is determined. Therefore, the process of training the top-down information is essential in the target detection system using the top-down information. Also, what should be the basic features to learn and how to learn what values of these features can be important factors in improving system performance. In this paper, we propose a hybrid saliency model that combines the bottom-up and top-down methods.

2 Proposed Hybrid Saliency Model

Fig. 1 is the overall process of the proposed model. Only those values which are considered to be important among the feature values and the saliency values generated at various stages of the bottom-up model are selected and these values flow into the top-down model. These flowed values are trained and made into trained data, which are then used to flow into the bottom-up model when searching for and recognizing a specific object to produce specific feature and saliency values. The specific object detection in the bottom-up model searches the existence of a query object in the current image by taking the input of the training data and the image containing the object to be detected.

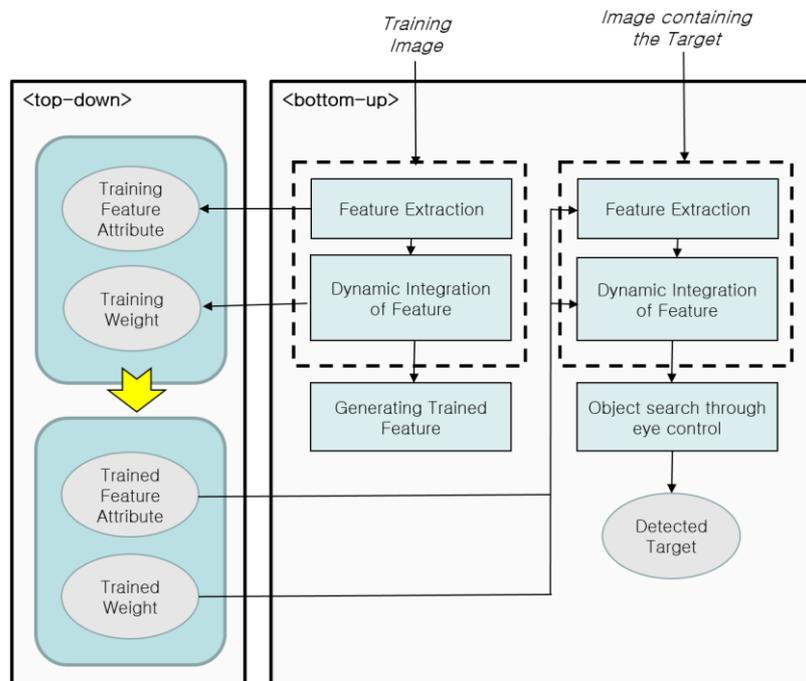


Fig. 1. Overall process of the proposed model.

For the performance evaluation, we applied the model to the problem of detecting triangular safety objects and coke cans. Test images were classified into two groups where the object to be detected is prominent and the case where it is not. Figure 2. shows some results of the proposed model. The proposed model detects triangular safety object and coke can immediately.



Fig. 2. Some results of the model.

3 Conclusion

In this paper, a hybrid saliency model is proposed. The proposed model consists of two modules, a training module for training top-down information and a detection model for distant target detecting using top-down information. There are two most essential parts to consider in the proposed model. The first is what values of which features are used for training, and the second is how to use the trained data to apply the model to object detection.

For the performance evaluation of the proposed model, we conducted triangular safety objects and can detection experiments. The experimental results showed that the proposed model showed good performance in terms of the average number of false detections, but there have been cases where the detection failed within a specified number of times, depending on the image configuration. At present, there are three features used in training. Researches on how to find more features that supplement the model and also the training method should be conducted continuously.

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Automated Baby Monitoring System for Preventing Emergency Situations

Choi Soohyun¹, Yun Songho², Han Haein², Byeongtae Ahn³

¹School Of Electrical Engineering and Computer Science, Gwangju Institute of Science and Technology, Korea, ²School Of Electronics and Communication Engineering, Chonnam National University, Korea, ³Liberal & Arts College, Anyang University, Korea

¹ff152@gist.ac.kr, ²134330@jnu.ac.kr, ²163901@jnu.ac.kr, ³ahnbt@anyang.ac.kr

Abstract. To nurture infants in safe, monitoring infants is necessary. However, it is not possible to watch babies all the time in the modern society. Thus, we propose automated baby monitoring system which monitors infants' lying position and crying and provides parents-to-baby video streaming and voice transmission. In addition, parents can get daily video diary made by detecting the baby's emotion. These main features are based on PoseNet [1], EfficientNet-B3 [2], WebRTC and face-api.js [3] and run on Android OS.

1 Introduction

Sudden Infant Death Syndrome(SIDS) is the number one cause of death of infants in United States and the third in South Korea. Some parents use general CCTV to monitor babies, but it cannot notify parents of emergency situations and users need to buy expensive hardware. To solve these problems, we designed an automated baby monitoring system aims to prevent emergency situations such as crying and suffocation due to rolling over. The main features of the system include 1. Monitoring dangerous lying position, 2. Detecting infant cry, 3. Parents-to-baby video streaming and voice transmission and 4. Recognizing the baby's emotion.

2 System Architecture and Methods

The key functions of the system are detecting dangerous lying position and crying, video streaming from parents to a baby with voice transmission and creating 3-minute daily video diary.

These features work on two Android smartphones which are paired by tokens. A camera on baby-side smartphone monitors baby's status and detects possible hazards such as "no face detected" or "crying." If found, the system automatically sends an alert message with baby's image to parent-side smartphone by Firebase Cloud Messaging(FCM).

The lying position detector monitors if baby is "not in scope" or "no face detected." While sending alerts to parents, 3-second-long videos are saved on the server so that

parents can check what had occurred. Powered by PoseNet on ml5.js [1], the position detector runs on Chrome web browser on Node.js backend server.

Infant cry detector also warns if the baby is in emergency by classifying the input sound into “crying” and “not crying.” Based on EfficientNet-B3 [2], mel-spectrograms of crying sounds of baby are used for transfer learning.

The function of live video streaming and voice transmission allows parents to watch their baby and send their voice in live, making sure that the baby is in safe. It is implemented by Socket.io and WebRTC API on the backend server.

In addition, the system creates a 3-minute-long video diary of the baby and pushes it to users also by FCM. The diary is created by detecting facial expressions of the baby by face-api.js, which utilizes SSD MobileNet V1 Face Detector [3].

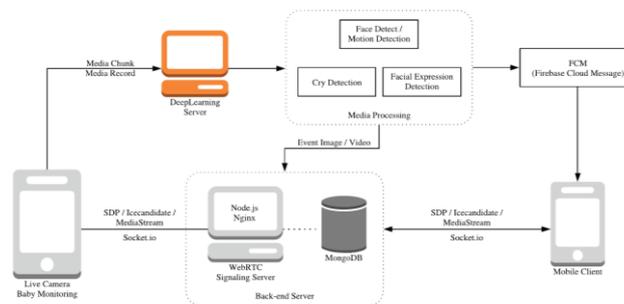


Figure 1. Design of Automated Baby Monitoring System

3 Conclusion

Parenting is not easy especially for parents who raise newborn babies. The automated baby monitoring system is designed to alleviate the burden on parents who are working, by monitoring the baby’s lying position and crying. With sending alert by FCM, it saves a short video to identify the exact event detected. Additionally, 3-minute daily video diary is provided to parents by capturing emotional faces of the baby.

In future, the accuracy of each main functions needs to be increased. To serve the system in real-time, the system should be made light and integrated to run on the application itself. Also, this system can be developed to run on iOS.

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Design for an Intelligent CCTV application using deep learning

Joo Yeon Park¹, Chang Soo Sung²

¹ Discipline of Information Technology, Mathematics & Statistics, Murdoch University, Western Australia.

² Dept. Of Technology Entrepreneurship, Graduate School, Dongguk University, Korea

jooyeon.park@murdoch.edu.au, redsun44@dongguk.edu

Abstract. In recent years, investigations and responses have been made based on CCTV objective data on crimes and disasters. However, it is still used only in a passive manner and is mostly used as data after an event occurs. The use of CCTV in an active and proactive manner requires that everybody monitors themselves, which is very cost-effective. Accordingly, this study intends to develop intelligent CCTV using deep learning that actively monitors itself without a direct detect from people.

1 Introduction

In recent years, investigations and responses have been made based on CCTV objective data on crimes and disasters. However, it is still used only in a passive manner and is mostly used as data after an event occurs. The use of CCTV in an active and proactive manner requires that everybody monitors themselves, which is very cost-effective. Accordingly, this study intends to develop intelligent CCTV that actively monitors itself without a direct detect from people. To solve the problems of existing CCTV, deep learning technology will be carried out through designing a processed model of data to visualize data as well as detect fire. Also, image data of real-time video will be processed and implemented on the web using GPU server and Raspberry Pi for intelligent CCTV system design.

2 System development

The system environment includes python flask for WEB, python TensorFlow in deep learning, and python socket for Raspberry Pi. GPU server consists of four vCPU 30G memories and one 24G Tesla p40 GPU.

A. Raspberry Pi (Camera)

Raspberry pie plays the same role as the existing CCTV in that it not only functions as a transmission function of a camera image frame but also captures images.

B. GPU servers

GPU server performs a total of three functions: socket communication with Raspberry Pi, automatic recognition deep learning and notification algorithm, and website opening. Each function consists of three threads within the GPU server and operates simultaneously

The second model of the deep learning algorithm is the acceptance V3 model based on fast RCN. The model forms a hierarchy as shown in Figure 1, and has a very high recognition rate for image recognition.

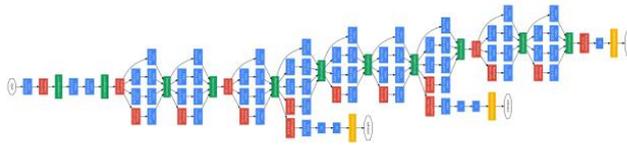


Figure 1. Inception v3 Model

For data training in deep learning, the corresponding label in the image was found and named as shown in Figure 2, and then converted to XML file. The changed XML file was converted to CSV file, then the existing ckpt was called and converted to the new tf-record.



Figure 2. Deep Learning with 99% chance of fire detection

3 Conclusion

. The key to intelligent CCTV systems developed through this research is deep learning algorithm that is assigned to servers. In fact, there are servers where CCTV images are stored in each building or area. If the intelligent CCTV system's deep learning technology is applied to each of these servers and a web server and app-enabled notification system is installed, it will be a higher level of crime and disaster notification system using existing resources, CCTV.

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A new approach to identify promising industries and technologies

Jinho Choi¹, Yong Sik Chang²

¹ School of Business, Sejong University, Republic of Korea

² Department of IT Management, Hanshin University, Republic of Korea

¹jhchoi@sejong.ac.kr, ²yschang@hs.ac.kr

Abstract. We suggest in this paper a new methodology that can recommend promising industry and technology areas using merger and acquisition (M&A) information. We define a variable for the analysis: number of M&A transactions and present decision models for estimating the velocity of M&A transactions to identify promising areas based on M&A information. Then, we identify the promising industry and technology areas with longitudinal analyses of M&A trends by sub-industry in the IT industry.

The main significance of our research is that it is a prior data-based analytic method based on M&A transactions to identify the growth of industry and technology.

Introduction

Companies are struggling to diversify and grow their businesses due to a lack of diversification information, opportunity capturing capability and actual commercialization capability. Forecasting emerging technologies is a challenging task due to little or no availability of historical data [1].

To overcome these difficulties, a variety of forecasting methods to identify promising industry, business or technology areas have been developed thus far.

Some of the more useful and widespread forecasting techniques are judgmental methods [2-5] and bibliometric analysis methods [6-9].

The methods mentioned above have some limitations, respectively, in applying their analysis results to the real world. The major problem of judgmental methods is that the results of the methods are not objective. In the case of bibliometric methods based on a paper or patent, there is a time lag [10, 11] for practical use in the market because it generally takes 1 to 3 years to finally publish a paper or apply a patent from finishing documents to publishing or application.

In this paper, we suggest a new methodology that can recommend promising industries and technologies using merger and acquisition (M&A) transaction information. A promising industry/technology means an industry/technology that has been rapidly growing in the market in recent years. In other words, it can be used interchangeably with growing industry/technology or emerging industry/technology. Because M&A information itself shows dynamic linkages among industries or technologies through the relationships of participating companies, it can be very useful for analyzing correlations and convergences between different industry, business or technology areas. Furthermore, the analysis information based on the M&A data can be utilized as an infrastructure for identifying promising industry and technology areas or exploring new business opportunities for future collaboration.

In particular, the significance of our research is that it is a prior data-based analytic method based on M&A transaction data that do not have a time-lag issue, and this is the first research using market information as a new and meaningful method that complements previous methodologies in identifying promising industries or technologies.

Methods and data

As suggested above, in this research, we intend to derive promising industry or technology areas in the IT industry by analyzing the velocity and acceleration of M&A transactions. For the analysis, we define variables and decision models to identify promising industry and technology areas in this section.

We suggest some variables.

i : Index of period

Num_i : Number of M&A transactions for the i th period

$Si(Num)$: Cumulative number of M&A transactions until period i

Decision models for measuring M&A status to identify promising industry and technology areas based on M&A data are presented in Fig. 1.

$$v_i(Num) = \frac{\Delta S_i(Num)}{\Delta t} = \frac{S_i(Num) - S_{i-1}(Num)}{\Delta t} = \frac{Num_i}{\Delta t}$$

Fig. 3. Decision models to identify promising areas.

$v_i(Num)$ refers to the growth velocity of period i based on the number of M&A transactions. As with the general concept of velocity, the growth velocity can be obtained by dividing the difference between the cumulative number of M&A transactions until period i and cumulative number of M&A transactions until period $i-1$, $\Delta S_i(Num)$, by the time difference between the two periods, Δt . $\Delta S_i(Num)$ divided by the demanded time (Δt) of period i is defined as the growth velocity of the i th period based on the number of M&A transactions. In other words, the number of M&A transactions completed during the unit period is defined as the growth velocity of the i th period in terms of the number of M&A transactions. In this study, the total period of 15 years is divided into five intervals, so the time difference (Δt) corresponding to each period is defined as 3 years.

We extracted all the M&A transaction data in the IT industry over

the last 15 years, from 2002 to 2016.

8 Longitudinal Analysis of M&A Trends by Sub-industry in the IT Industry

Fig. 2. shows the analysis results for cumulative M&A transactions

based on the number of M&A deals by sub-industry (level 4) in the IT

industry over the recent 15 years (2002-2016).

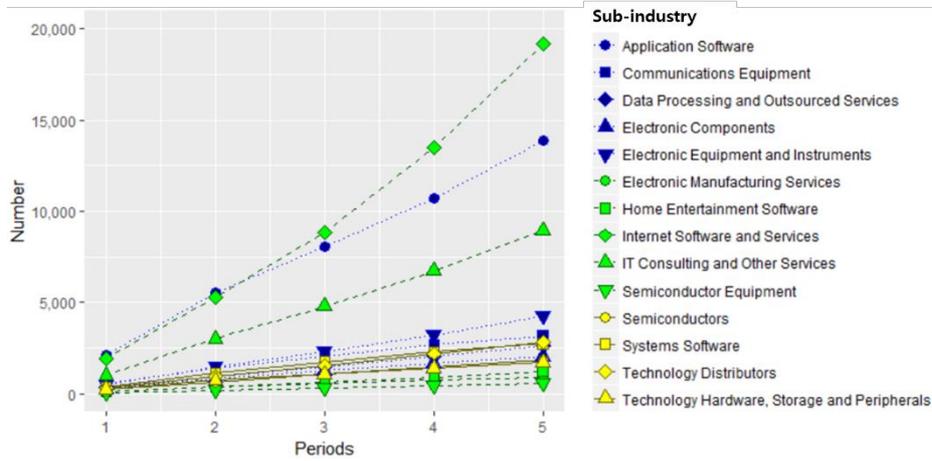


Fig. 2. Cumulative number of M&A transactions by sub-industry

The number of M&A deals has been increasing across most of the sub-industries, although there are some differences in each technology area. In particular, among the sub-industries, “Internet Software and Services,” “Application Software” and “IT Consulting and Other Services” account for a large part of the M&A transactions and show continuous and steeply increasing trends. In contrast, sub-industries such as “Electronic Manufacturing Services,” “Home Entertainment Software” and “Semiconductor Equipment” have a relatively low proportion of frequency of M&A transactions, although the number of transactions continues to increase over time.

Fig. 3. shows the analysis results of the velocity of M&A investment in terms of the number of M&A transactions by sub-industry in the IT industry. Through the analysis of the velocity we can identify continuously growing or declining sub-industries.

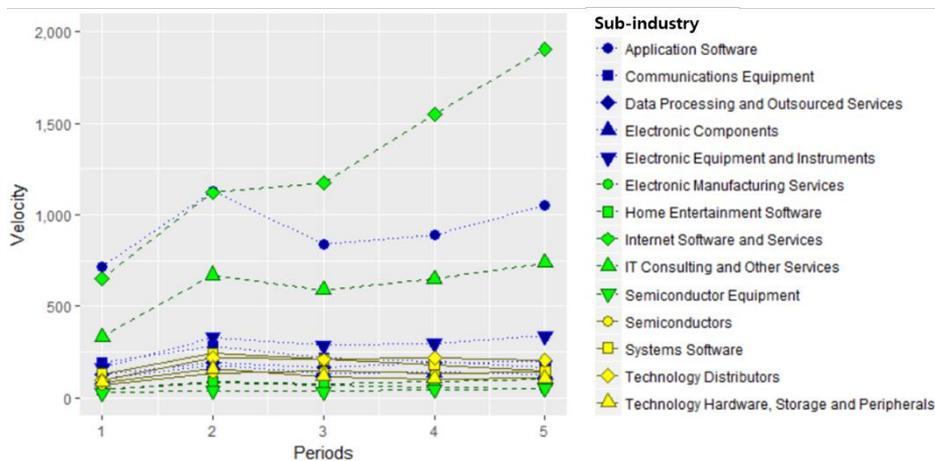


Fig. 3. Velocity of M&A transactions based on number of M&A transactions by sub-industry

The sub-industry “Internet Software and Services” shows a steadily increasing pattern of growth over all periods on a velocity basis. In particular, in period 3 (from 2008 to 2010), all sub-industries except “Internet Software and Services” and “Semiconductors” show a temporary decline. This phenomenon does not mean the decline of the IT industry but seems to be caused by external factors such as the global financial crisis at that time. After this period, most sub-industries show recovery. However, the sub-industries “Communications Equipment,” “Electronic Manufacturing Services” and “Systems Software” shows a continuous decline of M&A velocity after the peak in period 2.

7 Conclusion and discussion

In a competitive industrial environment, companies are struggling to diversify and grow their businesses due to a lack of diversification information, opportunity capturing capability and actual commercialization capability. To overcome these limitations, we suggested in this paper a new methodology that can identify promising industries and technologies using M&A transaction data.

The major findings of our research are as follows. We defined a variables for the analysis, number of M&A transactions, and presented decision models for estimating the velocity of M&A transactions to identify promising areas based on M&A information. Based on the defined variables and decision models, we conducted longitudinal analyses and cross-sectional analyses of the M&A transactions in the IT industry over the last 15 years to identify promising industry and technology areas.

The significance of the analytical methodology presented in this study is that it is prior data-based research based on M&A transaction data that deals with the growth of industries or technologies.

In the future research, the authors will design a methodology that supports more robust analysis and integrated interpretation of the various indexes and analysis results and will apply research to the business field.

Acknowledgement

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Big Data in Korean National Innovation Systems (KNIS): Evolution or Involution?

Kim Eun Sun¹, Bae Kuk Jin², Byun Jeongeun³

^{1,2,3} Technology Commercialization Center, Korea Institute of Science and Technology Information (KISTI), Korea

¹kimes@kisti.re.kr, ²baekj@kisti.re.kr, ³jebyun@kisti.re.kr

Abstract. This study examines Korean national innovation systems (KNIS) that has developed over the past 14 years from 2003 to 2016 in the governments of Roh Moo-hyun, Lee Myung-bak, and Park Geun-hye. The aim of this study is to evaluate the KNIS in three-fold. First is to analyze the NIS of three governments based on data of 470,000 national research and development (R&D) projects; from this to compare innovative outcomes of three governments; lastly to figure out characteristics and future trends of the KNIS in innovative performance. Empirical evidence highlights that policies implemented for more than a decade do not effectively link to economic outcomes resulting in imbalance between innovation input and innovation output.

1 Introduction

Korean government steadily increased R&D investment from USD 3.45 billion in 2000 to USD 17 billion in 2017, expecting that more inputs might bring out more outcomes for economic growth. For the period that the government adopted the concept of NIS, this study attempts to seek whether investment led to noticeable outcomes by analyzing the KNIS from the Roh government, which first constructed NIS as a policy framework, to the recently completed term of the Park government.

This study is differentiated from previous studies. First, it attempts to analyze the KNIS between 2003 and 2016; in other words, when the KNIS emerged and how it was developed under three changes of government, rather than to provide simple characteristics of the KNIS at a specific point of time. Second, this study adopted a dataset of 470,000 national R&D projects of the National Science & Technology Information Service (NTIS) accumulated over 14 years while previous studies have used survey results conducted by international organizations.

2 Data and Analytical Method

For the study to capture how KNIS has evolved for 14 years at macro-levels, we used the dataset of national R&D projects extracted from NTIS. In the process of data preprocessing and analyzing, programming language R, a software environment for statistical computing, is used.

3 Analysis and Results

Our main results are reported in Fig. 1 which demonstrates innovative performance per government investment of KRW 100 million: the number of papers published domestically and overseas (Papers), the number of patent applications and grants domestically and overseas (Patents), the royalty income from technology transfers (Royalty income), the sales from commercialized projects (Commercialization), and the number of jobs created by commercialized projects (Job creation).

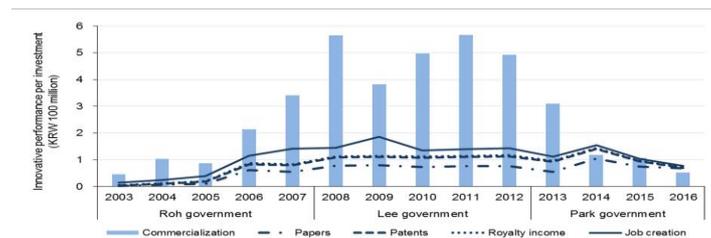


Fig. 7. The change in path of the KNIS via empirical analysis (The period average exchange rate for 2016 is KRW 1,160.13=USD 1)

4 Conclusion

This study examined the history of KNIS for 14 years based on a dataset of 470,000 national R&D projects. The result shows that the KNIS was developed and evolved from 2003 to 2007, maintained until 2008, and gradually declined. Korea has been steadily expanding government investment in national R&D projects, through three governments from 2003 to 2016, but the outputs indicating innovative performance varied among governments

This study traces back the dynamic history of KNIS and contributes to existing knowledge by analyzing big data that has rarely been examined by NIS scholars. Rather, previous research tends to focus on national comparisons of innovative performance or analyzing the current status of NIS.

Acknowledge

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Deep Attention Matching Network with Turn-Level Recurrence for Multi-turn Response Selection

Junyoung Sohn, Hyuntae Park, Gijoo Yang
Dongguk University, Republic of Korea
firnslwma@gmail.com, pht0639@naver.com, gjyang@dongguk.edu

Abstract. Real world intelligent dialog system should essentially support multi-turn conversation. In addition to its encouraging future and high commercial potentials, the development of deep neural networks spurs the study on the end-to-end multi-turn goal-oriented dialog systems. This work focuses on the retrieval-based response matching systems where the long-term dependency information is extracted with the help of turn-level recurrence. Recently, Transformer network module (Vaswani et al., 2017) is very popular in NLP domain. Being inspired by Transformer, Zhou et al., (2018) propose a novel response matching model, namely Deep Attention Matching (DAM) networks, in which they utilize the representations through the stacked self-attention and the cross-attention. We extend the DAM in two ways. First, we add the novel turn-level recurrence to the stacked self-attention mechanism. With this scheme, the current self-attention layer takes its input from both the directly lower-level layer and the same-level layer of previous self-attention layer. Second, we applied the relative positional encoding in word embedding so that positional bias can be encoded to discriminate identical words with different positions. In our experiments on Ubuntu Corpus, our proposed model outperforms DAM.

1 Introduction

Research interest in the intelligent dialog systems are consistently growing due to its promising potentials and alluring commercial values. In fact, various kinds of dialog systems are being used in many areas of industry and most of them are retrieval-based model. Notwithstanding its relatively long history and potentials, the multi-turn natural language understanding remains as a challenging task in machine learning community.

Multi-turn dialog systems are largely divided into generation-based methods (Serban et al., 2017; Zhou et al., 2017; Wu et al., 2018) and retrieval-based methods (Lowe et al. 2015; Wu et al. 2016, Zhang et al. 2018; Zhou et al. 2018). Generation-based methods typically take a form of sequence-to-sequence or encoder-decoder. This method learns patterns of responses

from dialogues and can directly generalize new responses. Although generation-based models are considered to be theoretically ideal for the natural and more human-like conversation, they tend to generate short and general responses. They need more studies before they can be

deployed in commercial settings. Retrieval-based methods is to select the most relevant response given a user's utterances and the context of the conversation. While limited in the sense that it cannot generate new responses, retrieval-based systems are still often selected as a base method for many applications including summarization, task-oriented dialogue systems. Retrieval-based methods can take the advantage of informative and fluent responses, because they select a proper response for the current conversation from a repository with response selection algorithms. The key challenges of the response selection task include (1) how to identify important information (words, phrases, and sentences) in context, which is crucial to selecting a proper response and leveraging relevant information in matching; and (2) how to model relationships among the utterances in the context. In order to identify pertinent information in the previous utterances and properly model the utterance relationships to ensure conversation consistency, Wu et al., (2016) matches a response with each utterance in the context. The limitation of this approach is such that it fails to capture the internal semantics inside utterances. Recently, Chen et al. (2019) enhanced the performance of sequence-based methods by extending the model that was proposed for sequential NLI (natural language inference), called ESIM (Enhanced Sequential Inference Model) (Chen et al., 2016). Zhou et al., (2018) proposed deep attention matching (DAM) network which utilize the self-attention and cross-attention in order to match the conversation context and response. They exploit the Transformer (Vaswani et al., 2017) module in constructing self-attention and cross-attention between the segment embedding of context and response candidate. In this paper, we propose a novel turn-level recurrence mechanism as the extension to DAM. We tested our model on large public dataset, Ubuntu Corpus. Experimental results show that our model performs a little better than DAM.

2 Related Work

In recent years, we have seen an impressive advancement in neural retrieval-based dialog system. Now, we feel the development of an intelligent dialogue system becomes feasible (Williams et al., 2017; He et al., 2017; Dhingra et al., 2016; Zhang et al., 2018). In the following,

we provide an overview of studies which are closely related to our work.

Lowe et al. (2015) built an utterance ranking system based on a dual encoder. They first encode the context and the response separately into two fixed size vectors. Then, a ranking score is computed as a dot product between a learned parameter matrix and these two vectors.

With this approach only similarity on sequence level is captured.

Baudiš et al. (2016) combined both Recurrent Neural Networks (RNNs) and Convolutional Neural Networks (CNNs). They used the RNN to firstly encode the long-term dependencies of input text and model contextual representations of words. Then they applied CNN and max pooling to compute the response score. In addition to the complexity of their architecture, only sequence level information was used.

Zhou et al. (2016) performed context-response matching with a multi-view model on both word level and utterance level.

Yan et al. (2017) selected the previous utterances in different strategies and combined them with last utterance to form a reformulated context.

Wu et al. (2017) improved the leveraging of utterances relationship and contextual information by matching a response with each utterance in the context based on a convolutional neural network. They designed a system which considers the context utterances separately. From the candidate response and each utterance of the context, they computed word level and sequence level similarities. These similarities are encoded using a succession of convolution and pooling and then accumulated using Gated Recurrent Units (GRU). Xu et al. (2017), inspired by the human brain, incorporated domain knowledge into their system in order to improve context and response modeling. They introduced for the first time a new cell called r-LSTM which has an extra gate called Recall Gate. This cell helps in memorizing information about domain knowledge words in addition to encoding the context and the response with the same process as Lowe et al. (2015).

The domain knowledge words are obtained from a hand-made knowledge base which makes the approach not easily scalable from one domain to another. Zhang et al., (2018) employed attention-based recurrent networks on each utterance against utterance itself, aggregating the vital pieces of the contextual utterances. Also their model discriminates the importance of previous conversations and also accumulates substantial parts from each utterance according to each word in the utterance itself in a multi-turn scenario.

3 Proposed Systems

3.1 Problem Formalization

Since this work is based on DAM (Zhou, Xiangyang, et al., 2018), we follow the terminologies and notations in that paper where the DAM was originally proposed.

A multi-turn conversation context c is a sequence of utterances and denoted as $c = \{u_0, \dots, u_{n-1}\}$, where u_i stand for i^{th} utterance. Let's denote the response for the given conversation as r . As an utterance u_i and a response r can be consisted of one or more sequences, we concatenate the sentences into one long sequence. Hence every utterance and response can be represented with a sequence of tokens (or, words) w . If we let $y \in \{0, 1\}$ denote the binary label which represents if a response r is relevant to a given conversation c , our dataset can be denote as $\mathcal{D} = \{(c, r, y)_z\}_{z=1}^N$. At the end of every conversation, our task is to predict the relevance between the conversation and the response. Then our goal is to learn the matching model $g(c, r)$ which measure the relevance between any conversation context c and candidate response r , given \mathcal{D} .

3.2 Model Overview

Let's denote an utterance in a context as $u_i = [w_{u_i,k}]_{k=0}^{n_{u_i}-1}$, where $w_{u_i,k}$ and n_{u_i} stand for the k^{th} token and the number of tokens respectively. Similarly, let's denote a response candidate $r = [w_{r,t}]_{t=0}^{n_r-1}$, where $w_{r,t}$ and n_r stand for the t^{th} token and the numbers of tokens respectively.

At first, DAM+ reads in the subword tokenized dataset and, by using the shared word embedding table, represent u_i and r as sequence of word embeddings, namely $\mathbf{U}_i^0 = [e_{u_i,0}^0, \dots, e_{u_i,n_{u_i}-1}^0]$ and $\mathbf{R}^0 = [e_{r,0}^0, \dots, e_{r,n_r-1}^0]$ respectively, where $e \in \mathbb{R}^d$ denotes a d -dimensional word embedding. Being different from original DAM, which applies the positional encoding at this stage, DAM+ does the relative positional encoding when in multi-head attention is being applied.

In the representation module, L identical layers of self-attention are hierarchically stacked, where each l^{th} layer takes [as input both of the output of the \$l - 1^{\text{th}}\$ layer and the output of the \$l^{\text{th}}\$ layer](#) of the previous

utterance. In this way, representation module of DAM+ can not only composites the input semantic vectors into more sophisticated representations based solely on self-attention but also capture the long-term dependency in multi-turn dialog context. Resulting multi-grained representations of u_i and r are gradually and recurrently constructed, denoted as $[\mathbf{U}_i^l]_{l=0}^L$ and $[\mathbf{R}^l]_{l=0}^L$. These processes are depicted in Figure 1.

From now on, the procedure is exactly same as original DAM. Given $[\mathbf{U}_i^0, \dots, \mathbf{U}_i^L]$ and $[\mathbf{R}^0, \dots, \mathbf{R}^L]$, two kinds of matching matrices are constructed for each granularity $l = 0, \dots, L$, i.e., the self-attention-match $\mathbf{M}_{self}^{u_i, r, l}$ and cross-attention-match $\mathbf{M}_{cross}^{u_i, r, l}$. These matrices measure the relevance between utterance u_i and response r with textual information and dependency information respectively.

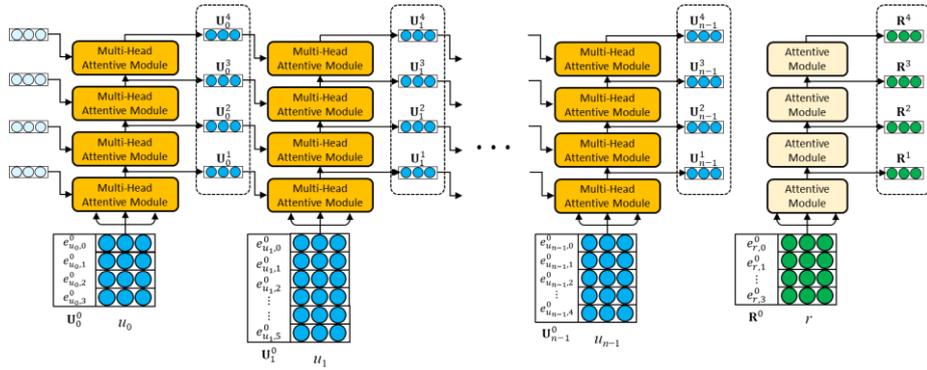


Figure 1: DAM with Turn-level recurrence

Those matching scores are finally merged into a 3D matching score image \mathbf{Q} . Each dimension of \mathbf{Q} represents each utterance in context, each word in utterance and each word in response respectively. Important matching information between segment pairs across multi-turn context and candidate response is then extracted via convolution with max-pooling operations, and further fused into one matching score via a single-layer perceptron, representing the matching degree between the response candidate and the whole context.

DAM uses the same Attentive Module in implementing both of self-attention in representation and cross-attention in matching. However, our model does not share the Attentive Module, because turn-level

recurrence is provided in the stacked self-attention but not in the cross-attention. This is our main contribution to DAM.

3.3 Relative Positional Encoding

Attention mechanism does not consider the order of tokens in a sequence. In order to use the order of the sequence, Transformer (Vaswani, Ashish, et al. 2017) add positional encodings to the input embeddings at the bottom of the encoder decoder stack. However, since vanilla Transformer suffers from context fragmentation problem due to its operation on fixed-length segments, Dai, Zihang, et al., (2019) propose the relative positional encodings. While original DAM does not adopt the positional encodings, we extended DAM to use the relative positional encoding. Instead of adding positional information to the initial embedding, our model dynamically injects the relative positional information into the attention score. For more detail information about the relative positional encoding, readers may refer to Dai, Zihang, et al., (2019)

3.4 Attentive Modules

Attentive Module of DAM similar to Transformer of the self-attention layer in the encoder (Vaswani et al., 2017) except the fact that Attentive Module has no multi-head attention mechanism. Similar to Transformer, Attentive Module has three input sequences: the query sequence, the key sequence and the value sequence, namely $\mathcal{Q} = [e_i]_{i=0}^{n_{\mathcal{Q}}-1}$, $\mathcal{K} = [e_i]_{i=0}^{n_{\mathcal{K}}-1}$, $\mathcal{V} = [e_i]_{i=0}^{n_{\mathcal{V}}-1}$ respectively, where $n_{\mathcal{K}} = n_{\mathcal{V}}$. The process of Attentive Module is as follows.

Attentive module takes as input each token in the query sequence and attend to tokens in the key sequences via Scaled Dot-Product Attention (Vaswani et al., 2017). Then the attention result is applied to tokens in the value sequence. These process is defined as:

$$Att(\mathcal{Q}, \mathcal{K}) = \left[softmax \left(\frac{\mathcal{Q}[i] \cdot \mathcal{K}^T}{\sqrt{d}} \right) \right]_{i=0}^{n_{\mathcal{Q}}-1} \quad (1)$$

$$\mathcal{V}_{att} = Att(\mathcal{Q}, \mathcal{K}) \cdot \mathcal{V} \in \mathbb{R}^{n_{\mathcal{Q}} \times d} \quad (2)$$

where each row of Q , denoted as $Q[i]$ is the i^{th} embedding in the query sentence Q . each row of \mathcal{V}_{att} , denoted as $\mathcal{V}_{att}[i]$, stores the fused semantic information of words in the value sentence that possibly have dependencies to the i^{th} word in query sentence. For each i , $\mathcal{V}_{att}[i]$ and $Q[i]$ are then added up together, compositing them into a new representation that contains their joint meanings. A layer normalization operation (Ba et al., 2016) is then applied, which prevents vanishing or exploding of gradients. A feed-forward network **FFN** with RELU (LeCun et al., 2015) activation is then applied upon the normalization result, in order to further process the fused embeddings, defined as:

$$\mathbf{FFN}(x) = \max(0, xW_1 + b_1) W_2 + b_2 \quad (3)$$

where, x is a 2D-tensor in the same shape of query sentence Q and W_1 , b_1 , W_2 , b_2 are learnt parameters. The result of $\mathbf{FFN}(x)$ is a 2D-tensor that has the same shape as x , $\mathbf{FFN}(x)$ is then residually added (He et al., 2016) to x , and the fusion result is then normalized as the final outputs. We refer to the whole Attentive Module as:

$$\mathbf{AttentiveModule}(Q, \mathcal{K}, \mathcal{V}) \quad (4)$$

As described, Attentive Module can capture dependencies across query sentence and key sentence, and further use the dependency information to composite elements in the query sentence and the value sentence into compositional representations. This property of the Attentive Module is used to construct multi-grained semantic representations as well as match with dependency information.

3.5 Turn-Level Recurrence

DAM considers only u_i when it construct the hierarchically multi-grained representations for u_i by stacking Attentive Module. Our proposed model utilizes the representations from the previous step of same level in order to capture the inter-utterance relationships. That is, given \mathbf{U}_i^l , the token-level embedding representations of granularity l for utterance u_i , our model takes \mathbf{U}_i^l and \mathbf{U}_{i-1}^l as inputs and hierarchically stacks the Attentive Module to construct multi-grained representations of u_i , \mathbf{U}_i^{l+1} . However, since a response r is a single turn utterance, only \mathbf{R}^l is taken as input to produce \mathbf{R}^{l+1} . This process is formulated as:

$$\mathbf{U}_i^{l+1} = \mathbf{AttentiveModule}(\mathbf{U}_{i-1}^l, \mathbf{U}_{i-1}^l, \mathbf{U}_{i-1}^l, \mathbf{U}_i^l, \mathbf{U}_i^l, \mathbf{U}_i^l) \quad (5)$$

$$\mathbf{R}^{l+1} = \mathbf{AttentiveModule}(\mathbf{R}^l, \mathbf{R}^l, \mathbf{R}^l) \quad (6)$$

where $l = 0, \dots, L$ denotes the different levels of granularity. This mechanism provides our model with turn-level recurrence capability so that our model can carry the information for the inter-utterance relationship which is useful when the resulting

representation is used in response matching.

3.6 Utterance-Response Matching and Aggregation

Since we follow the procedure of DAM (Jhou et al., 2018) from this stage, we are going to express the procedure as brief as possible. Readers can refer to their original paper if they want more detailed information. Given $[\mathbf{U}_i^l]_{l=0}^L$ and $[\mathbf{R}^l]_{l=0}^L$, self-attention-match $\mathbf{M}_{self}^{u_i,r,l}$ and cross-attention-match $\mathbf{M}_{cross}^{u_i,r,l}$ are constructed for each granularity level l , as follows:

$$\mathbf{M}_{self}^{u_i,r,l} = \{\mathbf{U}_i^l[k]^T \cdot \mathbf{R}^l[t]\}_{n_{u_i} \times n_r} \quad (7)$$

$$\begin{aligned} \tilde{\mathbf{U}}_i^{l+1} \\ = \text{AttentiveModule}(\mathbf{U}_{i-1}^l, \mathbf{U}_i^l, \mathbf{R}^l, \mathbf{R}^l) \end{aligned} \quad (8)$$

$$\begin{aligned} \tilde{\mathbf{R}}^{l+1} \\ = \text{AttentiveModule}(\mathbf{R}^l, \mathbf{R}^l, \mathbf{U}_{i-1}^l, \mathbf{U}_i^l,) \end{aligned} \quad (9)$$

$$\mathbf{M}_{cross}^{u_i,r,l} = \{\tilde{\mathbf{U}}_i^l[k]^T \cdot \tilde{\mathbf{R}}^l[t]\}_{n_{u_i} \times n_r} \quad (10)$$

In this way, those inter-dependent segment pairs are close to each other in representations, and dot-products between those latently inter-dependent pairs could get increased, providing dependency-aware matching information. DAM finally aggregates all the matching scores across each utterance and response into a 3D matching image \mathbf{Q} , which is defined as:

$$\mathbf{Q} = \{\mathbb{Q}_{i,k,t}\}_{n \times n_{u_i} \times n_r} \quad (11)$$

$$\begin{aligned} \mathbb{Q}_{i,k,t} = & \left[\mathbf{M}_{self}^{u_i,r,l}[k,t] \right]_{l=0}^L \\ & \oplus \left[\mathbf{M}_{cross}^{u_i,r,l}[k,t] \right]_{l=0}^L \end{aligned} \quad (12)$$

where \oplus is concatenation operation and each pixel $\mathbb{Q}_{i,k,t}$ has $2(L+1)$ channels, storing the matching degrees between one certain segment pair at different levels of granularity. Then \mathbf{Q} undergoes two layers of 3D convolution with max pooling, and produces the matching score $g(c, r)$:

$$g(c, r) = \sigma(W_3 f_{match}(c, r) + b_3) \quad (13)$$

where $f_{match}(c, r)$ is extracted matching features via single layer perceptron. The

loss function is the negative log-likelihood, defined as:

$$p(y|c,r) = g(c,r)y + (1 - g(c,r))(1 - y) \quad (14)$$

$$L(\cdot) = - \sum_{(c,r,y) \in \mathcal{D}} \log(p(y|c,r)) \quad (15)$$

4 Experiments

4.1 Dataset

We test our proposed model on public multi-turn response selection datasets, the Ubuntu Corpus (Lowe et al., 2015). Ubuntu Corpus is a collection of multi-participant chat conversations from the #UBUNTU IRC channel, in which multiple participants discuss technical issues they are having with the Ubuntu operating system. A previous version of this dataset was used in DSTC 7 track 1. For DSTC 8, the corpus was expanded to include multi-participants and scenarios in which there can be no relevant response candidates. We choose the updated Ubuntu Corpus since the setting is closer to real world. Updated Ubuntu training dataset has more than 200,000 conversation and about 2.4M multi-sentence utterances.

4.2 Preprocessing

At first, we tokenized the whole corpus with word piece model – Sentencepiece tokenizer (Kudo et al., 2018) – which is quite popular nowadays. Subword-level information is crucial for capturing morphology and improving compositional representations for out-of-vocabulary entries. Next, we trained the subword tokenized corpus with Word2Vec. Though there are many advanced word embedding methods, Word2Vec is enough to test the performance of our model in general setting.

4.3 Training and Evaluation

Our model is a binary classifier which predicts if any response candidate is relevant to a given conversation context. Tokenized corpus is converted to a list of pairs of one multi-turn conversation and one response candidate. Then these context-response pairs are fed into the model, and the model is trained to learn to classify if given context-response pair is relevant.

Proposed model was trained for 5 epochs on the Intel XEON Gold 6134 3.2GHz based server with 8 Nvidia GTX1080Ti GPUs. Also the original DAM networks was trained under the same condition. Training results are shown in Table 1. The performance of our model is a little bit better than that of original Deep Attention Matching networks with a little more training time.

Model	recall@1	recall@2	recall@5	Training time (seconds)
Original DAM	0.721	0.834	0.959	1,739
DAM with Turn-level Recurrence	0.732	0.841	0.964	1,812

Table 1. Result of the experiment (Test accuracy).

5 Conclusion

Proposed model showed a performance that is a little better than original DAM networks. Turn-level recurrence seems to help the model retain long term dependency among utterances. However, if we upgrade the model to consider the segment-level recurrence in the multi-head attention module, then we could get more performance and less training time. In the future study, we need to modify the aggregation module to mitigate the computational expense.

Acknowledgement

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Stretching Side Pose Classification using LSTM

Boldmaa Solongontuya¹, Kyung Joo Cheoi², Mi-hye Kim³

^{1,3} Dept. Of Computer Engineering, Chungbuk National University, Korea

² Dept. Of Computer Science, Chungbuk National University, Korea

²kjcheoi@chungbuk.ac.kr, ³mhkim@chungbuk.ac.kr

Abstract. Low back pain rehabilitation exercises have been widely used in spine-related illnesses. It is necessary to do the exercise correctly and a lot of times of repetitions for a healthy body. However, patient is more likely to make mistakes while exercising alone and is committed to establishing a correct standard of rehabilitation therapy to solve solitary problems. In this paper, we propose a new stretching side pose classification system using LSTM that could be used in rehabilitation therapy system. Our system classifies which exercise the patient is doing from a simple video file that is taken with a camera. 4 types of exercises are classified with RNN(Recurrent Neural Network) – LSTM(Long Short-term Memory). We have tested our system on a testing dataset of 80 skeleton sequences and achieved an accuracy of 81.67%.

1 Introduction

Physical rehabilitation therapy is a process that often-used regaining some of the abilities that have been lost and exercise repeatedly doing for health. There are rehabilitation treatments for all types of diseases, one of the rehabilitation treatments is for back pain. The back pain is one of the major causes of disability of people and it is becoming one of the concerns of global health organizations. One of the most commonly used treatments for back pain is regular rehabilitation exercises specifically designed by rehabilitation physicians. However, the patient is often alone in-home treatment due to the availability of doctors and the reasons for financial opportunities. Doing exercise at home save the patient's time and financially safe, but tend to slow down the healing process.

For these reasons, there have been a lot of research to help the patient doing exercise at home without the help of a physician and alone [1-7]. The first step of this kind of research is to recognize which exercise the patient is doing from a simple video file. In this paper, we propose a new model which classifies 4 types of the exercises, Bird Dog, Cat Camel, Cobra Stretch, Pelvic Tilt, for patients who have back pain using the LSTM model of deep neural networks.

Unlike previous studies [1-3] that used additional devices, such as sensors or Kinect, the biggest advantage of our proposed system is that the patient can check their movement using simple video which recorded any kind of ordinary camera and they don't need to use an additional device, such as sensors and Kinect cameras.

2 Stretching Side Pose Classification

Fig. 1 illustrates how to reach the goal of setting the standard of exercises correct form. After the implementation of data preparation and data preprocessing proposed methods implemented.

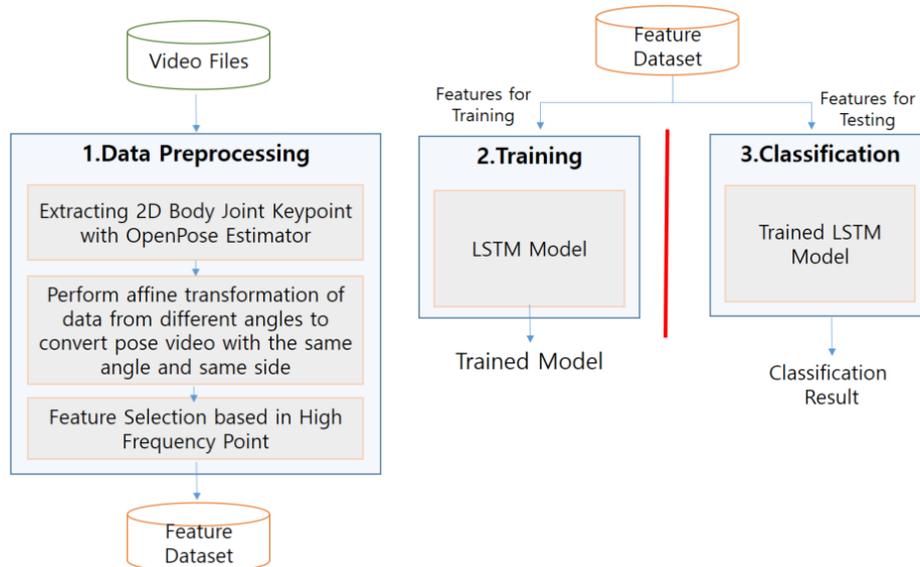


Fig. 1. Overall process of the proposed system.

3 Experimental Result

For the performance evaluation, we selected four types of exercises used for rehabilitation therapy before the data collection. These exercises include four types of exercises: Bird Dog, Cat Camel, Cobra Stretch, and Pelvic Tilt. Gathering data from channels that instructs on how to do on YouTube has the advantage of collecting data for different types of people and different situations. So, the data performed correctly on the four exercises have been collected from YouTube. Our total data consists of four categories, each of which contains 200 data per 50 video data. The length of the video is different because of the different speeds of each person performing the movement and the videos are between 4 and 25 seconds.

As a performance evaluation criteria, we used Confusion Matrix. Confusion Matrix is a table that is regularly used to present classification parameters based on the true value of test data [8]. We have tested our system on a testing dataset of 80 skeleton sequences and achieved an accuracy of 81.67%.

3 Conclusion

The system proposed in this paper aimed at setting the standard for rehabilitation treatment exercise for back pain using computer vision. 4 types of rehabilitation treatments have been selected, including exercises of Bird Dog, Cat Camel, Cobra Stretch, and Pelvic Tilt. The goal was to make an effort to do the exercises without any sensors or robots, and to analyze the videos of any simple camera. The system classified stretching side pose to identify which of the four exercises the people are doing. Doing the pose classification, a RNN-LSTM model was used. We have tested our system on a testing dataset of 80 skeleton sequences and achieved an accuracy of 81.67%. In future work, we need to extend the system, such as increasing the number of back rehabilitation exercises and the improvement of classification results.

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Real-Time Low-Cost Human Skeleton Detection

JinKyung Do¹, Eungyeol Song¹, Sunjin Yu¹

¹ Research and development department, Codevision Inc 50, Yonsei-ro, Seodaemun-gu, Seoul, Republic of Korea

² Changwon National University, 20 Changwondaehak-ro Uichang-gu Changwon-si, Gyeongsangnam-do 51140 Korea

¹jkdo0923@gmail.com, ¹song@codevision.kr, ²sjyu@changwon.ac.kr

Abstract. Human skeleton is useful for recognizing accurate human behavior and analyzing situations. This work introduces a low-cost human skeleton detection network for detecting skeleton in real-time. The proposed network is divided into two parts: pattern extraction and multi-stage CNNs. On multi-stage CNNs, we use repeated stages including two branches for estimation of heatmap and PAFs. Also, the network is consisting of inverted bottleneck layers and separable convolutions to extract features efficiently. Our method obtains about 10.45 average fps on test video, significantly performs video analysis with higher speed.

1 Introduction

Recently, the recognition performance of human detector algorithm is improved by the improvement of artificial intelligence (AI) technology. Skeleton-based 2D human pose estimation only use 2D images including x and y coordinates for skeleton estimation. It is divided into two methods, top-down and bottom-up. Top-down method is performed with higher accuracy but higher inference time. This method has a critical problem that inference time is depending on the number of people in the image. On the other hand, bottom-up method is performed with stable inference but relatively lower accuracy. OpenPose [1] encodes global context of an input image using heatmap and PAFs. It is composed of VGG-19 network and repeated CNN stages to extract heatmap and PAFs.

Our proposed algorithm focused on the higher speed of network. It contains pattern extraction part, the network calculates a proper feature, and multi-stage CNNs, which calculates heatmap and PAFs. We used COCO 2017 keypoints dataset [2].

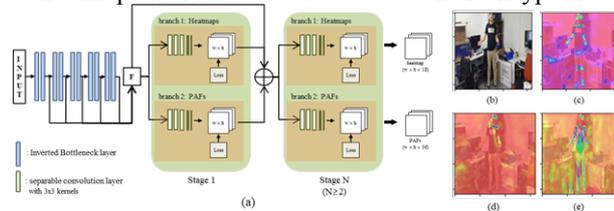


Figure 1. (a) Overall pipeline (b~e) experimental results

2 Methods

The proposed algorithm can be divided into two parts: (1) pattern extraction and (2) Multi-stage CNNs. Fig. 1(a) denotes the overall pipeline of the proposed algorithm. We repeat stages to estimate skeleton. Each Stage includes 2 branches, which one named “branch 1” calculates heatmap and the other named “branch 2” calculates part affinity fields(PAFs). The heatmap includes position of human keypoints and the PAFs include association between pair keypoints. And then, from N ($N \geq 2$) stages, the output of (N-1) th stage is used as the input of N th stage.

Pattern Extraction In the pattern extraction part, we used 10 inverted bottleneck layers. The inverted bottleneck layer is introduced at Mobilenet V2 [3]. 5 outputs of repeated inverted bottleneck layers is used as input of next part.

Multi-stage CNNs This part infers heatmap and PAFs using multiple repeated CNNs. One stage is composed of 2 branches. Branch 1 infers 18 dimension heatmap and branch 2 infers 36 dimension PAFs. Also, each branch calculates loss of heatmap and PAFs to refine result. The output of each branch is used as the input of next stage.

3 Conclusion

We used the video that original frame size is 2224x1080, and we resize the frame to 224x192 for inference skeleton information. Fig. 1(b) shows the input of frame, analyzed heatmap, analyzed PAFs maps. When we test the network with video, we obtain averaged 10.45 fps which is higher by 41.4 % than OpenPose [1], 4.33 fps.

Our proposed skeleton detection network shows an improved inference speed on the embedded environment. On the Edge-Computing environment, the proposed method would contribute to accelerate real-time analysis performance.

Acknowledge

This work was supported by the Technology Innovation Program (20006697, multi sensor based artificial intelligence technology passenger recognition and air clean console for autonomous design companion animal family centered) funded By the Ministry of Trade, Industry & Energy (MOTIE, Korea)

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2-GHz CMOS Weaver receiver with improved Image-reject receiver

Miyoung Lee¹

¹ Dept. Of Electrical and Electronics Engineering Hannam University, Korea
¹aphro95@daum.net

Abstract. This paper reports on a 2-GHz Weaver image-reject receiver with gain and phase mismatch cancellation circuits. Two negative feedback loops are utilized for cancelling the image signal due to I/Q phase and gain mismatch problems. They independently detect gain and phase mismatches and then cancel them out by adjusting the gain and phase of the second down-conversion stage without disturbing the RF mixers and the first LO. Implemented in a 0.18 μm CMOS technology, the receiver dissipates 39mA from a 1.8V supply voltage and achieves an image rejection ratio (IRR) of 58dB after the calibration mode.

1 Introduction

The image signal has been a troublemaker in all of the wireless communication systems. In the past, super-heterodyne receiver is employed but the need to use an off-chip passive BPF for image rejection adds cost and board space requirements. To overcome the limitations of super-heterodyne, recently the direct-conversion architecture has been proposed. The direct-conversion architecture [1] eliminates the image signal by setting the IF frequency at zero instead of using the bulky off-chip IF SAW filter. Although direct-conversion architecture is proud of high integration, this system has a trouble in two main issues : DC offset and flicker noise [2]. Low-IF architecture also provides much higher immunity in above problems, but higher-level of matching between signal paths is required for sufficient image rejection [3].

2 Improved Weaver Receiver

Proposed receiver concept is as shown in Fig 1.(a) and (b). As shown in Fig.1. (a), providing an image tone is applied at the RF input, as the shown below equations (1)-(2) at point c and d, phasor or exponential functional form of these equations can be written as :

$$A\cos(\omega_{IF}t) = A_1A_2e^{j0^\circ} = A_1A_2\angle 0^\circ \quad (1)$$

$$(A - \Delta A)\cos(\omega_{IF}t + \theta) = (A_1A_2 - \Delta A)e^{j\theta^\circ} = (A_1A_2 - \Delta A)\angle \theta^\circ \quad (2)$$

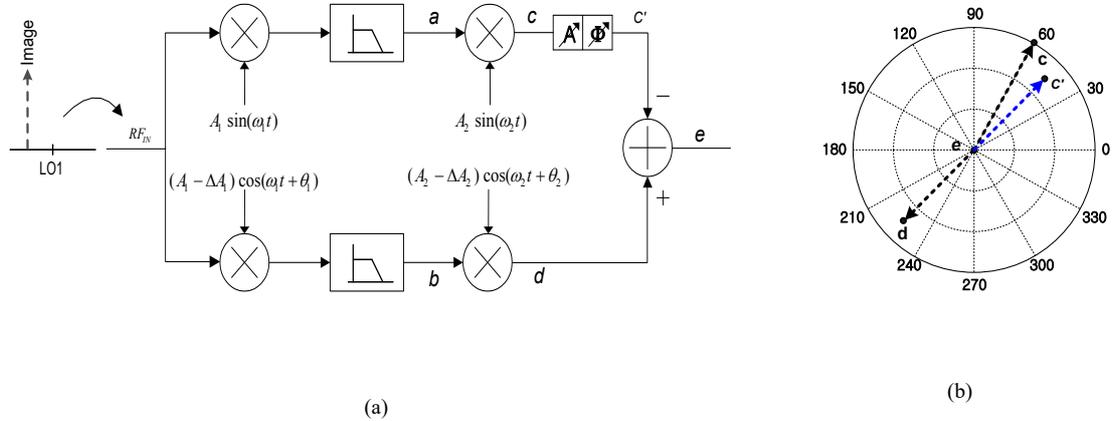


Fig. 1. (a) Modeling and generating system in Weaver receiver, (b) Image signal in vector polar-form

3 Conclusion

This paper reports on a 2-GHz Weaver image-reject receiver with gain and phase mismatch cancellation circuits. Two negative feedback loops are utilized for cancelling the image signal due to I/Q phase and gain mismatch problems. They independently detect gain and phase mismatches and then cancel them out by adjusting the gain and phase of the second down-conversion stage without disturbing the RF mixers and the first LO. Implemented in a 0.18 μm CMOS technology, the receiver dissipates 39mA from a 1.8V supply voltage and achieves an image rejection ratio (IRR) of 58dB after the calibration mode.

Acknowledge

This paper has been supported by 2020 Hannam University Research Fund.

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A Study for Time Coin for Celebrity Meeting Join based Blockchain

Byeongtae Ahn
Liberal & Arts College, Anyang University, Korea
ahnbt@anyang.ac.kr

Abstract Online below, the Seller and it is important that trust among buyers. However, existing trading platforms lack the means to prevent fraud or to trust the seller. In particular, trust in meeting people is more important than trust in commodity trading. In this paper, the blockchain is used to evaluate the requestor's reliability for meeting requests based on personal information and arrange meetings when trust is guaranteed. This system is a platform system that trades coincidence time for coins and purchases the time required to meet the public. The system uses Django to configure the REST Server, supports Android and iOS apps, and uses the reactor to construct the front-end.

1. Introduction

With the development of the Internet, the way in which consumers buy products is becoming more diversified, and the number of shoppers who use online used trading sites to purchase products at lower prices is steadily increasing [1]. However, online transactions have a problem that it is difficult to guarantee the reliability of the transaction because the buyer can not directly check the goods. In particular, the online dating service, which places great emphasis on trust between people, is mainly composed of services such as random chat or meeting [2]. However, these encounter services do not guarantee reliability and transparency. In addition, it will be impossible to arrange meetings with officials. In this paper, in order to arrange meetings with public figures, we develop a blockchain-based time coin that guarantees reliability and transparency [3]. Section 2 introduces the overall schematic of the system, and Section 3 proposes conclusions and future tasks.

2. System diagram

This system is divided into developer side and user side. This system used TDD (Test-Driven Development) method to test and used Django and postgresql to make REST API. React, Android, and iOS were used to provide web app service.

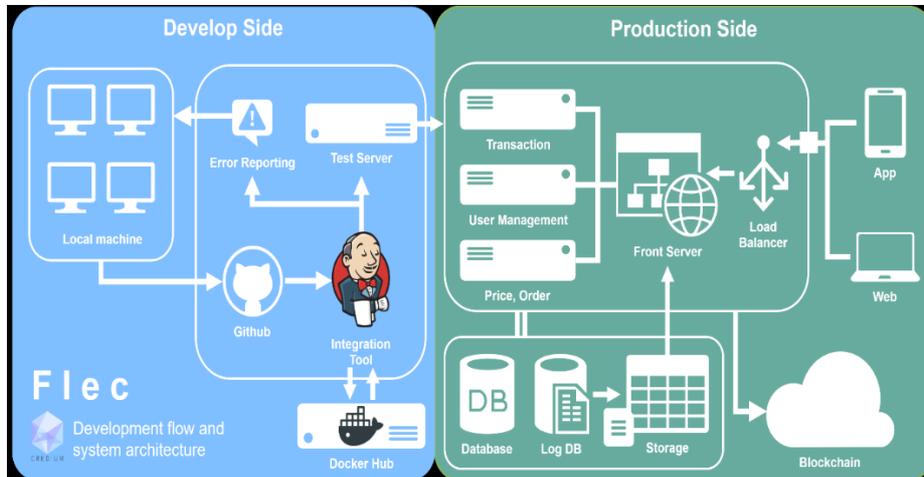


Figure 1. System Structure Diagram

Figure 1 shows the system configuration of user side and developer side. This system is to develop a blockchain-based minute coin to build an authorized arranged meeting platform that guarantees reliability and transparency.

3. conclusion

In this paper, we developed a blockchain-based time coin that guarantees reliability and transparency. This system is the first time trading coin through ICO, it is possible to meet with the public through the service. And you can socially recognize the objective value of your time.

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A Study on Importance Factors for Developing Logistics Center of Biopharmaceuticals

Choi, Hyuk-Jun¹ and Jung, Hyun-Jae²

^{1,2} Pyeongtaek University, 111 Yonggi-Dong, Pyeongtaek City, Gyeonggi Province, Korea
¹profchoi@ptu.ac.kr, ²hjjang@ptu.ac.kr

Introduction

As the ongoing demographic shift towards geriatric population and increasing prevalence of chronic diseases, the biopharmaceutical market is growing considerably since biopharmaceutical contribute to prevent and treat various diseases. In particular, the biopharmaceutical products including antibody-based anti-cancer therapeutics are the major revenue stream of pharmaceutical companies (Jungbauer and Göbel, 2012). Increasingly interested in the health of customers, technological advancements in biopharmaceuticals, and increasing R & D investments are considered as the factors that affect increasing the size of the biopharmaceutical market. In particular, the biopharmaceutical market is growing at a faster rate than the conventional and general pharmaceutical market (Bishara, 2006, 2008). According to a report titled "World Market Study on Biopharmaceuticals," the global biopharmaceutical market size is estimated to reach \$ 162 billion in 2014. The value of the global biopharmaceutical market is expected to grow at a CAGR of 9.4% between 2014 and 2020, reaching \$ 278 billion. Moreover, Asia's biopharmaceutical market is projected to be the highest, due to the increase of interest in their health as well as increasing the purchasing power of Asian consumers.

The biopharmaceutical market of Korea has steady growth from 2007 to 2016. As interest in the biopharmaceutical industry and business increases in Korea, the size of the biopharmaceutical market has also increased not only the total amount of production but also the import and export amount as shown in Figure 1. In recent, the amount of exports of the biopharmaceutical products have exceeded the amount of imports since 2015. This study focus on the necessary factors for establishing a biopharmaceutical distribution center in consideration of not only location factors but also cost and facility factors by using Fuzzy-AHP analysis, suggesting ways to activate biopharmaceuticals distribution center. Moreover, this study considers important factors in establishing a biopharmaceutical distribution center to activate biopharmaceutical logistics in terms of manpower, insurance, regulation and certification system, and infrastructure of the biopharmaceutical industry.

Research Methodology and Result

To analyze the factors of biomedicine logistics center establishment, literature research was conducted on relevant works. As a result, 11 primary factors were selected and then were examined by an expert group of employees in bio logistics business. This study focused on the factors of logistics center establishment in consideration of the features of biomedicine logistics.

Conclusion

This study drew the main factors for the establishment of biomedicine logistics center and analyzed the relative importance priority of each factor. As a result, facility factor was found to be most important, followed by position factor and cost factor in order. Regarding sub factors (variables), the sub factor of temperature control devices was found to be most important. This result was different from the result of a previous study on the main factors for the establishment of general logistics center. Given the result, it is necessary to take into account special factors like proper temperature management of biomedicine in order to efficiently establish a biomedicine logistics center. Logistics promotion through the establishment of biomedicine logistics center was found in four ways.

The first one is LNG cold energy based energy saving. In this way, -162oC LNG cold energy generated in the process of evaporating solid LNG is transferred to be used in a logistics center. If a logistics center is established in such a way, it is possible to save 53-69% of electric charges and 70% of maintenance cost, compared to conventional mechanical cold storage, and reduce 9% of investment through simple equipment.

The second one is related to convenience of transportation. Given that the industrial structure focuses on exports, it is necessary to take into account convenient transportation and industrial intensity. Therefore, if such a hinterland as biocluster scheduled to be established in New Port of Incheon is utilized to establish a logistics center, more operation efficiency is expected to be achieved.

Thirdly, if temperature control regulations, which are currently recommendations, are established, and biomedicine regulations are as rigid as in the international level to deal with the situation where global regulations are tightened for more safety, it is possible to meet the needs of foreign biomedicine demanders.

Lastly, it is necessary to introduce a customized warehouse management system given the importance of inventory management of biomedicines. With the system, it is necessary to manage and provide biomedicines with dedicated type and high-added value in line with customers' requirements. In addition, a thorough security system should be introduced to prevent any leakage of psychotropic medicines which can raise a social issue.

Amount of Network Traffic Prediction Protocol with IoT Environment

Kim Ga-young¹, Kang Jin-Gu², Jung Jin-Seop³, Doo Ill-Chul⁴*

^{1,2} Dept. Of Computer Science and Engineering, Dongguk University, Korea

³ Dept. Of Information & Communication Engineering, Dongguk University, Korea

* Correspondence: Dept. Of Convergence Education Dongguk University, Korea

¹dolga2000@dgu.ac.kr, ²kanggu12@dongguk.edu,

³jjscan@naver.com, *mrdoo@dongguk.edu

Abstract. Advanced Metering Infrastructures (AMI) is a measurement system that analyzes and collects schedules or requests for communication of meter devices, utility distribution and energy consumption. In this paper, we propose a smart protocol for AMI that can more accurately predict traffic volume in IoT(Internet of Things) environment and reduce unnecessary energy waste. By predicting network traffic complexity based on data collection, we proved that the proposed protocol can effectively use energy by reducing collisions and delays of numerous data.

1 Introduction

In cities using the IoT[1], it is essential to integrate all data through intelligent measurement devices, which can measure the overall service volume of electricity, water and gas to better manage the supply network and balance efficiency between consumption and demand. We aim at having. A key technology element is a smart meter that can be a thing inside the IoT. Smart metering systems allow water, electricity and gas utilities to continue to consume time, or at least daily, reporting, monitoring and billing and recording.

Smart meters [2] enable two-way real-time communication between the flow meter and the utility central system. This allows each device to collect data transfer intervals, base demand data, power outage management, service outages, service restoration, service monitoring quality monitoring, distribution network analysis, distribution planning, peak demand, demand reduction, customer billing and task management. Can be. Through this, it is possible to manage demand response, so that customers can make informed decision-making and consumption forecasts, which will increase the efficiency of smart cities. However, there is no effective protocol for throughput, energy, and latency for data processing that can support this metering. This paper presents the standard for the standard protocol for AMI in IoT environment.

This paper presents the standard for the standard protocol for AMI in IoT environment.

2 Traffic Prediction Protocol

Our paper proposes a protocol that predicts network traffic in the environment for such AMI and converts it into the appropriate duty cycle [3]. Figure 1 shows the proposed algorithm. When the module (1) determines that the amount of traffic is greater than the average amount during a certain period, the module (2) is operated to reduce the sleep period. At this time, whether or not the module (1) judges whether the collision is high and the collision is high, the sleep period is reduced by about 10%, thereby reducing the total period to increase the number of wakeups for a predetermined time. Module (3) behaves like a normal asynchronous protocol if the traffic volume is thought to be equal on average over a period of time, and if the amount of traffic drops because it is thought that the traffic volume has decreased over a period of time, as in module (4), then the sleep period is roughly reduced.

Increase it by 10% to lengthen the entire cycle. Module (2) increases the overall traffic volume of the network, increasing the number of wakeups in one cycle, increasing the probability of successful data transfer, increasing throughput, and reducing latency. Module (4) can reduce unnecessary energy by reducing the amount of traffic in one cycle by reducing the amount of traffic in the opposite situation

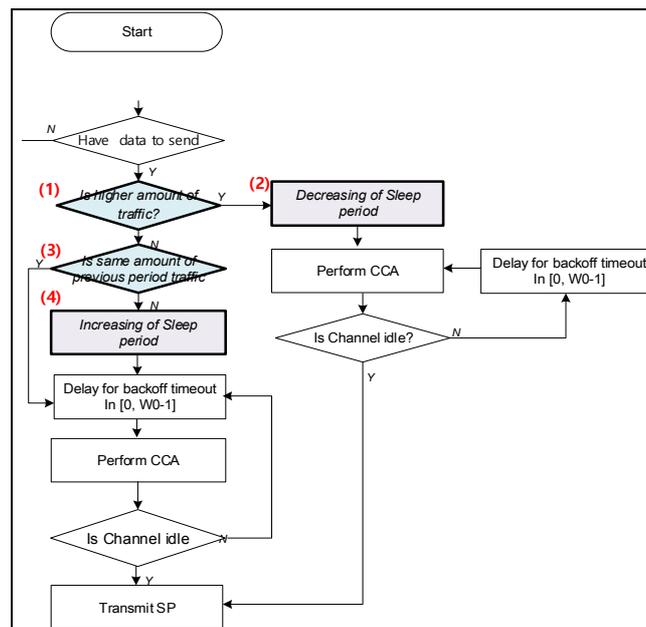


Figure 4. Flowchart of proposed algorithm

3 Conclusion

We proposed an adaptive protocol for AMI that can improve the transmission efficiency and reduce unnecessary energy by predicting and applying future traffic

through observation of data traffic for many devices in IoT environment for a certain period of time.

Acknowledge

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Analyzing user playstyle and approximating skill level in League of Legends through Video processing and statistical methods

Shinyoung Kim¹, Dohyeon Kim², HyungGeun Ahn³, Byeongtae Ahn⁴,
¹Boin High School, ²PlayAuto Inc., ³Sungkyunkwan University, ⁴Liberal & Arts
College, Anyang University, Korea
¹ttllshin@gmail.com, ²nonamep@setsuna.kr, ³ahg2230@gmail.com,
⁴ahnbt@anyang.ac.kr

Abstract. Massively Multiplayer Online (MMO) game players sought out a reliable way to diagnose their performance and find ways to improve. Manual replay analysis by players through visual media, such as video, are the most common way to do so. This paper attempts to imitate the analytical process done by players through extraction of data from game play video and deriving an intuitive game play “style” from the popular MMO game League of Legends.

1 Introduction

With the rise of Multiplayer Online Battle Arena (MOBA) genre games, League of Legends has risen to become the most played MOBA game to date. We aim to create an accurate metric representing individual player skill, taking into account various factors which could not be represented with single-dimensional stats, like kill-death ratios, damage dealt, etc. We also extended such metrics to represent aggressiveness and cooperation, giving a high level overview of how the player is likely to play. Another aspect we focused on is using the created metrics to aid player skill improvement, by finding specific points within the game which could be improved, yielding better player performance. By sampling a large amount of games played by high ranked players, we were able to compare decisions made for a significant event as to how a lower ranked player performed in a similar situation, thus being able to recommend the “optimal” choice in a given scenario.

2 System Architecture and Processing Methods

Riot Games, the developer of League of Legends, provides two methods for data collection; a REST based API for static data after a game has been finished, and a replay API which allows for automated playback and control of game video. Existing statistical analysis websites like “OP.GG”, relied only on the REST API, which returned straightforward stats including, but not limited to: KDA, total damage dealt,

creep score, etc. These values are useful for assessing the overall state of the game, but fails to reflect smaller events in a time series.

We were able to supplement the data with additional stats that were extracted by analyzing game video through computer vision techniques such as YOLOv3. The resulting data, including temporal individual character position, reduced the entire game into sequential events making detailed analysis possible. Upon carrying out Principal Component Analysis, followed by K-Nearest-Neighbors clustering on the aggregated data, we were able to find common traits that either aggressive or cooperative players have, and vice versa. With the clustering data from 400,000 individual games, a user's playstyle in a game could be accurately measured in the following metrics: aggressiveness and cooperativeness.

3 Conclusion

This paper aimed to classify a player's gameplay style into intuitive categories, allowing better diagnosis of performance. By analyzing video game footage, we were able to supplement the limitations of existing statistic services and present representative metrics for accurately assessing game state information. However, due to current limitations of extracting data, the scalability of the method is deemed low. Future research is to be focused on efficient image processing methods for rapid and large scale game video analysis. Such metrics, including but not limited to stats presented in this paper, may enable further research on professional e-sports analytics, ranging from applied statistics to Machine Learning for predicting game outcome.

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Cross-domain Transformation for Cross-Spectral Face Recognition

Beom-Seok Oh¹ and Sunjin Yu²

¹ School of Digital Media Engineering, Tongmyong University, South Korea

² Dept. Of Culture Techno, Changwon National University, South Korea

¹bsoh@tu.ac.kr, ²sjyu@changwon.ac.kr

Abstract. In this paper, we propose a simple and yet effective common space learning method namely, T projection for cross-spectral face recognition. The core idea of the proposed projection is to learn a common space between two different sensing spectrums such as the visual (VIS) spectrum and the thermal infrared (TIR) spectrum in terms of correlation of pixels. Given a test VIS (or TIR) sample image, a corresponding TIR (or VIS) image is then obtained by reversing the T projection.

1 Introduction

Heterogeneous usage and management of resources is considered among the key components in current and next generation multi-media applications. In forensics and visual surveillance, it is common to find the gallery databases being populated with photographs while the probe images often been limited to certain alternate modality. A familiar example is to identify the suspect based on the infrared surveillance video which was captured under adverse illumination condition where the main challenge is to compare between the usually poor quality probe image under infrared spectrum with those relatively good quality visual gallery images (RGB) from the database. However, the current state of research [1,2,3] for such cross-spectral scenario has yet to reach a satisfactory performance level for real-time applications. Moreover, consideration into development of efficient and yet effective methods for heterogeneous feature extraction for secure applications have not been studied systematically[1,2,3]. Hence, in this paper, we propose a systematic framework for extraction of cross-spectral information based on image processing and image patch learning as stated in the following section.

2 T projection for cross-spectral matching

Our proposed resolution for common space learning is to map the image correlation between the two different sensing spectrums. The overall flow of the proposed method is shown in Fig. 1 where VIS (visual) and TIR (thermal infrared) images are used in the illustration. It is assumed here that both VIS and TIR images have either no or minor pose variation and rather well aligned.

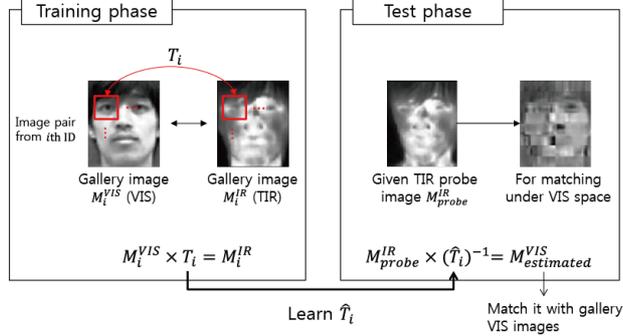


Figure 1. An illustration of the proposed T projection

In the training phase, as illustrated in Fig. 1, we have an image pair consisting of a VIS image (denoted as M_i^{VIS}) and a TIR image (denoted as M_i^{TIR}) per identity. We attempt to learn the relationship between these two image modalities by means of a mapping function T_i defined as follows:

$$M_i^{VIS} \times T_i = M_i^{TIR},$$

where $i = 1, 2, \dots, n$ denotes the number of identities. Here, our objective is to learn a mapping transformation function T_i which relates the two spaces of the two modalities. We propose to learn the function directly using the given image information as follows:

$$\hat{T}_i = (M_i^{VIS})^{-1} \times M_i^{TIR}.$$

Given a new probe image taken under TIR spectrum (denoted as M_{probe}^{TIR} in Fig. 1), the learned transformation function \hat{T}_i is then used to estimate the corresponding VIS image as follows:

$$M_{probe}^{TIR} \times (\hat{T}_i)^{-1} = M_{estimated}^{VIS}.$$

The resulted estimation $M_{estimated}^{VIS}$ is then directly used for matching with images in the VIS gallery under the VIS space.

Fig. 2 shows an estimated VIS image obtained using a given TIR probe image. This figure shows the feasibility of the transformation mapping based on a single training VIS-TIR image pair. To enhance the robustness of performance, we shall investigate into the use of multiple VIS-TIR image pairs in training.

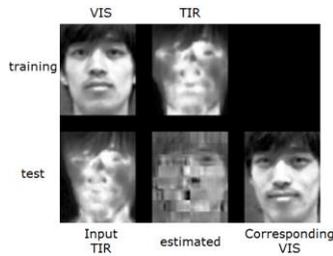


Figure 2. Top row: Training VIS-TIR image pair, Bottom row: test TIR probe, an estimation under VIS space, ground truth of the corresponding VIS image.

3 Experiments

Fig. 3 shows the estimated VIS images obtained by projecting 20 different users' probe TIR images onto two (e.g., the first and the second) subjects' bases functions. The upper panel of Fig. 3 shows the estimated images obtained by projecting 20 TIR images onto the transformation basis function T_1 of the first identity. We observe here that among the 20 estimations, the first user's estimation (denoted by a red box) shows the highest resemblance to the basis identity. Similar result is also observed from the bottom panel of the figure where all the 20 TIR probe images are projected onto the transformation basis function T_2 of the second identity. The estimated VIS images are then used for matching under the VIS space.

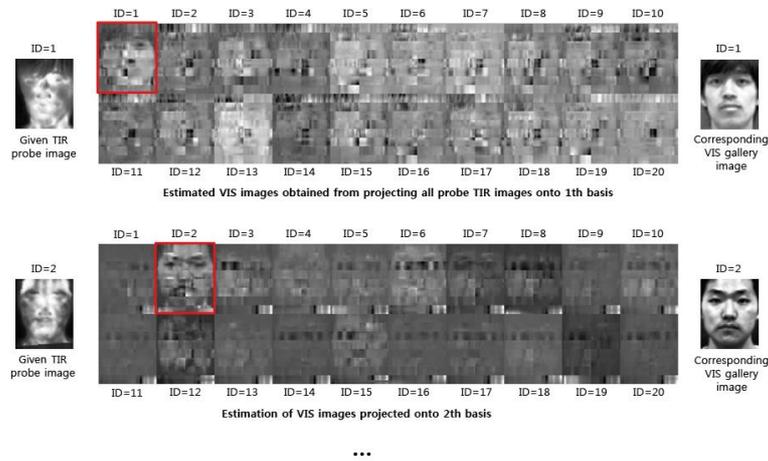


Figure 3. Mapping of 1 same identity and 19 different identities

To obtain the numerical performance of the proposed method, a preliminary study is performed using a subset of the BERC database [4]. The subset consists of 288 images (96 identities, each with one VIS and two TIR images adopted in the preliminary experiment). The 96 VIS-TIR image pairs (192 images) are used for training and the remaining 96 TIR images are used for testing. Under this scenario, the proposed approach shows 88.54% rank-1 accuracy which appears promising.

4 Conclusion

In this paper, we have proposed T projection to learn the common space between the VIS spectrum and the TIR spectrum for cross-spectral face recognition. Particularly, the projection basis function per subject was learned using VIS-TIR image pairs. The obtained projection bases were then utilized to reconstruct the corresponding VIS (if the test input was TIR) or TIR (if the test input was VIS) image for identification.

Acknowledge

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Design and Analysis of 2 GHz Low Noise Amplifier Layout in 0.13 μ m RF CMOS with Cadence Spectre RF and HFSS

Miyoung Lee¹

^{1,2} Dept. Of Electrical and Electronics Engineering Hannam University, Korea
¹aphro95@daum.net

Abstract. This paper presents analysis of passive metal interconnection of the LNA block in CMOS integrated circuit. The performance of circuit is affected by the geometry of RF signal path. To investigate the effect of interconnection lines, a cascode LNA is designed, and circuit simulations with full-wave electromagnetic (EM) simulations are executed for different positions of a component. As the results, the position of an external capacitor (Cex) changes the parasitic capacitance of electric coupling; the placement of component affects the circuit performance. This analysis of interconnection line is helpful to analyze the amount of electromagnetic coupling between the lines, and useful to choose the signal path in the layout design. This work has been simulated and verified by Cadence spectre RF tool and Ansoft HFSS. And also, this work has been implemented in a 0.13 μ m RF CMOS technology process.

1 Introduction

The CMOS process is a good choice for current wireless communication systems due to advantages such as low cost and easy merging with digital block, so that CMOS process is widely used from digital circuit to millimeter wave circuits. Contrary to the millimeter wave circuit design as [1], [2], the relatively low RF circuit layout design operating in 1 to 5 GHz range is carried out without electromagnetic coupling consideration. However, the measurement result of fabricated CMOS circuit shows that the operating frequency goes down from the designed operating frequency. Even in the relatively low RF circuit, therefore, the electromagnetic coupling may be an issue that can affect the circuit performance. The size of RF circuit is much smaller than its wavelength, so that the transmission line effects need not to be considered [3].

2 Related study

The LNA is designed for multi-band (WCDMA: 2.11~ 2.17 GHz, CDMA200 1x : 1.84~1.87 GHz, WiBro : 2.3~2.4GHz) mobile application. A well-known cascode LNA structure is adopted, and it is shown in Fig. 1. M1 is a transconductance transistor which amplifies input signal, and M2 is a cascode transistor that suppresses Miller effect and improves reverse isolation. L_s is a source degeneration inductor, L_g

is a gate inductor, and L_D is bias inductor and contributes to the output matching with C_L . C_{ex} is an external capacitor that supplement C_{gs} to complete simultaneous noise and input matching.

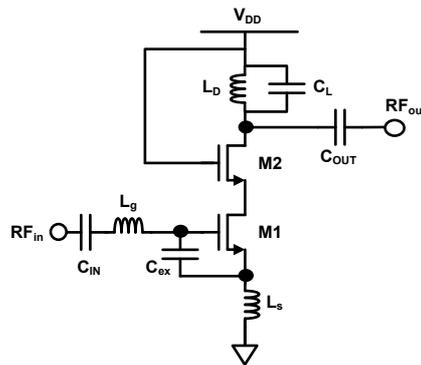


Fig. 1. Designed cascode LNA structure.

4 Conclusion

In this study, the full-wave EM simulation result is included in RF CMOS circuit layout design. The simulation results which take into account full-wave EM simulation results show that the operating frequency of the circuit is shifted to the lower frequency by nearly 10%, and the gain is reduced about 2 dB compared with the result of the circuit simulation without electromagnetic considerations..

Acknowledge

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Development of Comparison Service Supporting for Used Transaction using Data Mining

Park ByungJoon¹, Kim HaSung², Lee DongRyul³, Byeongtae Ahn⁴

¹Computer Science and Engineering, Sejong University, Korea, ²IT College, Suwon University, Korea, ³Computer Science, Yonsei University, Korea, ⁴Liberal & Arts College, Anyang University, Korea

¹byungjoon412@sju.ac.kr, ²13053019@suwon.ac.kr, ³leedr@yonsei.ac.kr, ⁴ahnbt@anyang.ac.kr

Abstract. With the recent increase in used trading sites that support used trading, users want to find various information in real time. However, each used trading site has its own characteristics, making it difficult to standardize one. Therefore, in this paper, we developed a system that provides the user's requirements in real time and provides the desired information quickly. This system receives the data of used trading site in real time through web crawling and enables the user's request through data analysis.

1 Introduction

The explosive growth in services supporting second-hand trade has exceeded \$ 2.5 billion last year. As a result, a variety of used trading sites, including used countries, have generated various demands from customers [1]. In particular, it takes a lot of time to find a product that the customer wants and a lot of time to find the desired item. In this paper, we develop a pre transactions comparison service to find the client's needs in real time [2]. The system is real-time Web crawling using collect data, means that the data to extract information for mining were used [3]. In Chapter 2, the overall structure of the system is introduced, and in Chapter 3, the conclusions and tasks are proposed.

2 Used Deal Comparison Service

The biggest problem of the existing trading sites are used only increase the chance that a sale transaction As many as possible sites users can access , there is a problem that is much dispersed users also need to pass through several sites [4] . In particular, sellers post on multiple sites to sell quickly, and buyers have to search several sites to find the products they want. And currently used trading sites do not divide the categories of items as clearly as the open market, so when you search for items, you have to write a clear product name. Since you can't choose the performance details other than the product name, you'll have a lot of trouble searching this part.

Therefore, this system collects new posts on each site and divides categories based on valid data only in the title and body of each post. After that, it extracts information about detailed performance which is useful when searching each product from data so that it can be searched in web service. And this system is to provide real time information using web crawling. A crawl is a collection of information on the web. It's an HTML file for your site. Currently we have 3 per minute from sale of trading sites a recent article that crawl and run the program. Crawl when the interval becomes wider, so that the amount of the data program to get be more 1 executes the program each time.

Finally, this system analyzed data to extract meaningful information. The data analysis technique is a process of classifying only the posts needed by the crawled data and extracting detailed information therein. First of all, I did not divide the categories for all posts. Initially, we tried to use the stemmer, but some stemmers were not efficient because of the long loading time, and even though the performance was good, the writing form of the article for sale article was difficult to classify because the writing form was different from the general sentence. Therefore, in this study, string matching is used in the process of extracting the detailed options of the product, and in the case of numerical data, there is a range suitable for each, and thus, a method suitable for each category is selected by extracting the corresponding numerical data.

4 Conclusion

In this paper, we developed a system that collects information from several used sites and provides only the information that customers want at once. The system clarifies the product category and extracts the product's performance and price so that customers can easily find the product they want. However, the system is currently providing 20 units, 30 it is supported only on popular topics for the subject will be added to the number of items that can be used in the future various levels.

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Effect of customer value propositions on repurchase intention in the sharing economy

Woo-Sung Cho¹, Seung-Gyun Yoo²

^{1,2} Dept. Of Global Economics and Commerce, Dongguk University, South Korea

¹ threethree@naver.com, ²bluetrade@dongguk.ac.kr

Abstract. Purpose – the purpose of this paper is to figure out the repurchase intentions of customers in the sharing economy through Airbnb and Uber which are the sharing economy classic. Design/methodology/approach – This paper was analyzed sharing economy effect using various variables by Structural Equation Model. Findings – It is verified that values have a significant effect on trust in platform. And it's verified that effects value propositions have on repurchase intention have significant values.

1. Introduction

The industry of the sharing economy like Airbnb and Uber is now growing explosively all around the world. According to Business App, they are now under way in more than 600 cities of 65 different countries and 14 million people use this service everyday. In total, 10 billion Uber taxis have been around until now. There are about 14 million Uber drivers and women take 27% of all drivers. Enterprise value of Uber was 72 billion dollars in 2019 and that of Didi Chuxing in China, the rival company, was 56 billion dollars in 2018, according to a study. The sharing economy is changing many structures of the industry. First of all, customers are getting the same as vendors. In the past, the company provided service and goods, and it meant that customers were separate from vendors. On the other hand, individuals are vendors and customers all at once in any accepted sense of the current sharing economy. The company provides platform for smooth trading between vendors and customers.

2. Literature Review

The concept of sharing economy was first introduced by Professor Lawrence Lessig (2008) of Harvard University. Gansky(2010) reinforces commercials more than Lessig's sharing economy. Kim, Yoon & Zo(2015), this paper uses exchange theory to show why people use sharing instead of owning. Belk(2014), This paper consists of scholarly researchers.

Sheth, Newman, & Gross(1991) considered customer value that affects customer choice behavior and divided it into 5 values. Ozanne & Ballantine (2010), This paper shows that the consumer's behavior is affected by social value; friendship, sense of belonging, sense of duty, etc. Holbrook & Hirschman (1982), The results show that emotional value is very important variables that affected to the consumer's behavior.

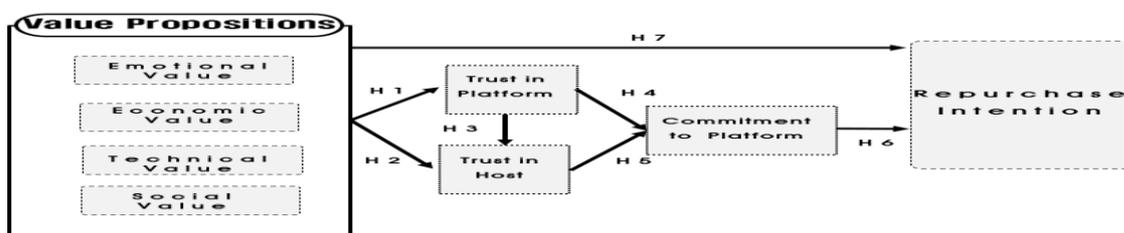
Johnson and Grayson(2005), there are two different types of trust. Yang, S. B., Lee, K. M., Lee, H. N., and Koo, C. M., (2018) used Airbnb to explain these two types of trust. In other words, trust in platform is cognitive based trust. Kim, Park, & JO (2015), The results show that trust is deeply affected by perceived value, and the network externality gives effects to the trust as well.

Yoon (2018) is the study on accommodation shared services. This study analyzes that economic, reciprocal, empirical values have a positive influence on repurchase intention and danger has a negative influence on it.

3. Research Model and Discriminant validity

The study established a research model which is shown in Figure 1.

Figure 1: Research Model



4. Conclusion

It is about what causes affect repurchase intention of customers. The results and implications are listed below. First, it is verified that values have a significant effect on trust in platform. Second, in the effects that trust in platform and trust in host have on commitment of platform, trust in host has a significant influence on it while trust in platform doesn't. Third, in the effects that trust in platform have on trust in host, trust in platform has a significant effect to the trust in host. Finally, it's verified that effects value propositions have on repurchase intention have significant values.

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Implementation for used car trading platform based BlockChain

Byeongtae Ahn
Liberal & Arts College, Anyang University, Korea
ahnbt@anyang.ac.kr

Abstract Recently, the used car market continues to grow in size. In this used car deal market, various used car deal damage is occurring due to the asymmetry of information between seller and buyer. Therefore, in this paper, we implemented a used car trading platform that uses blockchain based smart contract to ensure reliability without intervention by third parties. This system mitigates the asymmetry of the information between the buyer and the seller through the characteristics of the block chain that guarantees the integrity and transparency of the data, and reduces and prevents the brokerage fee of the distribution process in which the third party does not intervene. The core of this paper is based on the theory of block chain technology, which has recently become an issue, and developed a service by directly applying blockchain based smart contract.

1 Introduction

As the demand for used cars increases due to unstable prices, economic recession, and the burden of purchasing new cars, the used car market continues to grow in size [1]. With the expansion of the used car deal market, damage to used car dealers has also been expanded. Among the damage types, the highest percentage was the case where the performance, condition check, and actual vehicle condition showed false sales[2]. In addition, there are fraud forms in which a dealer tricks a customer into fraudulent transactions related to brokerage due to the nature of a used car deal contract, in which a third party intervenes and ensures reliability. In order to solve these problems, the country provides a guide to buy used car and a service to search car history of Car-History.

2 Used car contract platform with smart contract

Used car contract platform with smart contractIn this paper, we use Ethernet based smart contracts to provide transparent vehicle data and to ensure contract reliability without third party guarantees. A typical characteristic of a block chain is integrity and transparency. Each block header contains hashed encryption of the information of the previous block. Therefore, transactions recorded in a linked block chain can not be counterfeited or altered unless all previous transaction details are modified [3]. The use of smart contracts also allows dealers, who are brokers, to skip the purchase process

and implement reliable contracts at low cost. Therefore, the buyer can receive reliable and integrated information about the vehicle and can purchase the vehicle at a reasonable price owing to the fact that the dealer intervention in the sales process is omitted. Merchants can also simplify the vehicle registration process by integrating vehicle data as well as reducing commissions.

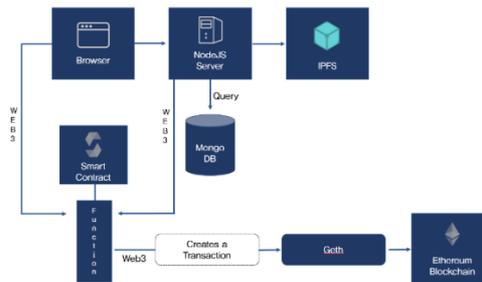


Figure. 1 System Architecture

Figure 1 shows the structure of the web-based commercial vehicle trading platform. Each function of the system is as follows. - IPFS: stores the hash value of the data for practical decentralization of block chain data storage. - Solidity Contract: Create and distribute Ethereum's smart contract using Solidity language.

3 Conclusion

In this paper, we have implemented a used car trading platform using block chain ethereum - based smart contract to solve the problems of the existing used car dealers market. This system assumes that reliable data is input. That is, after data input, integrity is ensured, but validation before input is accompanied. In spite of these limitations, this study suggests a way to solve the problems of the existing used car market by using the block chain technology, which is a recent issue. Based on this research, it is necessary to study a new management method that transparently manages the overall data of the automobile as well as the data of the used car.

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Korean Leisure Sports Culture Prospect in the Fourth Industrial Revolution

Shin, kyulee
Dept. of Sports Sciences,
Seoul National University of Science & Technology, Korea
kyuleeshin@seoultech.ac.kr

Abstract. The purpose of this study is to predict the effect of the application of the core technologies of the 4th Industrial Revolution to the sports consumption behavior and sports culture phenomenon of Koreans. The leisure sports culture of the future should be developed in such a way that everyone can participate and spread sustainable sports through the ease of scientific approach without losing the original value of sports.

1 Introduction

The advent of the 4th Industrial Revolution has caused various changes not only in the IT sector but also in various areas of human life such as education, medicine, sports, and welfare. In the sports field, the core technologies of the 4th Industrial Revolution have been actively applied in both direct and indirect sports consumption areas, and a new system is being built to enable sports consumers to self-quantify. This convergence of the key technologies of the 4th Industrial Revolution and the sports and healthcare sector will provide a variety of approaches to the direct participation of sports in the future, thereby expanding the population of sports enthusiasts in the sports field.

2 Prospect of Korean Leisure Sports Culture in the Fourth Industrial Revolution

The changes in sports participation culture that resulted from the convergence of new technologies represented by the 4th Industrial Revolution will be divided into direct and indirect participation. First, the change in direct leisure sports participation can be confirmed through major measures of <Sports Vision 2030>, which is currently being implemented at the Korean government level. For example, simulation tools using VR technology are no longer special tools for training professional athletes. Like this, the role of the training tool of the technical analysis for the elite athletes in the past as well as the role of multiplying the participation and fun of the general leisure sports participants is strengthened. Second, this pattern is the same in the area of indirect leisure sports participation. For example, if we watch sports at home, we can enjoy

exciting visual experiences and professional sports that transcends the beauty of traditional

sports through time and space through video cameras, VR and AR, the core technologies of the 4th Industrial Revolution. The future society is expected to establish a new system that can actively utilize sports and health promotion behavior by utilizing the core technologies of the 4th Industrial Revolution.

3 Conclusion

Changes in the Korean sports ecosystem will be inevitable due to the application of new technologies in the 4th Industrial Revolution. However, the leisure sports culture of the future should be developed in such a way that everyone can participate and spread sustainable sports through the ease of scientific approach without losing the original value of sports.

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Multi-User Diversity with Combined Channel Hopping in IoT Environment

Kim Ga-young¹, Jeong Junho^{2,*}

¹ Dept. Of Computer Science and Engineering, Dongguk University, Korea,

* Correspondence: Dept. of Computer Science & Engineering,

Kongju National University, Korea

¹dolga2000@dgu.ac.kr, *yayenli@kongju.ac.kr

Abstract. In this paper, the CSMA / CA (Carrier Sense Multiple Access / Collision Avoidance) [1] channel hopping [2] is proposed to solve the deep fading problem as the way to obtain multi-user diversity in the case that there are multiple channels and It improve channel QoS (Quality of Service). If when each user transmits a data to the base station, the IoT (Internet of Things) channels experience independent fading, then some users show a good uplink channel state in the particular channel, whereas other users may not be able to that. In this case, through the method to primarily service users who show good channel conditions, the performance degradation due to the occurrence of deep fading can be prevented. In this paper, we propose the CSMA/CA channel hopping applying the method transfer the data by setting differently IFS (Inter Frame Space) depending on the priority of the channels in IoT environment [3-4]. We show that using a proposed CSMA/CA channel hopping method that data rate improve channel performance in massive IoT and the QoS of channels

1 Introduction

In this paper, the channel hopping is proposed to prevent the performance degradation due to the occurrence of deep fading. The technique transmitting data by the method of Adaptive IFS hopping which has no data retransmission through the improvement of existing hopping method, therefore, saves time and energy, and helps avoid collision between data, is proposed.

2 Related Researches

For the communication of multiple devices the management way to avoid conflicts between data is needed. In random access or line competition any device does not take precedence over other devices and cannot control them. Every moment the device with data to transmit follows the procedures specified in the protocol to determine whether or not to transfer, and the determination is dependent on the state of the medium (idle/busy).

Typical methods of random access protocol are CSMA (Carrier Sense Multiple Access), CSMA/CD (Carrier Sense Multiple Access/Collision Detect), and CSMA /

CA(Carrier Sense Multiple Access/Collision Avoidance).

In order to construct IoT, the essential condition of Massive IoT which is a technology to effectively connect many devices distributed at a high density, devices require communication in a machine type (MTC : Machine Type Communication). These MTC devices have little mobility compared to HTC, and have very short data transmission periodically or intermittently [3-4]. MTC devices can be located in places where it is difficult for human to measure them and can be in an environment where signals are difficult to reach. Due to low cost transmission requirements and low transmission power and use of narrow-band frequency band, Can be lowered. To prevent this, a channel hopping method is used in which the frequency is changed in a predetermined order every predetermined time.

3 Combined Channel hopping

Figure 1 illustrates the operating principle of CSMA/CA Channel hopping. Uplink is proceeded from the device with high priority for the channel, but if devices with high priority try to transmit at the same time, energy and time consuming due to the retransmission can happen.

It is used to avoid transmission conflicts in competition intervals, and in such cases, if the device is transmitted using the above method, there exist a waste interval over TDMA channel hopping with-out priority for there is contention interval.

Each sensor device delays random back-off time before transmitting using combined channel hopping algorithm and by preliminary detecting the channel disperses data transmission between sensor devices. Whenever the channel hopping is done, if devices with high Priority using CSMA/CA algorithm and adaptive IFS priority algorithm conduct the Uplink transmission, each user will transmit to a good channel, and by thus eventually multiuser diversity effect can be achieved.



Figure 1. Combined Channel hopping

4 Experiments

This section evaluates the data rate dissipation of proposed CSMA/CA channel hopping and adaptive IFS Priority algorithm against traditionally TDMA protocol under WSNs. For low cost and low power it is assumed that a narrowband is used.

The experiment was conducted only considering Up-link for a simple comparison of TDMA and Combined in the system environment which is assumed in this paper.

The number of channels used in the Channel Hopping is 16, and the average transmit power was fixed at 10dB. Adaptive IFS and CSMA/CA algorithm gives the priority according to the SNR of each channel, and the higher is the priority, the size of the IFS is reduced. The method of transmit after waiting random from 0 to Max Contention

Window was simulated. The result of comparing the performance of both methods is shown in Figure 2. The total data transmit rate due to the increase of Devices was measured. In the case that the number of devices than 8 it was shown that combined channel hopping scheme has approximately 1.8 times higher in the data rate.

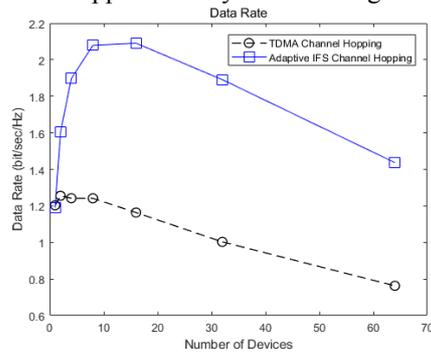


Figure 2. Number of devices Vs. Data Rate

Acknowledge

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Promoting Foreign Electronic Commerce: Focusing on International Margins

Yoonkyo Cho¹, Jaewhak Roh²

¹Dept. of International Trade and Economics, Hansung University, Korea

²Dept. of International Trade, Hansung University, Korea

¹ubllcho@gmail.com, ²jwroh@hansung.ac.kr

Abstract. This study examined the effects of international margin on electronic commerce (e-commerce) industry. Until now, tariffs have been a major transaction cost of international trade to deal with. Tariffs are most applicable to online as well as offline trade, and they have been the most critical factor limiting international transactions. However, tariffs in international e-commerce have been obstacles to the development of the online commerce industry. Here, we have studied the role of international margins in both online international trade and economy as a whole. The results show that the direct taxation of the consumer goods industry had the greatest impact on the production, consumption, and imports of consumer goods. In addition, taxing international margins has a significant effect on the import prices and the domestic market price of consumer goods. Therefore, we found that international margins have a positive effect on promoting foreign electronic commerce.

1 Introduction

Many previous studies have examined e-commerce and tariffs [1]. However, international margins also arise for transactions that cross borders, like tariffs. There are two types of international margins: international trade margins and international transport margins. The international trade margin refers to the difference between the prices that a wholesaler or retailer paid for goods and the price at which they were sold to the next consumer. International transport margins are defined as the difference between the total price the seller will pay for all the freight and insurance premiums to the destination country [2]. While international margins are a small part of trade and the economy as a whole, the analysis of international margins is significant because international margins are always accompanied by international on- and offline trade, and international trade has a large share in the Korean economy.

2 Research Design

To analyze the impact of taxes on industries including international margins on e-commerce and Korea's economy, we used an input-output table. We categorized the industries in the table into six sectors: the consumer goods industry, the

manufacturing industry, agriculture, the service industry, international trade margins, and international transport margins. Since the consumer goods industry is an industry where electronic commerce is active, we considered this industry as the representative industry of the e-commerce industry and conducted the analysis. Two types of taxes—production tax and import duties—were used as factors affecting the industries and Korean economy. Based on the non-taxation of all the sectors, simulations were conducted by combining the types of sectors and taxes. We focused specifically on the analysis of the consumer goods industry and the international margin sectors. For the analysis, we used the computable general equilibrium model.

3 Results

We analyzed the effects of production and import taxes on the consumer goods industry and international margins on the welfare of the entire economy. As a result, we found that welfare of economy decreased more when a 10% import tax was imposed on international trade margins and international transport margins than when a 10% import tax was imposed on the consumer goods industry. In this case, tariffs on international margins had a greater impact on welfare than tariffs on the consumer goods industry. In addition, the effects of the tax imposed on each sector were examined for specific industries, namely the consumer goods industry, in which e-commerce is active. We found that the direct taxation of the consumer goods industry had the greatest impact on the production, consumption, and imports of consumer goods. In addition, taxing international margins has a significant effect on the import prices and the domestic market price of consumer goods.

4 Conclusions

This study showed international margins as a way to promote foreign e-commerce and welfare by moving away from customs policies. We found that taxes on international margins can affect both e-commerce industry and Korea's welfare. This implies that the government should consider policies on international margins going forward rather than its current focus on tariffs only. Therefore, in order to increase foreign e-commerce, companies and governments should carefully examine the business strategy and policy related to international margins and e-commerce.

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Recommendation Service using ANP for Airbnb

Hae-Jong Joo¹, Hwa-Young Jeong*²

¹Dept. Of Computer Science & Engineering, Dongguk University, South Korea

²Humanitas College, Kyung Hee University, Seoul, South Korea

¹hjoo@dongguk.edu, ²hyjeong@khu.ac.kr

Abstract. This research aims to make a personalized recommendation model and to analyze the guest preferences for accommodation using Airbnb. For this process, the study constructs criteria from accommodation information in Airbnb and it calculates and analyzes the guest's preference by AHP (Analytic Hierarchy Process). The result shows the optimal room choices from the Airbnb website according to the guest's preferences.

1 Introduction

Due to the spread of the internet with wired/wireless networks and SNS, various Web-based business services have appeared over the past few years [1, 2]. The advent of services like Hotels.com, Hotels Combined, Booking.com, Trivago, and Airbnb has added another dimension to the convenience of travel [3, 4]. Airbnb is a good choice when the users want hire room or house to other country or location but various factors must be taken into consideration in order to obtain a room that meets the conditions desired by the user. Occasionally, the user may have booked a room based on the desired conditions, but it may be different or disappointing. Therefore, it is very important work to find a room or house where they want.

This study aims to propose a MCDSS (Multi-Criteria Decision Support Service) that users can find the most suitable rooms or house in Airbnb. For this work, various factors from the characteristics of Airbnb phenomenon between the customers and providers are made. The data for accommodation can be extracted from Airbnb in Korea, analyzed and provided to the user. The service developed using .Net framework and connected the website to Airbnb. Using the service, the users can easily find and make decision to book rooms or house.

2 Airbnb

By Airbnb web site [5], Figure 1 shows a view of Airbnb for Seoul. The users can check rooms or house in Seoul with a map when they want to stay as well as they can compare the price for each room or house very easily.

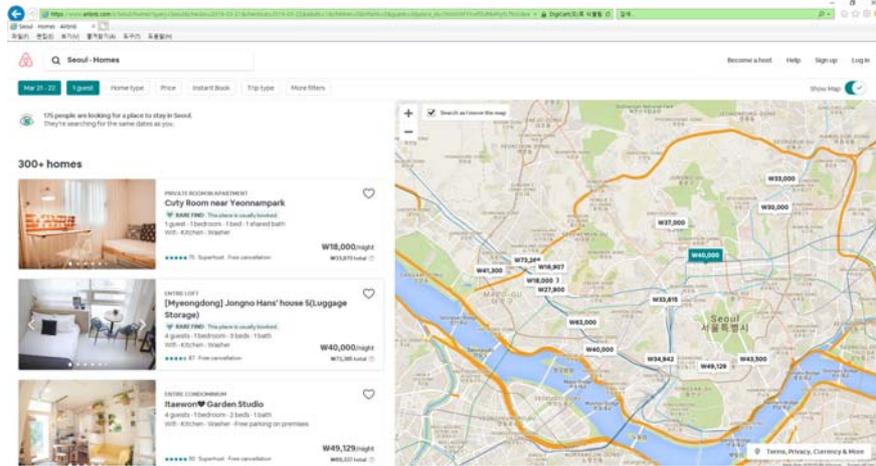


Figure 1. Airbnb web site for Seoul

3 Booking accommodation in Airbnb

The proposed the service model for booking accommodation is shown in Figure 2.

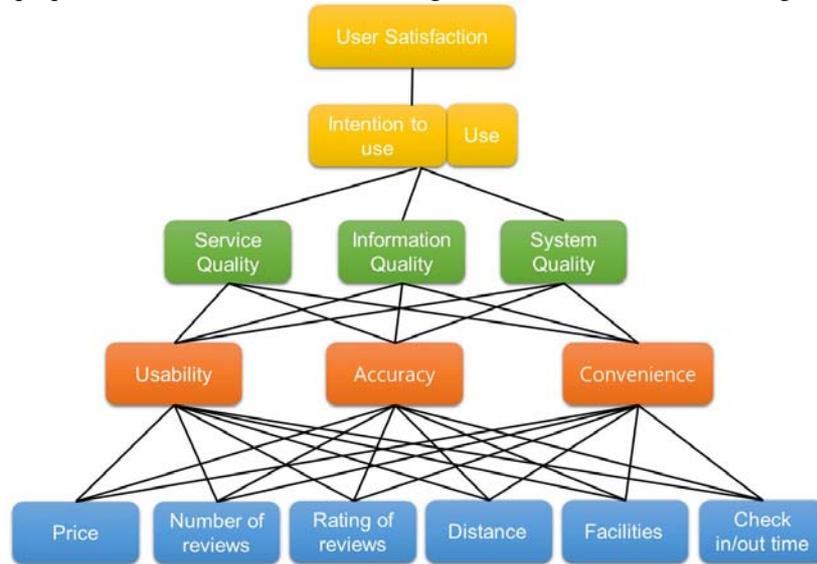


Figure 2. Hierarchical structure of service model for booking accommodation

This research was used the factors that can be important criteria when users actually make bookings, and recommend for accommodation as a result of analyzing according to the score of each range. Figure 3 a and b shows criteria from the Airbnb service.

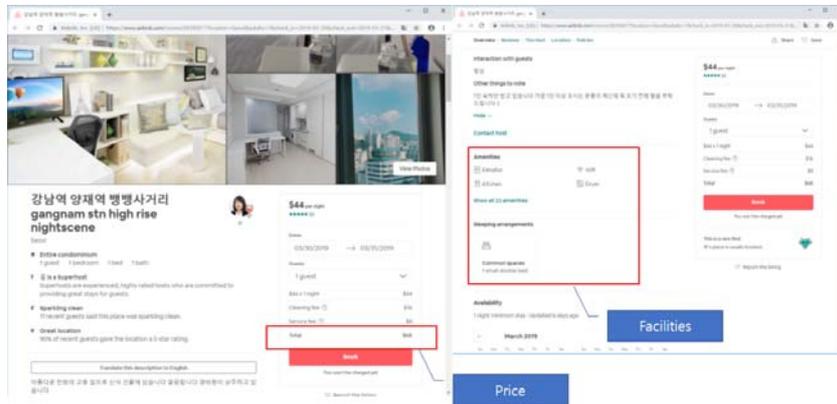


Figure 3 (a). Price and Facilities from Airbnb

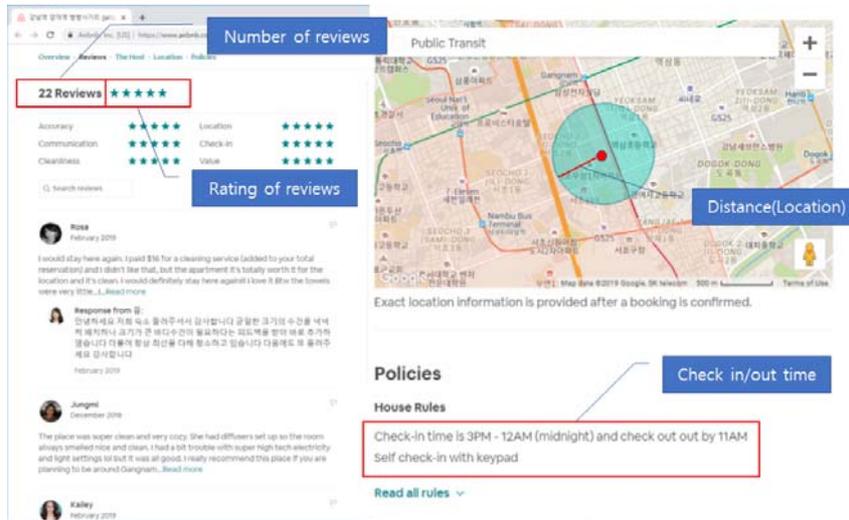


Figure 3 (b). Number of reviews, Rating of reviews, Distance(Location), and Check in/out time from Airbnb

By guest's preferences, pairwise comparison matrices can be get as table 1.

Table 1. Pairwise comparison matrices for AHP

Criteria	Price	Number of reviews	Rating of reviews	Distance (Location)	Facilities	Check in/out time
Price	6.0000	14.500	29.333	24.4167	45.5000	53.0000
Number of reviews	3.2500	6.0000	14.416	10.0000	27.7500	29.2500
Rating of reviews	2.0750	4.6667	6.0000	5.0833	11.8333	16.1667
Distance(Location)	2.6500	5.3333	8.0833	6.0000	17.4167	22.2500
Facilities	1.0986	2.6611	3.9333	3.6333	6.0000	8.2500
Check in/out time	0.7778	1.9389	3.1000	2.7583	5.0000	6.0000

By table 1, the value of eigen vector for each criterion can be calculated as table 2.

Table 2. Pairwise comparison matrices for AHP

Criteria	Eigen vector
Price	0.4657
Number of reviews	0.2444
Rating of reviews	0.1235
Distance(Location)	0.1664
Facilities	0.0689
Check in/out time	0.0528
Total	1.0000

4 Conclusion

The research is analyzed the guest's preference and calculated her/his intention by AHP. In order to make scores for each criterion from the guest, this research uses criteria such as Price, Number of reviews, Rating of reviews, Distance(Location), Facilities and Check in/out time. The result of analysis shows the first choice is price when the guest search rooms by Airbnb, Number of reviews is next and Check in/out time is last. By this priority, this method shows room where is the best choice from the guest.

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Software System integration project Quality Improvement Practice based on Test Process Model

Jin-Wook Jang

Professor, College of Liberal Arts, Anyang University, Anyang, Korea
jinwjang@anyang.ac.kr

Abstract Many Companies are benefiting from using process models such as CMMI and SPICE to improve software quality and improve development productivity. However, in the case of SI projects, it was not enough to apply only this general process model to improve the quality of products delivered to customers eventually. As a result, it was necessary to introduce a process-specific process model, which is a key area for quality improvement. Especially, it. In this paper, we introduce an example of process improvement and software quality improvement by applying a test process model called TPI.

Keywords: Project Quality, Test Process, TPI, Software Quality, Test Process Model

1. Introduction

Recently, for the purpose of establishing and improving processes for improving software quality, many companies have actively introduced process models such as ISO 9000, CMM (Capability Maturity Model), CMMI (CMM Integration), SPICE (Software Process Improvement Capability determination). Domestic A company also develops quality manual and e-INNOVATOR based on these international standards and presents them as company standard process and methodology, and it shows much improvement in development productivity through process improvement. In addition, A company has conducted three part inspection of the product before shipment as part of the "ZERO DEFECT 21" campaign since 1999, improving the defect rate by 247%. In addition, 86% of the respondents said that product inspection activities contributed to the improvement of reliability.

2. Related Works

The TPI model was developed by Kooman and Pol in 1997, and it is designed to make it easier to improve the test process [2, 3]. By examining the organization's test process maturity, improvements can be made to the test process by determining areas of strengths and weaknesses and providing appropriate improvements. The TPI model consists of Key areas, Levels, Test Maturity Matrix, Checkpoints, and Improvement suggestions.

The TPI model has 20 key areas, most of which relate primarily to improvement of system and acceptance testing. The 20 key areas are divided into five areas: Life cycle, Technique, Infrastructure, Organization and others. Details are shown in Table 1.[1]

3. TPI-based Software improvement

The process and necessary activities that improve the maturity of the test process of an organization or project using TPI are shown in Figure. 1.[2]

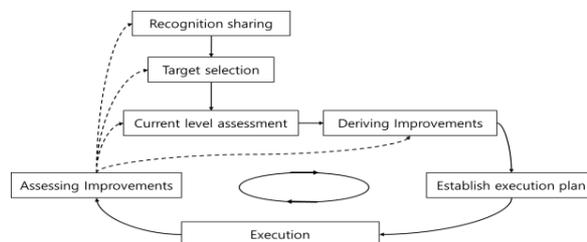


Figure 1. Change Process

4. Accessing Improvements

These improvements should be periodically reassessed and new improvements should be made to ensure that test process improvements are constantly being made. the results of the same evaluation are shown in Table 1.

Table 1. Test Maturity Matrix

Key Areas	Controlled	Efficient	Optimizing
	A	C	D
	A		
	A	B	D
	A	B	
	A		
1. Test strategy			
2. Life-cycle model			
3. Moment of involvement			
4. Estimating and planning	A	B	
5. Test specification techniques			
6. Static test techniques	A	B	C
7. Metrics	A	B	C
8. Test automation	A	B	C
9. Test environment			
10. Office environment	A		
11. Commitment and motivation			
12. Test functions and training	A	C	
13. Scope of Methodology			
14. Communication	A	B	C
15. Reporting			
16. Defect management	A	B	C
17. Testware Management			
18. Test process management	A	C	C
19. Evaluation	A	C	C
20. Low-level testing	A	C	D
	A	C	
		A	
		B	

Using the test maturity matrix evaluated as in Table 1, we can select the areas of improvement that should be applied first. The grade is displayed at the lower level of detail, but the core area that has not yet been achieved is the top priority. The maturity matrix shows that the following four key areas with grade A at one level of detail among the 13 key areas should be improved first.

5. Conclusion

Among the several models proposed to improve the test process, we briefly introduced the TPI, and introduced the test process improvement activities and results of the A company. by performing improvement activities based on the process model, we were able to perform progressive, effective and continuous process improvement. Through this, we found that choosing an appropriate model to improve the quality of the process, rather than one-time improving the process for achieving certification, is crucial to improving the process of improving processes.

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Amount of Network Traffic Prediction Protocol with IoT Environment

Kim Ga-young¹, Kang Jin-Gu², Jung Jin-Seop³, Doo Ill-Chul⁴*

^{1,2} Dept. Of Computer Science and Engineering, Dongguk University, Korea

³ Dept. Of Information & Communication Engineering, Dongguk University, Korea

* Correspondence: Dept. Of Convergence Education Dongguk University, Korea

¹dolga2000@dgu.ac.kr, ²kanggu12@dongguk.edu,

³jjscan@naver.com, *mrdoo@dongguk.edu

Abstract. Advanced Metering Infrastructures (AMI) is a measurement system that analyzes and collects schedules or requests for communication of meter devices, utility distribution and energy consumption. In this paper, we propose a smart protocol for AMI that can more accurately predict traffic volume in IoT(Internet of Things) environment and reduce unnecessary energy waste. By predicting network traffic complexity based on data collection, we proved that the proposed protocol can effectively use energy by reducing collisions and delays of numerous data.

1 Introduction

In cities using the IoT[1], it is essential to integrate all data through intelligent measurement devices, which can measure the overall service volume of electricity, water and gas to better manage the supply network and balance efficiency between consumption and demand. We aim at having. A key technology element is a smart meter that can be a thing inside the IoT. Smart metering systems allow water, electricity and gas utilities to continue to consume time, or at least daily, reporting, monitoring and billing and recording.

Smart meters [2] enable two-way real-time communication between the flow meter and the utility central system. This allows each device to collect data transfer intervals, base demand data, power outage management, service outages, service restoration, service monitoring quality monitoring, distribution network analysis, distribution planning, peak demand, demand reduction, customer billing and task management. Can be. Through this, it is possible to manage demand response, so that customers can make informed decision-making and consumption forecasts, which will increase the efficiency of smart cities. However, there is no effective protocol for throughput, energy, and latency for data processing that can support this metering. This paper presents the standard for the standard protocol for AMI in IoT environment.

This paper presents the standard for the standard protocol for AMI in IoT environment.

2 Traffic Prediction Protocol

Our paper proposes a protocol that predicts network traffic in the environment for such AMI and converts it into the appropriate duty cycle [3]. Figure 1 shows the proposed algorithm. When the module (1) determines that the amount of traffic is greater than the average amount during a certain period, the module (2) is operated to reduce the sleep period. At this time, whether or not the module (1) judges whether the collision is high and the collision is high, the sleep period is reduced by about 10%, thereby reducing the total period to increase the number of wakeups for a predetermined time. Module (3) behaves like a normal asynchronous protocol if the traffic volume is thought to be equal on average over a period of time, and if the amount of traffic drops because it is thought that the traffic volume has decreased over a period of time, as in module (4), then the sleep period is roughly reduced.

Increase it by 10% to lengthen the entire cycle. Module (2) increases the overall traffic volume of the network, increasing the number of wakeups in one cycle, increasing the probability of successful data transfer, increasing throughput, and reducing latency. Module (4) can reduce unnecessary energy by reducing the amount of traffic in one cycle by reducing the amount of traffic in the opposite situation

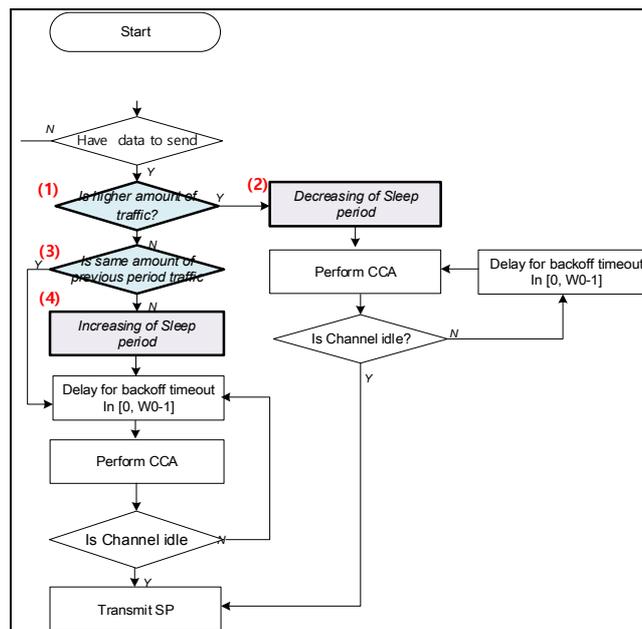


Figure 5. Flowchart of proposed algorithm

3 Conclusion

We proposed an adaptive protocol for AMI that can improve the transmission efficiency and reduce unnecessary energy by predicting and applying future traffic through observation of data traffic for many devices in IoT environment for a certain period of time.

Acknowledge

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Research on Detection of Reinforcement Binding Spacing Based on Corner Detection Algorithm

Mingshou An¹, Dae-seong Kang²

¹Dept. Of Computer Science, XI'AN Technological University, China

²Dept. Of Electronic Engineering, Dong-A University, Korea

135881862@qq.com, 2dskang@dau.ac.kr

Abstract. The tying and installation of steel bars in the field of construction engineering is the last step in the steel works and the most important one. In order to solve the environmental constraint problem in the acceptance of steel banding quality, this paper proposes an image-based intelligent steel bar distance measuring system, which is convenient for workers to measure distance at a long distance, and can effectively improve the range measurement during the acceptance process of steel bar binding project. The environmental constraint problem can also save the time for the acceptance of the quality of the steel bar binding and can greatly improve the process acceptance efficiency.

Keywords: Acceptance of steel banding, distance measuring system, image processing, corner detection.

1 Introduction

1.1 A Subsection Sample

In the process of tying the steel bars, the management personnel are not in place, the tying workers are sloppy, not tied according to the size of the drawings, the process is improperly arranged, and the steel bars are affected by various factors such as pedaling, which may result in the quality of the lashing being out of standard or quality. The problem has serious consequences. Therefore, in the acceptance, the quality is usually judged by comparing the drawings with the manual ruler. During the acceptance process, the inspectors need to be close to the steel bars and use the distance measuring ruler to measure the distance between the steel bars. However, in most cases, the engineering site where the steel bars are tied is a place with a relatively bad environment, and some steel bars are not able to be tied in the air. Close to, etc., there will be some safety problems in the process of the

ruler cannot be measured due to environmental restrictions. In order to solve a series of problems in the quality acceptance of steel banding, this study proposes an image-based intelligent steel bar distance measuring system[1], which not only facilitates the distance measurement by the staff at a long distance, but also saves the time for the acceptance of the quality of the steel banding. The range increases the process acceptance efficiency. In order to solve the above problems, this thesis proposes a distance measurement method based on image and laser range finder, which can effectively improve the environmental constraint problem of ranging during the process of measuring the acceptance of steel bar binding engineering.

2 Proposed method

The method proposed in this paper is composed of three parts. The first is to measure the distance from the instrument to the steel bar by a laser range finder. The second is to take image of the steel bars through the camera. In the image, each corner stripping point is detected using a corner detection algorithm[2-4]. Then calculate the number of pixels between the two points. Finally, the distance value detected by the laser range finder and the pixel value of the image detection are obtained, and the actual distance between the two corner points is obtained by a trigonometric function relationship.

Corner detection: Based on the image ranging method, firstly, each steel corner point is detected based on the image information, and the contour of the entire steel mesh and the coordinate information of each steel intersection are detected. Detecting the distance between the corner of bars: The results of the inspection are processed to calculate the pixel values contained between the intersections of each bar.

Finally, combined with the laser ranging method, these pixel values and the distance values detected by the laser range finder are calculated to obtain the actual distance between the final steel bars.

3 Conclusion

This paper proposes a combination of laser detection and image processing algorithms

to detect the distance between the steel banding points, solve a series of problems in the acceptance of steel bar binding quality and improve work efficiency and safety.

Acknowledge

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Autonomous and Operational Services for Machine Vision-based Inspecting Colors of Multiple-wire Harnesses

Kyou Ho Lee¹, Seung Beom Hong²

¹ Dept. of Information and Communications Engineering, HSV-TRC, UHRC, Inje University, Korea

² Graduate School, Inje University, Korea

¹kyou@inje.ac.kr, ²xere2001@naver.com

Abstract. This paper proposes a technology of autonomous and operational services for machine vision-based inspecting colors of multiple-wire harnesses. Particularly an implemented system solution for this applicable to the inspection step of the harness product is presented. This paper also presents a smart solution that enables a operation user or a manager real-time monitoring by collecting automatically product information and test results related to the inspection in real-time.

1 Introduction

Automation of the cable harness product inspection process is based primarily on a machine vision technology. A machine vision-based automatic inspection system is the representative field that the industrial field utilizes the advantages of the machine vision system. As this technology can process faster and more precisely than the human eye, it has been applied to various industrial areas while contributing greatly to the improvement of productivity in industrial sites[1][2]. This paper proposes a technology of autonomous and operational services for machine vision-based inspecting colors of multiple-wire harnesses. Particularly, in the harness manufacturing process, the machine vision-based automatic inspection solution to be applied to the inspection step of the harness product is presented. This paper also presents a smart solution that enables a operation user or a manager real-time monitoring by collecting automatically product information and test results related to the inspection in real-time with IoT configuration and recording, storing, and managing them in the cloud server.

2 Architecture of the Proposed System Solution

This study establishes the conceptual model of a machine vision automatic inspection system of multi-wire harness, and designs and implements the system solution including its core functions and system components. Based on the established system conceptual model, the target system to be developed was defined as SVI-CH (Smart

System for Vision-based Inspecting Colors of a Multiple-wire Harness). This system consists of the image capture (IC), inspection and interpretation (II) and autonomous and operational services (AOS) subsystems, and a communication connection network for data and information transfer between them. The II is composed of software programs for image processing, inspection and interpretation, while the IC consists of vision inspection equipment such as a CCD camera, a lens, and an image data grabber. The AOS includes real-time data detection function of each process step, data base and management function, data transmission/reception and communication function, and real-time monitoring access function.

The proposed operational architecture of the vision-based color inspection system solution of the multi-wire harness using the development target system, SVI-CH, is shown in Figure 1.

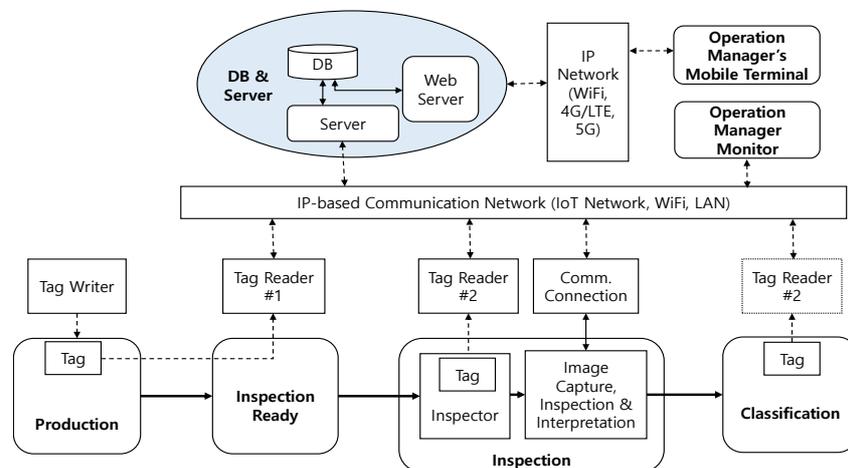


Figure 1. Operational architecture of the proposed system solution

3 Conclusion

This paper proposes a technology of autonomous and operational services for machine vision-based inspecting colors of multiple-wire Harnesses. Particularly an implemented system solution for this applicable to the inspection step of the harness product is presented.

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Improved method for learning data imbalance in gender classification model using DA-FSL

Jun-Mock, Lee¹, Hack-Yoon, Kim², Dae-Seong, Kang³

^{1,3}Dept. of Electronics Engineering, Dong-A University, S. Korea

²Dept. of Electronics Engineering, Cheongju University, S. Korea

¹mogilee@dau.ac.kr, ²hykim@cju.ac.kr, ³dskang@dau.ac.kr

Abstract. As the deep learning technology grows, the accuracy of the training data to improve the model becomes important. If there are not enough learning data between classes, there is a problem that the performance of the deep learning model is greatly reduced. In this paper, we propose a method to solve data imbalance caused by the difficulty of collecting learning data through DA-FSL(Data Augmentation based Few-Shot Learning). The purpose of this paper is to verify whether the data imbalance of gender classification model can be solved through the experiments applied by the proposed method and to prove its effectiveness.

1 Introduction

Unlike traditional machine learning algorithms, deep learning performs well when there are enough data to train the model. However, if the data to train the model is limited, an unbalanced amount of data for a particular class may occur, which is a major factor in reducing the accuracy of the model.

In the past, data resampling [1] was simply used when there were not enough image data to learn to solve the data imbalance [2]. Learning from this data has its limitations in improving accuracy. In this paper, we propose DA-FSL(Data Augmentation based Few-Shot Learning) technique that can classify data with only a small amount of learning data for classes with data imbalance. DA-FSL refers to a method of generating and re-learning training data through GAN(Generative Adversarial Networks) [3] using data augmentation [4].

2 Related Work

2.1 YOLO Networks

YOLO(You Only Look Once) [5] is one of the famous single-stage detectors. Divide the image to be predicted into N by N grid cells and predict one object for each cell. YOLO should select one box that best contains the detected object to calculate the loss of true positives of multiple bounding boxes. Figure 1 shows the architecture of YOLO.

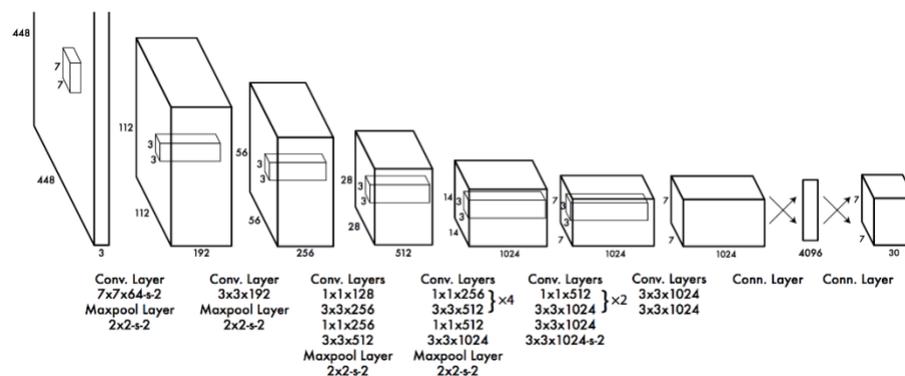


Figure 1: YOLO architecture

2.2 GAN(Generative Adversarial Networks)

GAN consists of two neural networks, generator which generate a new instance of data and discriminator which assess the authenticity of this generated data. Figure 2 shows the architecture and operation of the GAN.

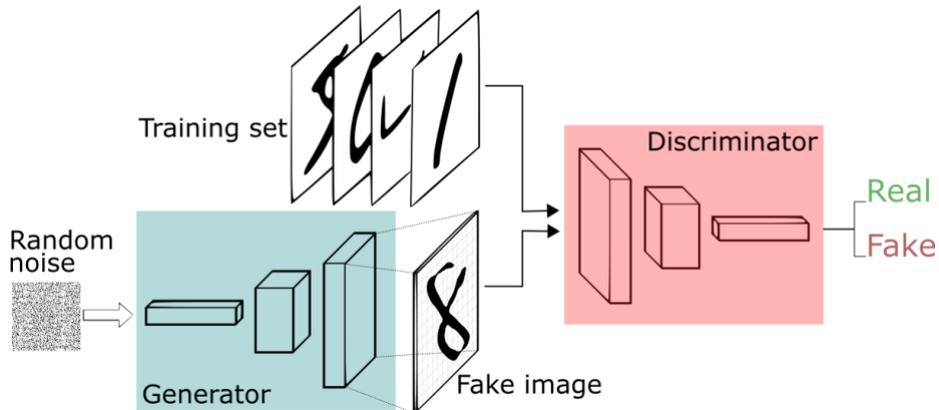


Figure 2: GAN architecture and operation

GAN works as follows:

- (1) Generator receives arbitrary input data and outputs the generated image.
- (2) The generated image is delivered to the Discriminator with image taken from the actual data set.
- (3) Discriminator distinguishes between real image and fake image and returns as probability value between 0 and 1. It has double feedback loop.
- (4) Discriminator receives feedback from the correct answer of the image, and the generator receives feedback from the discriminator.

3 Proposed Methods

Figure 3 shows the proposed method. First, the amount of learning data for each class is compared to determine whether there is a data imbalance. If there is an imbalance, set the data of the class with a relatively large amount of data to be A and the class of imbalance of B.

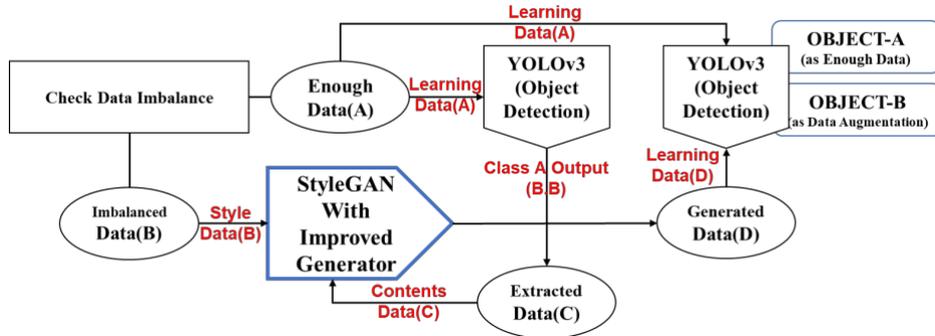


Figure 3: Proposed methods flow chart

Through the YOLO network, we train the detection model using only data corresponding to A, and extract only the result of the bounding box of the classification corresponding to A, and call it C.

Generative Adversarial network model now generates new data by specifying the underlying data as C and the data to be synthesized as B. Combine this data with B and call it D.

Finally, based on the data corresponding to A and D, we train the detection model through the YOLO network and evaluate whether the data imbalance of the class is solved through the experiments in the next section.

4 Experiments

DA-FSL technique apply in a deep learning model that detects the face of a conventional male. A small amount of female face learning data is used to generate and relearn new data. Using this data, extends the deep learning model to detect women's faces and evaluates their accuracy.

The training data to be used for experiment were 10,000 male face data and 10 female face data randomly extracted from the human data of UMD Faces datasets [6]. The test dataset evaluates the accuracy of the model from 1,000 randomly selected PASCAL VOC 2012 Datasets [7].

Figure 4 shows the result of synthesizing the images through the generation model.

First, the results of learning by equally dividing the face data of female and male by 10,000 by the general method are shown in Table

1. When the data imbalance between male and female classes occurred, the results of gender classification of male and female who applied female face data to three, five and ten data using the proposed method are shown in Table 2. The comparison of the two methods is shown in Table 3.



Figure 4: Synthesis results for Contents C(Male) and Style B(Female)

Table 2. Result of general method gender classification

Model	Male success	Male mismatch	Female success	Female mismatch
YOLOv3(With 10,000 female data)	447	59	456	38
YOLOv3(With 10 female data)	453	57	53	437

Table 2. Result of proposed method gender classification

Number of learning data	Male success	Male mismatch	Female success	Female mismatch
3	466	48	145	341
5	453	62	308	177
10	456	57	422	65

Table 3. Comparison of accuracy between the two methods

Method	Male success	Male mismatch	Female success	Female mismatch
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YOLOv3(with 10,000 female data)	447	59	456	38
Proposal(with 10 female data)	456	57	422	65

The learning time for existing method and proposed method is shown in Table 4.

Table 4. Comparison of learning time between the two method

Evaluation Type	YOLOv3	Proposal(3)	Proposal(5)	Proposal(10)
Learning Time	8h 12m	6h 34m	10h 13m	14h 10m

5 Conclusion

In this paper, we propose a method that can improve the accuracy of deep learning model through DA-FSL in the presence of learning data imbalance. In the experiments, we improved the detection accuracy through the proposed method with only a small amount of female face data and solved the problem of data imbalance.

The proposed technique can be applied to which not only alleviate the imbalance of gender data but also various fields generating limited learning data such as crime behavior pattern detection, disaster situation detection, revenge sex crime, etc. because generate new data according to the data distribution. The final goal of this research is to further optimize data augmentation technology and the diversification of data generation patterns to identify possibilities in all areas where learning data are limited.

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Isolation Enhancement for the Mobile Phone LTE/WiMAX/ and Dual WiFi-Band MIMO Antenna

Lee moon-hee¹, Son tae-ho², Lee yong-chang³, Kim sun-hyung⁴,

^{1,2,4} Dept. Of Information and Communication Engineering, Soonchunhyang
University, Korea

³ Div. Of Broadcasting & Art Convergence Dong-Ah Inst. Of Media & Arts, Korea

¹criticalm90@gmail.com, ²thson@sch.ac.kr, ³yclee0703@gmail.com,
⁴shkim@sch.ac.kr

Abstract. In this paper, a practical method for isolation enhancement for the mobile phone MIMO (Multiple Input Multiple Output) system of the 2.4/ 5.8 GHz dual WiFi band and LTE band(2.3 GHz~2.690 GHz)/ WiMAX band(2.5 GHz~2.7 GHz) band were studied. A MIMO antenna was designed as a hybrid antenna operating both a monopole and an IFA. We designed two structures for enhancing antenna isolation, and placed these components between the antennas. The isolation on the WiFi/LTE/WiMAX was -20 dB for both bands. The characteristics of the MIMO antennas demonstrated the VSWR below 2: 1 and ECC less than 0.1 over design bands.

1 Introduction

Recently, in accordance with the rapid growth of the mobile communication market, mobile communication systems exploiting LTE technology have been commercialized to provide the public with diverse service options in order to meet their business and consumer needs. The 4G and 5G mobile communication system is a type of high-speed packet data transmission system, the implementation of which requires a MIMO antenna as well as the essential LTE technology.

2 Antenna design

Figure 1 shows the structure of the antennas. The antennas can be divided into the monopole antenna and IFA. The monopole antenna operates by the current feed of the system. The IFA is coupled with the monopole antenna, as illustrated by the dotted line of the current feed, and is connected to the ground via the shorting pin. This enables the simultaneous hybrid operation of the two antennas, the monopole one and the IFA. Figure 2 shows a comparison between the recorded actual measurements and results of the simulation of the isolation and reflection coefficient of the antennas examined.

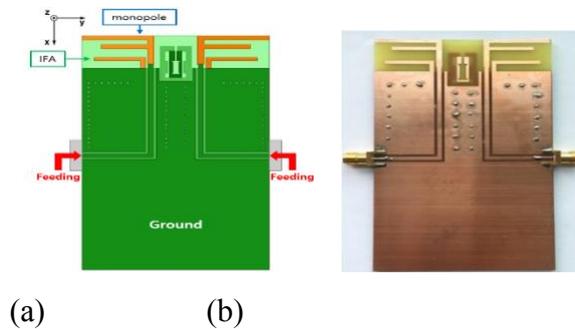


Figure 1: Structure of hybrid MIMO antenna (a) simulation, (b) implementation.

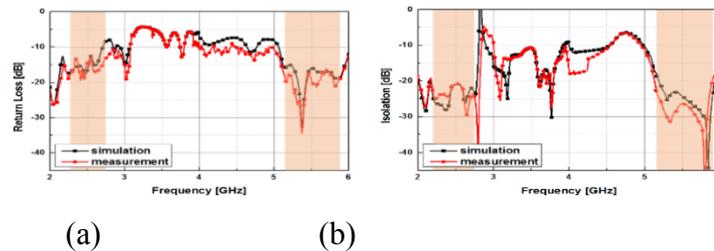


Figure 2: Return loss and isolation of the antenna (a) return loss, (b) isolation.

3 Conclusion

In this study, the use of a grounding structure that could improve the isolation of MIMO antennas in WiFi bands (2.4/ 5.8 GHz), LTE, WiMAX were presented. The characteristics of VSWR below 2: 1 and ECC less than 0.1 over design bands. The isolation on the WiFi/LTE/WiMAX was -20 dB for both bands

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Address: Dunsan Hyundai Aitel 1713, 113 Dunsan-ro Seo-gu Daejeon City, Korea

Tel: +82-42-488-2505

Email: kiitorkr@gmail.com

Homepage: <http://www.ki-it.or.kr/sobis/kiit.jsp>



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