International Conference on Advanced Computing, Communication, and Information Sciences (ICACCI-2019)

December 13-14, 2019
Sejong University, Seoul, South Korea
■ Date: Friday and Saturday 13-14, 2019, 10:00 – 17:30

■ Place: AI Building, B116, Sejong University Seoul, South Korea

■ Organizer:

The Korea Academic Society of Digital Business Administration (KASDBA) (사)한국디지털경영학회

Korea Institute of Digital Convergence (KIDICO)

Department of Computer Science and Engineering Sejong University

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Korea Small Medium Business Association
Good morning! Ladies and gentlemen, on behalf of the ICACCI-2019 organizing committee, I am honored and delighted to welcome all the participants to the International Conference on Advanced Computing, Communication and Information Sciences held at the Department of Computer Science and Engineering of Sejong University, Seoul, Korea.

First of all, I would sincerely express my gratitude to keynote speaker Dr. Sudan Jha, who is a Professor of Computer Engineering at KIIT University, India.

I would also like to extend my sincere thanks to invited speaker Dr. Emil Robert Kaburuan, who is a professor of the BINUS University, Indonesia, and Dr. Muhammad Hanif from Hanyang University, South Korea.

Particularly, I would like to thank members of the technical program committee, local organizing committee and session chairs for their contribution on organizing the conference program and the reviewers for the submitted papers.

My special thanks to the sponsors, Korea Small Medium Business, and National Information Society Agency (NIA). Finally, I want to thank all authors for their willingness to openly describe their achievements, share experiences, and present their ideas.

This conference aims to provide a platform for participators in the field of Advanced Computing, Communications and Information Sciences to present their research and share their ideas as well as formulate new research collaborations with them. With your support and cooperation, we will organize high quality conferences in the future as well.

I hope that all participants of this conference have a valuable and wonderful time by treasuring the memories of this conference in Seoul.

Thank you.

2019-12-13
Dae Wan Kim (Ph.D) President,
Korea Academic Society of Digital Business Administration
Good morning everybody! Welcome to the International Conference on Advanced Computing, Communication and Information Sciences (ICACCI-2019).

Firstly, I would like to thank the president of the Korea Academic Society of Digital Business Administration, co-organizer of this conference, Prof. Dae Wan Kim, for organizing this conference here in Sejong University.

I would like to thank all participants for your participation in the ICACCI-2019. I also want to express my thanks to keynote speaker, Prof. Sudan Jha, Department of Computer Science and Engineering at KIIT University, India.

My special thanks are extended to invited speakers, Prof. Emil Robert Kaburuan from BINUS University, Indonesia and Dr. Muhammad Hanif from Hanyang University, South Korea.

Finally, I am also grateful to all of the conference’s chairs, committee members, and staff for their support and help.

I hope this conference can be an inspiring experience for you. Enjoy your participation in the ICACCI-2019 and memorable time here in capital city Seoul.

I wish you a pleasant stay in Seoul.

Thank you.

2019-12-13
Hyeonjoon Moon, PhD
Department of Computer Science and Engineering,
Sejong University
International Conference on Advanced Computing, Communication, and Information Sciences (ICACCI 2019)
December 13-14, 2019
Sejong University, 05006, Seoul, South Korea

About the conference

The Korea Academic Society of Digital Business Administration (KASDBA) is pleased and proud to announce the International Conference on Advanced Computing, Communication, and Information Sciences (ICACCI 2019) that will be held at the AI Building, Sejong University, Department of Computer and Engineering, Seoul, South Korea.

ICACCI-2019 is hosted by the Korea Academic Society of Digital Business Administration, co-organized by the Department of Computer and Engineering, Sejong University, Seoul and Technology and Korea Institute of Digital Convergence (KIDICO) and sponsored by Korea Small Medium Business Association and National Information Society Agency (NIA).

The main objective of the ICACCI-2019 is to provide an excellent opportunity for authors working in areas related to Advanced Computing, Communication and Information Sciences to present their research outcomes and exchange views and experiences. The conference also offers an opportunity to strengthen existing collaborations in order to achieve tangible research outputs in a short time frame.

With your support and cooperation, KASDBA has organized and is committed to organizing more high-quality conferences in the future as well.
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2019 ICACCI Keynote Speaker

Sudan Jha, PhD
School of Computer Engineering,
KIIT University, India

2019 ICACCI Invited Talk -1
Emil Robert Kaburuan, PhD
BINUS University, Indonesia

2019 ICACCI Invited Talk -2
Muhammad Hanif, PhD
Hanyang University, South Korea
Conference Venue

**Venue:** AI Building, Building Number 17 in the following map.

Direction:
https://eng.sejong.ac.kr/contents/eng/cor/location.html

Sejong University Campus Map

**Conference Place:** AI Building, Room #B116, Sejong University, 209 Neungdong-ro, Gwangjin-gu, 05006, Seoul, South Korea.

**Telephone number:** (+82) 02–6935–2481

**E-mail:** joshi@sejong.ac.kr  (Prof. Gyanendra Prasad Joshi)
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Keynote Speech

1. Neutrosophic Soft Sets Decisions- A Step Towards Prediction and Exactness

Prof. Sudan Jha, PhD
School of Computer Engineering,
KIIT University, India

Abstract

Many problems including uncertainties are a major issue in many fields of real life such as economics, engineering, environment, social sciences, medical sciences and business management. Uncertain data in these fields could be caused by complexities and difficulties in classical mathematical modeling. To avoid difficulties in dealing with uncertainties, many tools have been studied by researchers; some of these tools are fuzzy sets, rough sets and intuitionistic fuzzy sets.

Further, the recent research trends on stock market shows that prediction does not match with the exact value incurred due to the lack of data exactness, accuracy of data, and uncertainty of values that occur in the real time. Neutrophic Soft Sets (NSS) for prediction is a new approach that predicts the stock price based on the factors like “open”, “high”, “low” and “adjacent close”. The highest value retrieved from the score function is used to determine the closing price.

Since there is no competing interest exists in the field of applied NSS, there are various scopes using fuzzy theory to determine the predictability of stock parameterized values at the specific time. This approach focuses on the value for the opening and closing points. Mathematically, it seems neutrosophic logic is more generalized than intuitionistic fuzzy logic. Also, neutrosophic logic is more advantageous than Intuitionistic fuzzy logic in real life scenarios.
1. Opportunities and New Challenges in Distributed Stream Processing: Predictive Analytics, and its Future

Muhammad Hanif, PhD
Division of Computer Science and Engineering
Hanyang University, Seoul, South Korea

Abstract

In the past decade, there is an upsurge in five "Vs" volume, velocity, variety, value as well as veracity of data due to the popularity of cloud computing applications such as social media, scientific analytics, IoT (Internet of things) etc. and services such as IaaS, PaaS, SaaS as well as SPaaS. This leads big data analytics solutions as a mainstream in research communities of industry along with academia. Even though batch-processing technologies such as MapReduce, Pig, and Hive solved the issue of processing big volume and variety of data successfully, the velocity, value and veracity still needed attention. To satisfy the growing demand of processing such streaming data, a number of distributed stream processing systems emerged, developed and widely adopted, such as Apache Storm, Dataflow, Apache Spark, Millwheel, System S, Samza, Apache Flink, and Apache Beam. All these systems support online stream processing, high scalability, high availability, and task monitoring. Fueled by industry's growing interest in dealing with high-velocity big data in near real-time settings, there has been a resurgence of recent activity in both research and engineering of large-scale stream processing systems. In this talk, we will examine the state of the art, focusing in particular on key trends of the past years with an outlook towards the upcoming years. I will also give examples from our own work, including stream processing in transactional settings and its refinements as well as predictive time series analytics for the Internet of Things. Transactional stream processing broadly refers to processing streaming data with correctness guarantees. These guarantees include not only properties that are intrinsic to stream processing (e.g., order, exactly once semantics), but also properties of traditional databases, which arise in streaming applications with shared mutable state. In our recent work, we designed an intelligent and competent adaptive watermarking and dynamic buffering timeout mechanism for the distributed stream processing platforms. It is designed to increase the overall throughput of the system through making the watermarks adaptive towards the stream of incoming workload and scale the buffering timeout dynamically for each task tracker at runtime while maintaining the SLA-based end-to-end latency of the system. This work focuses on tuning the parameters of the system (such as window correctness, buffering timeout, and so on) based on the prediction of incoming workloads and assesses whether a given workload will breach an SLA using output metrics including latency, throughput, and correctness of both intermediate and final results. We also design rational and effective topology refining
scheme based on a workload prediction mechanism. The prediction decisions are made through a model based on a merger of autoregressive and moving average model with minor adjustment to make it work on the fly. The system is designed to optimize the overall performance by making the topology refining robust to the incoming workload on the fly, while still be able to achieve QoS goals of SLA constraints. I will share some of our early results from this project, and then conclude the talk with a discussion of future research directions.
Advances in Information and Communication System, Technology

Session Chair: Dr. Rakesh Shrestha

Place: Room # B102
Date: Friday, December 13, 2019
Time: 13:30 – 15:00

1. Deep Learning-based Intrusion Detection Scheme for Very Small Number of Unknown Intrusion Instances
   • Gyanendra Prasad Joshi and Eunmok Yang

2. A Superframe Adjustment and Slot Reservation-based MAC Protocol for Wireless Body Area Networks
   • Seong Cheol Kim, Joong Jae Kim

3. Performance Comparison for Multi-Dimensional Index Structures of RDF Data
   • Seulgi Yun, Zhao Tianyi and Yongju Lee

4. A Novel Approach to Designing Controller based on a Class of Affine T-S Fuzzy Models
   • Shuyun Xiao and Hugang Han

5. Light-Weighted Mobile-Net based Human Pose Estimation for AR Service
   • Byung-Gyu Lee, Ju Young Kim, and Sung-Uk Jung
Deep Learning-based Intrusion Detection Scheme for Very Small Number of Unknown Intrusion Instances

Gyanendra Prasad Joshi and Eunmok Yang

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Abstract

Intrusion detection system (IDSs) monitors computer system in real-time for activity indicative of attempted or actual access by malicious persons or bots. IDSs plays an important role in identifying malicious attacks and threats in networking systems. With the massive increase in malicious attacks and threats, the study of intrusion detection systems has received a lot of attention among security researchers and industries related to computer. As fundamental tools of IDSs, learning based classification methods have been widely employed. When it comes to detecting network intrusions in small sample sizes, e.g., newly emerging intrusions, the limited number and imbalanced proportion of training samples usually cause significant challenges in training supervised and semi-supervised classifiers [1].

In this work, we proposed a general network intrusion detection system to address the challenges of class imbalance datasets. The proposed framework focuses on incorporating deep adversarial learning with statistical learning and exploiting learning-based data augmentation. Many intrusion detection systems in the literature [2], [3] used the KDDCup99 dataset [4] for experiments. In KDDCup99 dataset, there are some intrusion with rare occurrences [5]. These small number of intrusions are, in fact, high threat because they are unknown intrusions. These types of class imbalanced datasets occur in many real-world applications where the class distributions of data are highly imbalanced. Cost-sensitive learning is a common approach to solve this problem. Existing works in the literature deal with frequently attacking cases that can reach very high accuracy by simply predicting these intrusions every time, but it provides a useless classifier for the rarely occurred new intrusion use case. Therefore, this paper proposes a properly calibrated method that may achieve a lower accuracy but would have a substantially higher true positive rate.

Comprehensive experimental validations on KDDCup99 dataset show that the proposed method outperforms the existing learning based IDSs in terms of accuracy, precision, recall, and F1-score.

Keywords:
References


A Superframe Adjustment and Slot Reservation-based MAC Protocol for Wireless Body Area Networks

Seong Cheol Kim, Joong Jae Kim
Department of Convergence Electronics,
SangMyung University,
Seoul, Korea

Abstract
In recent years, Health monitoring applications measuring a multitude of physiological parameters has been increased due to the evolution of the biomedical sensors. Since biomedical sensors in WBAN (Wireless Body Area Network) operate by batteries, high power efficiency is required due to the limited available energy. Furthermore, reliable data transmission is required to deliver urgent measured information to the sink node. In this paper, we present a super-frame adjustment and slot reservation-based MAC protocol for Wireless Body Area Networks which we call H-MAC (Health MAC) for health applications. In the H-MAC, senders can send a burst data when there is an urgent event such as heart beats. These events are usually critical, so the measured burst data should be transmitted in limited time to their final destination node. The H-MAC protocol reduces the packet transmission delay and prolong the network lifetime in comparison to existing related MAC protocols.

Keywords:
WBAN, MAC, Health Monitoring, Delay, Energy

Acknowledgment
This research was supported by a 2019 Research Grant from Sangmyung University.
Performance Comparison for Multi-Dimensional Index Structures of RDF Data

Seulgi Yun, Zhao Tianyi and Yongju Lee*

School of Computer Science and Engineering
Kyungpook National University
Daegu, Korea

Abstract

The development of semantic web poses new challenges for RDF (Resource Description Framework) data retrieval performance. How to efficiently manage RDF data has become an important research direction in the past decade. Multi-dimensional indexing structures are gaining more acceptance as a major solution. This paper proposes a solution to improve retrieval performance by utilizing M-tree indexing structure. Meanwhile, performance comparison and analysis are performed in initialization and retrieval with mainstream RDF index structures. Compared with other index structures, M-tree shows stable performance both in initialization and retrieval. Through experimental data, we confirmed the possibility of improving the performance by minimizing the index space overlap and minimizing the node radius.

Keywords:
R*-tree, K-dimensional tree, M-tree, Linked Data, RDF

Acknowledgment

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (No. 2016R1D1B 02008553).
A Novel Approach to Designing Controller based on a Class of Affine T-S Fuzzy Models

Shuyun Xiao and Hugang Han
Prefectural University of Hiroshima, Japan

Abstract

Due to the affine terms in the affine T-S fuzzy model, when designing a controller based on which the system stability conditions usually are difficult to be arranged in the form of linear matrix inequalities. Taking into consideration that the affine terms are zeros in some fuzzy rules around the origin of the system, the paper partitions the whole state space into two regions: one is around the origin, and the other where the system state is away from the origin, which is corresponding with an inequality. Taking advantage of the partition and the inequality a novel controller is presented with the help of S-procedure.

Keywords:
S-procedure, Affine T-S Fuzzy Model, LMIs.
Light-weighted Mobile-Net based Human Pose Estimation for AR Service

Byung-Gyu Lee, Ju Young Kim, and Sung-Uk Jung

Intelligent Knowledge Content Research Section
Electronics and Telecommunications Research Institute, Korea

Abstract

As deep neural network technology has been utilized in the field of image recognition, it is necessary to implement the light-weighted network to apply the AR service. In the sense, we propose a new method to estimate the human pose using the modified mobile-net in the AR service. The contribution of this paper is as following. i) the modified light-weighted network is applied to the AR service. ii) the human pose is extracted and analyzed in real time. By the properties, this system can be useful for augmented reality and educational purpose.

Keywords:
Mobile-Net, AR Service, Augmented Reality

I. Introduction

Deep neural network finds increasing deployment for face recognition, object recognition, monitoring so on. The method, now, is utilized as the bridge between the image processing and the real world for practical purposes. However, the many previous approaches need high computation process and resources form the devices so that the many researches to reduce the processing time have been tried. Shang et al.[1] proposed the modified concatenated ReLU which resize the filter size and reduce the computation processing. Kong et al.[2] use high feature concatenation to connect low and high level abstraction information. Howard et al.[3] developed ‘MobileNets’ which implement efficient convolution network for mobile vision. Newell et al.[4] proposed a network with an hourglass-shaped structure, while growing the size to be re-deconvolution as the convolution is repeated.

II. Our Approach

![Diagram of the proposed network of human joint extraction](image)

Figure 1: the proposed network of human joint extraction
The figure 1 shows the overall structure of the proposed light-weighted network. The network uses the stacked hourglass module repeatedly to reduce the processing time. The stacked hourglass consists of ‘MobileNet’ The proposed network shows the heatmap which indicates human's joint using probability distribution. The network input is 192 x 192 pixels image and the output is 48 x 48 pixels heatmap. The heatmap is the information of joints such as head, neck, right shoulder, left shoulder, right elbow, left elbow, right wrist, left wrist, right hip, left hip, right knee, left knee, right ankle and left ankle. We tested our network using Intel i7-7820X CPU and NVIDIA Titan XP GPU. The database utilized is 2017 COCO database set [5]. Currently we are working on multi-person pose estimation method to enhance the performance of our system to apply more scenes easily based on the real space

Acknowledgement

This research was supported by Ministry of Culture, Sports and Tourism (MCST) and Korea Creative Content Agency (KOCCA) in the Culture Technology (CT) Research & Development Program. [1375026932, Development of participational AR platform for large-scale cultural space]

References

Presentation Session 1-2

ICT Convergence

Session Chair: Dr. Ali Rashid

Place: Room # B109

Date: Friday, December 13, 2019

Time: 13:30 – 15:00

   - Hyeok-in Kwon, Eui-jin Park, Mu-gung Hong, Seol-hee Kim, Ju-ho Kim

2. Analyzing the Success Factors of Movie Box-Office Using Customer Reviews with Topic Analysis
   - Zeng Jing, Ho-yeon Park, Dong-ho Kim, and Kyoung-jae Kim

3. Product Recommendation System through Data Analysis
   - Woo-Hyun Park

4. Development of a Pothole Detection Result Management System in Road Aerial Images
   - Yunsung Han, Seok Jin Kim, Dong Wook Lee, June Hong Park, Sung Won Lee, and Dongmahn Seo

5. Selective Exposure of Resonator Surface for the Concentration Detection of Aqueous Solution
   - Rajendra Dhakal and Anish Prasad Shrestha

Hyeok-in Kwon, Eui-jin Park, Mu-gung Hong, Seol-hee Kim, and Ju-ho Kim

Department of Business Administration, Department of Arts and Cultural Management, Chung-Ang University Graduate School, South Korea

Abstract

Home energy management system (HEMS) technology is being applied to smart homes and related industries along with the development of information and communication technology, and the smart HEMS market is also showing remarkable growth in Korea. However, the smart HEMS market is focused on large scale residential complexes, and thus commercialization in general homes is still not up to the mark. To overcome the limitations and expand the smart HEMS market, this study classified smart HEMS consumers and came up with strategies. To this end, we determined the consumer-centered value structure of the smart HEMS by applying the means-end chain theory and the laddering method, and then came up with items of attribute-consequence-value through a literature review and interviews with experts and consumers. Next, applying the association pattern technique, we examined what hierarchical value map consumers have when they are willing to use the smart HEMS. The results of the analysis showed that “Real-time monitoring of usage/charge” was the item most valued at the consumer attribute level, “Saving charge and energy efficiency” at the consequence level, and “Security” at the value level. As for the connections between each level in the hierarchical value map, the ladder structure of “Real-time monitoring of usage/charge—Saving charge and energy efficiency—Sense of accomplishment,” “Real-time monitoring of usage/charge—Saving charge and energy efficiency—Security,” “Service charge—Saving charge and energy efficiency—Sense of accomplishment,” and “Service charge—Saving charge and energy efficiency—Security” emerged as important connections. This study provides implications in that it has set the strategic direction for the expansion of the smart HEMS market by subdividing consumer value.

Keywords:
Means-end chain theory, APT, EMS, HEMS, Smart HEMS
Analyzing the Success Factors of Movie Box-Office Using Customer Reviews with Topic Analysis

Zeng Jing, Ho-yeon Park, Dong-ho Kim, and Kyoung-jae Kim
Department of MIS, Dongguk University-Seoul, Korea

Abstract
The film review website has evaluated and rated the film through several movie fan registration member accounts, thus forming a mode of offline viewing and online evaluation. The online commentary of the movie is analyzed by the Latent Dirichlet Allocation model, and the topics have obtained by the experiment with named as the seven emotions of the viewers.

Keywords:

Acknowledgment
This research was supported by the Ministry of Education and National Research Foundation of Korea (NRF-2017R1D1A1B03032770).
Product Recommendation System through Data Analysis

Woo-Hyun Park

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Sungkyunkwan University, Korea

Abstract

In Korea, credit cards or mobile cards are still more common, so customers are often lined up and left to the salesperson to pay for the products that they selected. However, overseas companies such as Costco and Amazon are making payments using artificial intelligence.

Recently, there are too many new products that come out one day after another. Consumers won’t be able to have hands because they don’t know the taste of the first product they encounter.

It will be easier to buy if consumers know how the taste of snacks is similar to what they have experienced before.

In this paper, we made a product recommendation system through data analysis algorithm.

This system is recommended by examining this type of snack because each person has a preferred product family and tends to buy that product line back mainly.

Keywords:
Recommendation System, VGG16, PCA, Clustering,
Development of a Pothole Detection Result Management System in Road Aerial Images

Yunsung Han, SeokJin Kim, DongWook Lee, JuneHongPark, SungWon Lee and Dongmahn Seo
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Abstract

Recently as the awareness of the pothole increases, many techniques for detecting the pothole have been studied. Among them, we propose a system that manages, backs up and visualizes the results of image processing and machine learning detection systems. In this paper, we propose and implement a webserver system for managing detection technology using image processing and machine learning.

Keywords:
Computing, Communication, Information

Acknowledgment

This work was supported by Korea Agency for Infrastructure Technology Advancement (KAIA) grant funded by the Korea Government (MOLIT). (No.19LRP-C145770-02, Development of Drone-Based Technology for Efficient Maintenance of Cutting Slope and Pavement)
Selective Exposure of Resonator Surface for the Concentration Detection of Aqueous Solution

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Abstract

This paper presents the concept of selective exposure of the resonator surface to the aqueous solution. The SU-8 is used as a passivation layer. Integrated passive device technology was adopted to realize the resonator sensor in a gallium arsenide (GaAs) substrate. The metal layers comprise copper/gold (Cu/Au) in the ratio of 0.9:0.1, respectively. The copper/gold layer was passivated by the SU-8, where only a selective portion of the resonator was kept open [1]. The open portion of the resonator is then used for sensing purposes, where it is exposed to the various concentrations of the glucose solution. The passivated layer prevents the aqueous solution to make contact with other portions of the resonator as represented in figure 1. This method of selective exposure of the resonator help in obtaining a reasonable shift in the frequency response for the various concentrations of the aqueous solution. The port of the resonator was connected to the PCB through the gold wire. The resonator and the PCB are connected to each other through die attach [2-3].

Keywords:
Resonator; Microfabrication; Resonator; Integrated passive device technology

Figure 1. Showing the SU-8 passivation for the selective portion of the resonator.
References


Presentation Session 2-1

Advanced Computing, IoT and Smart Cities

Session Chair: Dr. Gyanendra Prasad Joshi

Place: Room # B102
Date: Friday, December 13, 2019
Time: 15:30 – 17:15

1. Mosaicing Inside Tunnel Images for Tunnel Monitoring
   • Seok Jin Kim, Sung Won Lee, and Dongmahn Seo

2. Automatic Merging and Structuring of Data from Different Catalogs
   • Sharbanu Yermukhanbetova, Gulnara Bektemyssova

3. IoT Enabled Smart Building Operation and Maintenance
   • Lee Che-Kit, Chan Hor-Yin, YIP Kei-Man, Chan Tze-Chun, Yuen Piu-Hung, and Cheung Pui-Yi

4. SmartCare: A Blockchain-based Smart Healthcare for Hospitals
   • Rakesh Shrestha, Rojeena Bajracharya

5. A Survey of Blockchain Security Issues
   • Myung Suk Lee, Dae Jin Jang

   • Ming Xing Wang, Dae Wan Kim
Mosaicing Inside Tunnel Images for Tunnel Monitoring

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Abstract

One of the main reasons for safety accidents is the deterioration of buildings. For the old Social infrastructure, the continuous inspection and maintenance are required to prevent the accident. In the case of tunnels, the checking tunnels make a high cost. This system is a base system for marking each specific location in the tunnel to require repair, on the panoramic image. However, the inside tunnel less features for the generation of panoramic images. This paper proposes a stitching system for inside tunnel images.

Keywords:
Tunnel inspection, Image Stitching, Image mosaicking

Acknowledgment

This work was supported by the Technology development Program (S2622433) funded by the Ministry of SMEs and Startups (MSS, Korea).
Automatic Merging and Structuring of Data from Different Catalogs

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Abstract

The article is devoted to the existing problem of retailers in e-commerce on the Kazakhstan market in combining catalogs into one single format. Due to the rapid growth of online commerce over the past few years, this task is the most urgent and widely spread on the web portals of the country and neighboring states. The key problem is that the description of the same products in different ways are brought in different catalogs. Studying the best solutions of this problem in the world market, analysis, revealed several options for solving this problem.

Keywords:
Merging data, E-commerce, PDF.
IoT Enabled Smart Building Operation and Maintenance

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Abstract

With the characteristics of low power, low bandwidth and long-distance coverage of Low Power Wide Area Network (LPWAN) devices, massive and rapid deployment of Internet-of-Things (IoT) sensors can be achieved. To benchmark different LPWAN technologies, a physical testing ground has been established and different types of IoT sensors were installed in meeting rooms, car parks and toilets for space management applications. IoT sensors were also installed at venues without Building Management System to collect the operating status of equipment. This paper will discuss the adoption of IoT technologies in smart building operation and maintenance with a view to providing a cost-effective solution for near-to-real-time monitoring and demonstrating the benefits of building a common IoT network infrastructure for sensor connectivity.

Keywords:
Sensor Network, Operation and Maintenance
SmartCare: A Blockchain-based Smart Healthcare for Hospitals

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Abstract

Today, everyone has mobile devices such as smartphones, tablets etc., so they can monitor their health condition within click of their fingertips staying in their comfort of homes. They can now self-monitor and manage their health condition. This improves the quality, efficiency as well as low cost for health management system. The proposed SmartCare is based on Blockchain (BC). BC is a distributed public ledger or database of records that stores all the transactions between nodes. BC stores all digital events that have been executed and shared among participating nodes. BC has potential to change healthcare system, considering patient as the focus of the healthcare ecosystem. The BC helps to protect the privacy of the patient as well as secure his medical interaction with the hospitals and sharing of health information. The SmartCare based on BC and smart contract provides a new model for health data exchanges by recording digital events in a well-organized manner, secure and without intermediate parties. SmartCare acts as a health-monitoring log that empowers patients to take control and manage their long-term chronic conditions like cancers. A private regional blockchain is used to store all the history of medical information of the patients. The blockchain supports smart contract between the patient and the hospital. The blockchain store only the digest of the medical history while the raw data is stored in the off chain for scalability. Only the pseudo identity of the patient and hospital is used to preserve privacy of both the entities, i.e. the identities unlikable to their original ID such as citizenship ID etc. In SmartCare, after consultation or treatment by the doctor, health data is recorded in blockchain. If required, the health information can be shared with other third party such as research institution based on the smart contract between the patient and the hospital. The patients can have some control over their data such as they control their medical data and control how it is used and shared by the third parties like institutes. Smart contracts are used that represents the historical medical record of the patients within individual nodes on the network. The SC consists of metadata of medical records, permission and data integrity that provides privacy and security of the member nodes in the blockchain.

Keywords:
Blockchain, Smart Healthcare, Smart Data, Health Information
A Survey of Blockchain Security Issues

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Abstract

Blockchain platform allows the maintenance of a shared distributed ledger, which can be simultaneously read/modified by participants without being owned/controlled by a central unit or person. The transparency of the Blockchain technology has inspired several IT engineers leading to the development of application, projects, and startups in the financial sector as in areas related to IoT, public and social services, security and privacy, reputation systems, and so on. This article focusses on important Blockchain features and summarizes security and performance issues. We hope this work motivates unexperienced researchers to tackle security and privacy issues of Bitcoin systems, to provide a roadmap for Blockchain developers when selecting appropriate techniques in different scenarios, as to aid researchers in considering it for future research topics.

Keywords:
Blockchain, Security, Attack Type, P2P
Investigation of Ecological Marketing Strategy based on Technology-Organization-Environment Framework

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Abstract

Ecological marketing strategy is a new marketing concept for sustainable development. The goal of ecological marketing is to enable members in an ecological system to make profits and achieve a win-win situation. This paper uses a single case study approach in aligning the concepts and guidelines prescribed by the TOE framework to MI. The qualitative research method of content analysis will be used to analyze secondary sources such as MI corporate sustainability reports, journal articles, case study materials, trade publication articles, etc. Most of these materials are freely available on the web. This paper aim to combines the research results of predecessors from the perspective of enterprise development experience and takes MI Company as a typical case to analyze the current situation and problems of ecological marketing strategy based on the TOE framework. After comprehensive analysis, the other modern enterprises can learn more about ecological marketing strategy and realize ecological marketing can be concluded. Moreover, both the result and the analytic framework of Ecological marketing can also be a reference for modern enterprises to obtain their own interests and establish a symbiotic ecological marketing system.

Keywords:
Ecological Marketing Strategy, Technology-Organization-Environment Framework, MI
Contemporary Digital Convergence Business

Session Chair: Dr. Sudan Jha

Place: Room # B109
Date: Friday, December 13, 2019
Time: 15:30 – 17:15

1. Innovation Ecosystem Development Strategy for Activation of Startup and Technology Commercialization in Daejeon
   - Won-il Lee

2. A Study on the Application of RNN Technique to Predict Smartphone Purchase
   - Minho CHO

   - Rasid Ali, Muhammad Zubair Islam, Hyung Seok Kim

4. Effects of SNS on the Use Intention of Unmanned Aircraft Delivery
   - Jun-Wei Cao

5. Authentication and Key Establishment in Internet of Things
   - Anish Shrestha
Innovation Ecosystem Development Strategy for Activation of Startup and Technology Commercialization in Daejeon

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Abstract

This study analyzes the ecosystem of entrepreneurship and technology commercialization in Daejeon from the perspective of the innovation cluster. In Daejeon, the technology commercialization ecosystem consists of the support system of Daedeok Innopolis and local start-up institutions. Daejeon's innovation cluster will be able to develop further when the two institutions are not separated for the growth of start-up venture companies in Daejeon, but when they cooperate with each other to support start-up companies and technology commercialization. Strategies for fostering the ecosystem of startup technology commercialization in Daejeon are as follows. First, the vision and strategy should be established so that the Daedeok R & D zone and the local entrepreneurship policy can be organically linked. Second, a technology commercialization network linkage that can be linked to technology and markets should be established. Third, efforts should be made to establish a technology commercialization ecosystem so that local social capital can be formed through the founding technology commercialization policy in Daejeon.

Keywords:
Innovation ecosystem, Entrepreneurship, Startup, Technology commercialization

Acknowledgment

This research was supported by the research fund of Hanbat National University in 2018
A Study on the Application of RNN Technique to Predict Smartphone Purchase

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Abstract

This study is about how to use RNN among the techniques of deep learning. Especially, we focus on predicting which products to buy based on factors that influence customer purchasing decisions. Based on the data obtained from the survey, we applied RNNs to predict customer purchases. As a result, we have a good result in purchase forecasts and hope to use them in business area.

Keywords:
RNN, Prediction, Machine Learning, Data Analysis.

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Abstract

The next generation of cellular networks, such as 5th generation (5G) communication technology will be characterized by ultra-fast transmission rates, ultra-high reliability, ultra-low latency and ultra-dense connected user equipment (UE). The 3rd Generation Partnership Project (3GPP) has recently introduced 5G new radio (NR) access technology, the 5G NR is designed to match 5G ultra-reliable low latency communication (URLLC) requirements with the help of the millimeter wave (mmWave) band, massive Multiple Input Multiple Output (mMIMO), a flexible Orthogonal Frequency-Division Multiple Access (OFDMA) and novel deployment scenarios. 5G NR has been standardized by 3GPP with a first specifications draft, known as Release 15 in December 2017, whereas a full version is published in June 2018 in the Release 16. However, MAC layer resource allocation (MAC-RA) techniques of this 5G NR for URLLC requirements are still in the process of proposals from the industrial as well as institutional researchers.

Therefore, in this paper, we present a machine learning enabled theoretical framework of potential MAC-RA in 5G NR to achieve URLLC requirements. We completely redesigned it from the original 5G version that is MAC protocol for long-term evolution (LTE), because of the lack of support of machine learning-based multiple access. In addition, we present an intelligent channel access strategy, to support distributed coordination function based (DCF) resource allocation in 5G NR channel access.

Keywords:
5G, MAC, Resource Allocation, URLLC
Effects of SNS on the Use Intension of Unmanned Aircraft Delivery

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Abstract

본 연구는 중국의 소비자가 SNS에서 무인항공기 택배에 대한 인지적인 이해를 바탕으로 기술수용모형(Technology Acceptance Model TAM)을 사용하여, 중국 소비자의 무인기 택배를 수용 및 활용에 영향을 미치는 요인을 실증적으로 분석하고자 한다. 연구 모델을 설계하기 위하여 중국의 주요한 SNS 플랫폼(웨이보, 위챗 등)에서 무인항공기 택배’의 키워드가 포함된 데이터를 수집하며, 빅 데이터 플랫폼“TextOm”을 활용하여 데이터를 분석하였다. UCINET 를 통해 정리된 데이터를 CONCOR 집단화 분석하고, 중국 소비자가 무인항공기 배송의 인지에 영향을 미치는 9개의 요인을 도출하였다. 그리고 TAM 모형을 바탕으로 본 연구의 연구 모형 및 가설을 제시하였다. 이를 실증적으로 검증하기 위하여 중국 각 지방에 거주한 시민들을 대상으로 설문지 분석을 하였으며, PLS(partial least square) 기법을 활용하여 실증 분석하였다. 본 연구 결과가 물류 업체의 무인기 택배를 발전시키기 위한 이론적 근거와 실무관련 발전 전략을 제공할 것으로 기대된다.

Keywords: 무인항공기, 빅 데이터, 소셜네트워크 분석, TAM모형, SmartPls
Authentication and Key Establishment in Internet of Things

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Abstract

With wide availability of broadband internet and abundant devices with in-built sensors and connecting capabilities, new doors for the proliferation of internet of things (IoT) are opening each day. The IoT paradigm envisions billions of interconnected devices deployed just about everywhere, from inside of human bodies to the most remote places of the world. IoT can be viewed as a fusion of heterogeneous networks of large-scale sensor networks, mobile communication networks and the internet itself. As such, it comprises connecting nodes with different storage capacity, communication range, battery life and computing capabilities. Under these circumstances, traditional schemes for exchanging and securing data across the entire heterogeneous network become completely impractical. The research problems related to IoT security is different, for it is far more complicated due to endless variety of IoT applications, devices and users involved in it. Therefore, targeted solutions to each aspect of IoT network should be studied, particularly authentication together with key management considering heterogeneous nature.

Just as in any kind of network, an IoT device should also be first identified and authenticate itself before receiving or transmitting data to establish a trusted computing baseline. Considering resource constrained IoT devices, the cryptographic operation involved in securing IoT should not consume heavy energy. Furthermore, round trip time should also be minimal to reduce latency and maintain acceptable quality of service. While public key cryptography (PKC) is in demand for authentication and key management protocols in smart objects networks, the required resource for public key primitives is much larger than that of symmetric key primitives because PKC relies on computation expensive modular exponentiation. Therefore, lightweight cryptography based on a symmetric key cryptography is preferred for IoT [1]. It should be remembered that rapidly growing number of objects will make the key management a difficult task. Furthermore, authentication between two nodes that require several intermediate hops for communication will require end-to-end security. To overcome such problem, an integration of information-theoretic security based physical layer (PHY) security key generation and computation-based encryption can be opted as one of the best solutions [2].

A PHY key generation technique can allow to generate a secret key between any two users. The PHY key is generated from physical attributes by verifying the dynamic features of the associated physical communication links such as channel state information (CSI), received signal strength indicator (RSSI), etc. as well as characteristics of devices such as I/Q imbalance, carrier frequency offset (CFO), etc. [3]. The major benefit of adopting PHY key generation is that it avoids the problem of key management and distribution in device-to-device (D2D) scenarios. The communicating devices can generate shared secret key on the fly. However, it should
be noted that requirement for authentication in IoT tend to be end-to-end (E2E). To achieve E2E, ticket-based scheme [4] can be adopted which will not only allow E2E authentication, but also generate secure session key between two end users.

Consider a scenario where several IoT sensor nodes require to communicate with destination node (DN), e.g., Internet host, through some intermediary nodes and IoT cloud. Since not all sensor nodes can directly access to IoT cloud, some routing path is established. We assume there are $N$ sensor nodes form a path through which sensor node is connected to further intermediate nodes and finally to IoT cloud. Intermediate nodes tend to keep changing with time. This arises problem in key management among $N$ sensors and the intermediate nodes. The key management has to be dynamic in nature. In order to avoid the need to PKC, we assume there is a trusted third party (TTP) located in IoT cloud. Each IoT sensor nodes are equipped with a unique master secret key before deployed in the real-world environment. This master secret key is known only the TTP and the respective IoT sensor nodes. In the same way, DN also shares a secret key with the TTP.

Each sensor can be indexed as $n_i$ such that $i = 1, 2, ... N$. As such, each sensor $n_i$ share a secret key, $k_i$, with the TTP. For the source IoT sensor node (SN) to make an end-to-end secure connection with DN, it has to establish a secure path through other IoT sensor nodes, intermediate nodes, and IoT cloud. Under such circumstance, the secure path within the sensor networks can be established by generating key from physical layer attributes. This will help to establish key between each pair of devices (SN and $n_2$, $n_2$ and $n_3$). The SN will be able to access TTP through this path. The TTP can verify the SN and issue a ticket containing session key to SN. The source node can finally present this ticket to DN and successfully establish E2E secure connection. This kind of scheme will also mitigate to necessity to derive session key at the sensor nodes reducing the computational burdens. Therefore, the total number of keys to be managed also limits to $N$ instead of $N(N - 1)/2$. In addition, PHY keys are dynamic in nature and it is not required to be stored. Besides, PHY keys also do not require any pre-shared secret seed for generation.

Keywords:
IoT, Information Security, Cryptography, PKC

References
Contemporary ICT Convergence Trends

Session Chair: Dr. Dae Wan Kim
Place: Room # B102
Date: Friday, December 14, 2019
Time: 10:00 – 12:00

1. Smart Vault: Trustless Vault using IoT
   - Gopal Ojha, Rohit Kumar, Rakesh Shrestha

2. Evaluating Model of Mobile Social Networking Sites
   - Srijana Acharya

3. Unified Framework of O2O Service Usage Intention and Behavior
   - Hikmat Bahadur Bhaat

4. The Architecture of a Wearable Smart Device System
   - Jong-Gyu Chae

5. Major Success Factors of New Technology Adoption
   - Young-II Hong, Dae Wan Kim

6. Evaluation on Mobile Marketplace UI / UX
   - Sang Tae Kim
Smart Vault: Trustless Vault using IoT

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Abstract

Private property are safely kept in bank which fully depends on the trust of the bank. Third party agents are involved in keeping the safety of the property. However, the malicious actors are responsible for theft of the property stored in the third-party vaults. Existing Systems [1, 2] focus on the operation on the vault, whereas, which does not give proper transparency and immutability of the events in the vault. The safety of the owner property is a challenging issue unless the transparency of immutable vault operation is carried out. Blockchain have the benefit of Distributed application, in which smart contract allows for rules and execution instructions to perform predetermined processes on the blockchain in an automated, decentralized, and distributed manner. This paper proposes the trustless vault based on smart contract. The vault is connected with the Internet of Things (IOT) device, which processes the signals as per the owner’s instructions. The state on the vault are open and close, the operation for this state is determined by the smart contract. The smart contract executes and changes the state of the vault only when the contract condition is satisfied. Each transaction history is stored in the blockchain. The properties and advantages of blockchain realize the trustless vault, as any operation on the vault is tracked by the blockchain. This makes significant effect of the trust on the blockchain and trustless smart vault.

Keywords:
Blockchain, Immutability, IOT, Smart Contract, Transparency

References

Evaluating Model of Mobile Social Networking Sites

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Abstract

Social networking service (SNS) is the online based services with a webpage of the user profiles and their social circles and enables to maintain the social relationships with the others. SNS provides the features of tagging, search, picture management, comment on the wall, instant messaging (IM), real-time stream, grouping, networking, blogging, social plug-ins available to share interests, holding activities, posting events and managing social relations with their individual networks, RSS, widget, community and external content interaction. Mobile social networking sites (MSNS) are a subordinate of social networks, in which users make access to the social networking resources via portable mobile devices with underlying communication technologies. The pure form of the mobile social networks evolved from the convergence of mobile functionality, social networks and location-based services. These pure forms of location based mobile social network service has the features of geo-tagging, mobile image uploads and check-ins. The usages of MSNS are for information, professional, dating, multimedia and content sharing, social connection and the education. On the basis of this, this study suggests an evaluating model of mobile social networking services. The challenges of MSNS evaluating model are to provide appropriate, useful, and relevant theoretical background to further research and practical insight for mobile business area.

Keywords:
Mobile Social Networking Sites (MSNS), Evaluating Model, Theoretical Background, Practical Insight.
Unified Framework of O2O Service Usage Intention and Behavior

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Abstract

Utilizing online business plan and marketing strategies to improve the internet presence for an online store is important to operate the offline businesses for the hyper connected online marketplace. Because, world is digitalizing itself for more work benefits and comforts; lots of opportunities and challenges are coming to its way. Online to offline (O2O) services is bringing more opportunities to both business and consumers as an innovative e-commerce model. O2O deliver platforms for the online communication and transactions of service provider enterprises, focusing into the sales and services and open another booming channel of e-commerce industry. O2O service is the latest advanced and essential choice of most successful enterprises; so many big enterprises are implementing online to offline service in their business. The study ensures those essential factors to make usage intention by customer to adopt O2O service as for comfortable and convenient service. Regarding this situation, this study provides a unified framework of O2O service usage intention and behavior.

Keywords:
Online to offline (O2O) Services, Unified Framework, Intention Behavior
The Architecture of a Wearable Smart Device System

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Abstract

This study proposes a wearable smart device system architecture which consists of three elements: (1) a sensor part which has an input function, (2) a control part which is in charge of calculation or judgment, and (3) an output part which displays data and connects to IoT. The wearable smart device system architecture proposed by this study is a general model, the usage of which is expected to increase. It is also expected to raise customer satisfaction and understand with wearable products in the IoT environment.

Keywords:
Architecture, Wearable Smart Device System, Sensor, Control
Major Success Factors of New Technology Adoption

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Abstract

In order to actively keep up with the changes in the global business and market environments, it is very important to adopt new technologies, such as convergence technology, to increase the competitiveness of enterprises. Three factors that contribute to the success of adopting new technologies are; 1) managements’ understanding and interest in new technologies, (2) middle managers’ and workers’ understanding of and attitude toward new technologies; (3) the technical and marketing competence of companies that offer new technologies. These three factors are all necessary for good results. The model of new technology adoption that are proposed in this study are all conceptual, therefore, in-depth analysis is required in further empirical studies, in which they will be applied to corporations.

Keywords:
Success Factor, New Technology, Adoption
Evaluation on Mobile Marketplace UI / UX

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Abstract

E-commerce has enabled companies to conduct their entire production and distribution tasks through the Internet-based Web, thereby reducing off-line costs and securing highly efficient business processes using various online benefits. Large-scale manufacturers and distributors of existing offline companies have acquired market dominance with pricing policies and services that cannot be applied to existing distribution structures by applying an online marketplace platform to their infrastructures. These characteristics also apply to agricultural products distribution, which allows a variety of benefits when trading through the online marketplace platform of agricultural products. The online marketplace platform environment based on mobile technology not only promotes sales through sales promotion of agricultural products but also enables a platform for users to use the efficient platform, thereby providing more convenient on-site computing and work environment for maximizing added value can do. This study analyzes and studies the environment of related cases to understand these characteristics.

Keywords:
Marketplace, Convergence, Distribution Platform, Farm Produce