

Wednesday, February 5

Wednesday, February 5 9:30 – 11:00

O-CI1: Communication and IoT – 1

Room 1 | Chair: Woontack Woo (KAIST, Korea (South))

Temperature Beat Sensor for Energy Efficient, Long Range Smart Monitoring Systems
Van-Phuc Hoang (Le Quy Don Technical University, Vietnam); Van-Lan Dao (Malardalen University, Sweden); Van-Binh Dang (Le Quy Don Technical University, Vietnam)

Beat sensor has shown its large potential to address issues of smart environment monitoring such as real time drought management. This paper presents an efficient temperature Beat sensor for energy efficient, long range smart monitoring systems by combining a new technique of Beat sensor with long range (LoRa) communication protocol. With the compact circuit size and the low energy consumption, the proposed sensor can be applied for Internet of Things based smart monitoring systems. The analysis and experimental results have clarified the advantages of the proposed temperature Beat sensor and its potential applications.

Optimized solution for very-high performance DNS server over common server
Nguyen Minh Dung and Duong Hoang Hai (Viettel Cyber Security Company, Vietnam)

DNS server becomes more and more importance when new technologies such as IOT, 5G, 4.0 are deployed and their traffics are very-huge. Also, DNS servers influence to customer experience using Internet or Mobile. There are many commercial & open-source solutions for DNS server but the performance is too low and lacking accurately determined benchmark method or performance numbers. This paper proposes a new approach that can boost performance upto 20 times compared with normal solutions with strictly benchmark & evaluation methods. This approach using Intel DPDK framework and other optimization techniques over common servers and can be applied efficiently in ISP networks.

An IoT Node with Organic Pressure Sensor for Structural Health Monitoring System
Chien Duc Khong (Le Quy Don Technical University & Faculty of Radio-Electronic Engineering, Vietnam); Toan Dao (University of Transport and Communications, Vietnam); Anh Bui Tien and Van-Phuc Hoang (Le Quy Don Technical University, Vietnam)

In this paper, we develop an IoT node with organic pressure sensor for structural health monitoring (SHM) system. A 100um-thick polyurethane film is sandwiched by top/bottom electrodes to complete the flexible pressure sensor fabrication. IoT sensor nodes using available low-cost components in the market are designed for the SHM system. Sensors collect data about the state of structural infrastructures and send information to a virtual private server through a gateway. A website on hosting server is built for the purpose of SHM including monitoring signal, storing data and other administration tools. Experiment results show that the IoT node with organic pressure sensor has high potential in SHM application. The organic pressure sensor manufacturing steps and the SHM system are also described in detail in this paper.

An Efficient Channel-Aware Cluster-Based Routing Protocol in Cognitive Mobile Ad Hoc Networks

Thong Nhat Tran, Nguyen Toan Van and Beongku An (Hongik University, Korea (South))

In this paper, we propose an efficient channel-aware cluster-based routing (CCR) protocol in cognitive mobile ad hoc networks to improve the network performance. The proposed CCR protocol includes clustering and routing phases. In the clustering phase, we propose a stable cluster algorithm based on connected dominating set to provide a stable routing space for the routing phase. In the routing phase, the CCR routing protocol is proposed based on channel-aware approach to obtain a route which avoids the affected region of primary user. Finally, the CCR protocol is implemented in OMNET++ platform to show the advantage of the proposed CCR protocol over the AODV protocol in terms of control overheads and packet delivery ratio.

Security Attacks on Wireless Sensor Networks

Kashif Abbasi (GSESIT, Hamdard University & University Kebangsaan Malaysia, Pakistan)

Wireless Sensor Networks play a vital role in modern day communication process. These networks comprise of battery driven unattended wireless sensor nodes. Therefore power consumption and proper operation to the most optimum level is a real constraint in these networks. The security issues in these networks are of prime concern as there are many flaws in the security design of wireless sensor networks. The traditional measures which are used in mitigating such attacks cannot be directly implied in wireless sensor networks as the nodes are tiny and cannot fulfill high computational requirements of such measures. Attacks may take place in different fashions, either to hinder the proper operation of nodes or to deplete their energy levels to a minimum so that they become useless. The attacks on wireless sensor networks are very versatile. In this paper, different types of security attacks are discussed. Specially the impact of DoS and DDoS attacks in wireless sensor networks are discussed in detail.

Performance Analysis of Bit-Shuffle Coding in Multiple-Input Multiple-Output Visible Light Communication

Mingyu Sung, Hyoju Seo and Yongtae Kim (Kyungpook National University, Korea (South)); Dong-Hee Yoon (Kyungil University, Korea (South)); Youngsun Han (Pukyong National University, Korea (South))

Visible light communication (VLC) that exploits light-emitting diode (LED) devices to transfer data is one of the most promising wireless communication technologies. However, the flicker is an undesirable effect in VLC and needs to be addressed. In this paper, we propose a bit-shuffle coding based multiple-input multiple output (MIMO) VLC and analyze the performance of the system in terms of dimming level and ratio of level change to investigate the flickers. The experimental results have proven that the shuffled data part under the bit-shuffle coding scheme is well suited for the MIMO VLC while the metadata can be possible to cause frequent flickers, requiring a technique to mitigate the flickers.

A Robust Registration Method for Improved Field of View

Hyunsik Ahn and Muhammad Siddiqui (Tongmyong University, Korea (South))

The existing commodity of RGB-D sensors have a limited field of view (FOV) in comparison of wide angle RGB lens. That can restrict the activates of applications using RGB-D sensors e.g., virtual reality, robot vision etc. This article presents a robust real-time method to extend field of view using RGB-D sensor camera. The research consists of three phases. The extraction of 2D feature key points from pair of overlapped RGB image. Second, estimate and extract the identical pixel values from correspond aligned depth image. Finally, generation of registered color and depth image from RGB-D sensor. Furthermore, the textured 3D point cloud generated to analyze and compare with ICP registration results.

Analysis of Deep Model Training and Instance Segmentation on Tubo Dataset

Hyunsik Ahn (Tongmyong University, Korea (South)); Muhammad Sadiq Amin (Tongmyong University Busan South Korea, Korea (South))

The recent improvement in the deep learning a subgroup of machine learning in object recognition and detection problems has influenced human safety. DL becomes first choice applicable in different application domains like Mobile intelligence and web technologies. A natural disastrous situation like earthquakes is a nightmare for humans from the beginning. We step in to use deep learning approach for recognition of harmful objects in living rooms. In this paper, we present training analysis of YOLO our own dataset for indoor objects and then applying instance segmentation on our large surveyed indoor objects dataset images. We use these objects to predict harmful in unfavorable circumstances like earthquakes.

Behavior, Situation, and Cyber Space in Situation-based Assess Tree

Duckki Lee (Yonam Institute of Technology, Korea (South))

Despite their progress and advances, most present telehealth systems do not perform as effectively as would be expected due to asymmetric focus on sensing and monitoring with little focus on affecting or altering behaviors. We developed Action-based Behavior Model (ABM) that supports persuasion in telehealth system. However, ABM requires an assessment of user behavior responsiveness and compliance to cyber influence. In response, we developed Situation-based Assess Tree (SAT) as a methodology for domain-specific behavior assessment under ABM. In this paper, we describe formal definition of behavior, situation and cyber space and role and methodology of behavior, situation and cyber space.

A Study of Korean Online Reputation Analysis using Compound Word

JIn Hoon (Kyonggi University, Korea (South)); Yong-Gyu Jung (Eulji University, Korea (South))

Increasingly, attempts which to analyze or predict reputation using document corpus written in Korean are growing more and more. This includes various trend analysis demanded by governments, research institutes or industries their own purposes. Typical examples include one for predicting the candidate's chances of winning in election, another for predicting the possibility of a company's insolvency or a change in stock prices, and the other for applying it to marketing through a survey on the recognition of newly launched products. These studies are mainly lexical analysis using TF-IDF based on single keyword frequency or occurrence of online publication such as news articles, so research on semantic analysis is increasing in text analysis domain as the contextual meaning becomes more important. However, unlike English, Korean has a linguistic characteristic consisting of a combination of initial consonant - medial consonant - final consonant and irregular variations of endings or postposition. Thus, the lexical analysis method has mostly used a single keyword until recently. In addition, even in the case of a single keyword, variation of inflection in verbs and adjectives used for sentiment analysis is severe except for nominalizer ending so that it is difficult to use stemming or lemmatization that are often used in English sentence processing tasks. Therefore, in order to solve this problem, it is necessary to attempt to process compound words of two or more words

Association Analysis by Symptom of Infectious Diseases Using Weight and Time Series Characteristics

Hyoseon Kim (Eulji University, Korea (South))

Inflammatory bowel disease is an intractable disease in which inflammation occurs in the digestive organs including the large intestine such as inflammatory bowel disease and Crohn's disease. The number of patients with inflammatory bowel disease was 47,164 in 2013, 61,170 in 2017 (40,939 ulcerative colitis, 20,231 Crohn's disease), an increase of 29.7% compared to 2013. Forced hearing is important for the diagnosis of infectious enteritis, and this is the main complaint in interviews where this kind of military listening is an early stage. In this study, we analyzed the frequently occurring words from the EMR data recorded at such an inquiry stage, found the association rules between the analyzed frequent words, and identified the association rules that were discovered at the hospital's initial visit stage. It will help to develop a medical plan for medical staff.

CNN Object Classification Model with Automatic Non-uniform Filtering Level Decision

Jaeho Oh (Dongguk University, Gyeongju, Korea (South)); Sang-Woo Ban (Dongguk University, Korea (South)); Youk Dong-Bin and Kim Mincheol (Dongguk University, Gyeongju, Korea (South))

We analyze the effectiveness of an automatic non-uniform nonlinear filtering level decision method during saliency based non-uniform transformation preprocessing of input image for enhancing the performance of a convolutional neural network model. Experimental results show that the proposed automatic non-uniform filtering level decision method generates proper performance in order to outperform a general convolutional neural network model without nonlinear input image transformation.

A Study on Brain Pressure Measurement Using MEMS Pressure Sensor

Kyu-Sik Shin (Korea Electronics Technology Institute, Korea (South)); JiHyoung Roh (Daegu-Gyeongbuk Medical Innovation Foundation, Korea (South))

Intracranial pressure (ICP) measurement is an important part of the brain monitoring system. The increasing of brain tissue, blood and CSF (cerebrospinal fluid) influence on ICP rising, it gives a life-threatening, but The conventional pressure sensor for ICP is too big to implant in the human brain. The pPPD (Physical Pin Probe device) for measuring ICP was developed using MEMS (Micro Electro Mechanical System) technology. The pPPD is composed of a pressure sensor and a temperature sensor. Its shape is small and sharp like a pin in order to be inserted into the brain tissue. The ICP sensor was designed to be the honeycomb structure shape composed of arrayed ultra-small unit pressure sensing cell. It was fabricated to be micro capacitive type sensor with using the surface micromachining process. The size of fabricated ICP sensor is $400\ \mu\text{m}$ (W) \times $1000\ \mu\text{m}$ (L) \times $300\ \mu\text{m}$ (T). The pPPD was evaluated in 1 bar to 1.3bar of the absolute pressure. Its initial capacitance (C_0) was 7.0~7.5pF and its measured average sensitivity was about 1.74 pF/bar. In addition, pressure sensor was applied to rats to measure pressure change caused by brain edema.

A Design of FPGA-based system for Partial Discharge detection using advanced material sensors

Phuoc Nguyen, SeokJin Eo and LokWon Kim (Kyung Hee University, Korea (South))

The detection of partial discharge sources using systems with heterogeneous sensors has increasingly attracted research attention. The advancement in nanotechnology has introduced various elegant sensors with not only satisfactory sensitivity but also additional useful attributes such as energy harvesting. In this paper, the development of two sensors (piezoelectric and ultraviolet) based on advanced materials (zinc oxide nanorods) from the nanotechnology field is introduced to characterize their features. We also propose a FPGA-based system that could utilize the developed sensors for partial discharge detection and form a flexible data transmission.

A 400-MHz CMOS Passive Mixer for MedRadio Application

Jin-Man Myung, Seung-Jik Lee and Ilku Nam (Pusan National University, Korea (South))

In a conventional passive ring mixer consisting of four NMOS switches, the IF output signal is compressed by the threshold voltage characteristics of the NMOS switch when the RF input power increases. To overcome this problem, a passive ring mixer composed of NMOS and PMOS switches is proposed. In addition, the linearity of the proposed mixer is improved by connecting the source and body of each switch transistor with a resistor. The proposed mixer has been designed using 180-nm RF CMOS technology. It shows the voltage conversion gain of -4.2 dB, input P1dB of -2 dBm, IIP3 of 15 dBm, and NF of 8 dB.

A 0.4-1.4GHz Wideband Noise Canceling CMOS Low Noise Amplifier

Geon Woo Park, Yang ji Jeon and Ilku Nam (Pusan National University, Korea (South))

This paper presents a wideband noise canceling low noise amplifier (LNA) composed of a common source amplifier and a common gate amplifier. The common gate stage is used to simplify input matching in the wideband. In order to improve the noise performance at output node, the gain of the common gate path equal to that of the common source path. The low noise amplifier has been designed using a 180-nm CMOS process. The low noise amplifier consumes 12.9 mW at 1.8-V supply voltage. It has gain of more than 10 dB, noise figure of lower than 3.4 dB, and an input return loss of less than -10 dB from 400 MHz to 1.4 GHz.

Performance Optimization of Nitrogen Dioxide Gas Sensor Based on Pd-AlGaIn/GaN HEMTs by Gate Bias Modulation

Nguyen Van Cuong and Hyungtak Kim (Hongik University, Korea (South))

We investigated the performance of NO₂ gas sensors based on AlGaIn/GaN high electron mobility transistors (HEMT). The gate area of the HEMT sensor was functionalized using a Pd layer for NO₂ detection. In this paper, we demonstrated the possibility of adjusting the gate bias to optimize sensitivity, which exhibited the advantage of sensors based on HEMT compared to Schottky-diode-type sensors. At 350 °C, the sensor showed a huge improvement of sensitivity, from 17.5 % at VG=0 V to 50.1 % at VG=-0.8 V under 100 ppm concentration of NO₂ gas.

A Cluster-based Namespace Design for Single Channel Information-Centric Wireless Sensor Networks in Smart City

Donghak Kim (Hongik University, Korea (South)); Muhammad Atif Ur Rehman (Hongik University, Sejong, South Korea, Korea (South)); Hyun-Doo Jin (PSM Graduate School, Hongik University, Korea (South)); Byung-Seo Kim (Hongik University, Korea (South)); Rashid Ali (Sejong University, Korea (South))

The promising emerging Information-Centric Networking (ICN) architecture specifically the Named Data Networking (NDN) has earned extensive attention in academia. In NDN based Internet, the name component in the Interest packet is unbounded and can be of any length. However, the naming schemes for Wireless Sensor Networks (WSNs) must have a limited length of names that can fit into 127 bytes small Maximum Transmission Unit (MTU) size. In this paper, therefore, we propose a cluster-based limited length namespace design for single-channel Information-Centric WSN (IC-WSN). Simulation results demonstrate that the proposed namespace design decreases the un-necessary packet transmission in the network and thus improves the overall performance of the network.

Energy-Efficient Cluster-head Declaration Mechanism for Wireless Sensor Networks

Muhammad Salah Ud Din (Hongik University, Sejong, Republic of Korea, Korea (South)); Muhammad Atif Ur Rehman (Hongik University, Sejong, South Korea, Korea (South)); Rehmat Ullah (Hongik University Sejong Campus, Korea (South)); Hyun-Doo Jin (PSM Graduate School, Hongik University, Korea (South)); Byung-Seo Kim (Hongik University, Korea (South))

Nodes in wireless sensor networks (WSNs) are resource-constrained in terms of energy, storage, and computational capability. Energy is one of the major constraints which requires an efficient mechanism that takes into account the energy consumption of nodes to prolong the network lifetime. Clustering is the most popular approach to minimize energy consumption of nodes and prolong the lifetime of the network. This paper presents an efficient CH declaration mechanism that effectively balances the network load and significantly minimizes the re-clustering operation which results in low control overhead. Simulation results show that our proposed scheme minimizes the control overhead thereby reduces the power consumption in the network.

Wednesday, February 5 11:00 - 11:15

Coffee Break

Rooms: Room 1, Room 2, Room 3

Wednesday, February 5 11:15 – 12:00

K1: Opening Ceremony & Keynote Speech I (Ballroom)

Rooms: Room 1, Room 2, Room 3 | Chair: YongSoo Choi (Sungkyul University, Korea (South))

Wednesday, February 5 12:00 – 1:30

Lunch | Rooms: Room 1, Room 2, Room 3

Wednesday, February 5 1:30 - 3:00

O-CNS: Computer and Network Security

Room 1 | Chair: Young-Hoon Park (Sookmyung Women's University, Korea (South))

***Developing root problem aims to create a secure digital signature scheme in data transfer
Luu Xuan Van (People's Security Academy, Vietnam); Luu Hong Dung (Hoc vien Ky
thuat quan su, Vietnam)***

This paper presents the proposed method of building a digital signature algorithm which is based on the difficulty of solving root problem and some expanded root problems on Z_pZ_p . The expanded root problem is a new form of difficult problem without the solution, also originally proposed and applied to build digital signature algorithms. This proposed method enable to build a high-security digital signature platform for practical applications.

Comparison of Interactivity Performance of Linux CFS and Windows 10 CPU schedulers
Wai Kong Lee, Chee Siang Wong and Wei Cong Fan (Universiti Tunku Abdul Rahman, Malaysia); Seong Oun Hwang (Hongik University, Korea(South))

One of the main goals of a user-oriented operating system design is to ensure low response time of interactive tasks. Otherwise, high scheduling latencies will become obvious to the user and will in turn affect the user experience. One of the most popular benchmarks that can measure interactive tasks response time is Interbench. However, Interbench was only available in Linux, thus making interactivity performance benchmarking for other operating systems impossible. This research ported the Interbench to Windows operating system so that the interactive performance of Windows and Linux can be evaluated and compared. We studied the effect of various simulated workloads on interactive performance of both operating systems and concluded that the Linux CPU scheduler tends to have lower latencies than Windows 10 in most scenarios, except when a heavy background load is executed concurrently with heavy load interactive task.

Blockchain-based Mobility and Security Management using Smart NAT devices
Younchan Jung (The Catholic University of Korea, Korea (South)); Ronnel Agulto (The Catholic University of Korea, Philippines)

For lots of IoT devices connected to different private IPv4 networks, Network Address Translation (NAT) is an important issue to be solved because of traversal problems in end-to-end applications. Currently, NAT is controversial because NAT devices should process up to layer 4 while normal routers do up to layer 3. As a smart NAT, this paper suggests to use NATv2 which does not use port number field in layer 4. This paper proposes a Blockchain-based Integrated Management (BIM) system where the the NAT, mobility and security management is handled at once. The proposed BIM scheme is advantageous on the point that blockchain keeps information necessary for the integrated management in advance by means of ON-Blockchain process and each peer can easily obtain the necessary parameters required to handle the NAT, mobility and security management via OFF-Blockchain process.

Research on Data Recovery through EaseUS, a Disk Forensics Tool
Jae-ung Lee and Woo-young Soh (Hannam University, Korea (South))

Currently, hard disk drives (HDD) are commonly used for the majority of systems and a mixture of low volume solid-state drives (SSD) and hard disk drives are used due to the high price of high volume SSD. However, it is forecast that high volume SSDs are likely to be widely used for personal computers and laptops as well as high volume storage servers because of their plummeting prices. While an HDD is more vulnerable to external factors such as vibration, shocks or magnetic forces than an SSD, the data stored in HDDs is incredibly easy to recover unless its platter is severely damaged, or overwriting occurred multiple times. While an SSD is faster and less prone to errors than an HDD, overwriting is impossible for an SSD. In order to overcome such a weakness, it is required to use TRIM that zerofills the given data region by identifying unused files that have been deleted from the operating system. This paper performed data recovery through EaseUS, a disk forensics tool. The result of data recovery will prove helpful in deciding whether to adopt an SSD when building a new system.

Application of Graphical Passwords for Mobile Security

Kashif Abbasi (GSESIT, Hamdard University & University Kebangsaan Malaysia, Pakistan)

Software security and data security are main issues in modern world of computing. With the use of latest hacking tools, it has become easier for hackers to breach the security. Specially the mobile phones and smart phones have become main targets for security attacks. In this paper, we have discussed how we can improve security in mobile devices by using the graphical passwords. These graphical passwords are considered as alternate methods for secure user authentication. In comparison to normal text based passwords, these graphical passwords are well known for good security and they are less prone to attacks. In this paper, we have studied application of various graphical passwords on mobile devices to make them more secure against hackers.

P-C11: Poster 3

Room 2 | Chair: Beongku An (Hongik University, Korea (South))

Enhanced Explicit Congestion Notification (EECN) in TCP with P4 Programming

Shahzad Shahzad (Hongik University, Sejong Campus, Korea (South)); Eun-Sung Jung (Hongik University, Korea(South)); Joaquin Chung (Argonne National Laboratory, USA); Rajkumar Kettimuthu (Argonne National Lab, USA)

In current TCP/IP networks, TCP mainly relies on packet drops as the indication of congestion. With the emergence of Explicit Congestion Notification (ECN), the congestion is detected by marking packets instead of dropping them. This reduces the unnecessary delay due to packet drops especially for low-bandwidth delay sensitive connections. However, ECN still relies on the receiver to indicate congestion. This incurs in a round trip time (RTT) before the sender can react to the congestion. In a path with high bandwidth-delay product (BDP) this could be problematic. In this paper we present an enhanced ECN mechanism for early detection of congestion using P4 programming. In our proposed scheme the sender does not have to wait for the receiver to indicate congestion as the network is capable of indicating congestion. We evaluate our scheme through experiments, comparing our proposed solution with existing ECN. Initial results indicate that our scheme performs better than ECN.

An Image Shared Market Platform by Using Collective Intelligence

Kyusung Shim (Hongik University, Korea (South)); Yongeun Jung (EBU, Korea(South)); Beongku An (Hongik University, Korea(South))

In this paper, we propose the collective intelligencebased image shared market platform. The proposed platform provides the image sharing services with much more lower price than that of the conventional platforms since the price can be decided based on the buyers themselves. Since the proposed platform provides very efficient web accessibility, the various buyers can access and evaluate the image efficiently. The performance evaluation shows that the proposed image shared market platform can support the efficient image shared services efficiently.

The Multi-Medium/Multi-Band Communication for Seamless Delay/Disruption Tolerant Networking

Jinyoung Lee and Soo-Hyun Park (Kookmin University, Korea (South)); Sun-Ho Yum (Kookmin University & Special Communication Convergence Service Research Center, Korea (South)); Jung-II Namgung (Kookmin University, Korea (South)); Soo-Young Shin (University of Kookmin, Korea (South))

In this paper, we introduce S-DTN (Seamless Delay/Disruption Tolerant Networking) for extreme communication environments such as underwater, polar regions, underground mine or cave, and so on. We also suggest the MM/MB (Multi-Medium/Multi-Band) communication which is a key technology to support S-DTN. We have implemented a prototype with MM/MB in underwater and evaluated the performance of it. As a result, we found that the MM/MB communication is highly feasible to organize S-DTN.

Classification of turbulence channels using convolutional neural network for optical wireless communication system

Yongwoon Hwang (Chosun University, Korea (South)); Soeun Kim (Gwangju Institute of Science and Technology, Korea(South)); Chung Ghiu Lee (Chosun University, Korea (South))

In outdoor optical wireless communications, turbulence channels distort optical signals and degrade communication performance. Also, the channel turbulence model is depending on the weather conditions. A deep learning algorithm can contribute to classify the turbulence channels in real-time and it is helpful to decide suitable modulations for the channel characteristics to improve channel performance. The study performs generation of labeling each received data and distorted constellations for the different degrees of turbulence, which is computer-simulated by gamma-gamma distribution. With training convolutional neural networks, we evaluate the performance of the neural networks.

Development of GUI Flow Editor Supporting Neuromorphic Architecture based Neural Network
Hoinam Kim, Kyeongsoo Kim, Chan soo Kim, Jinman Jung and Young-Sun Yun (Hannam University, Korea (South))

In the existing studies, users can easily create programs using prebuilt components, but many development tools do not support neuromorphic computing models for AI development. Therefore, in this paper, we want to create a development tool that supports the neuromorphic architecture based AI model, and implement the function that the user can directly create a component and add it to the development tool. Through this, we implemented a classifier using spiking neural network (SNN), one of the neuromorphic network models. The classifier evaluated a performance using the well known MNIST model and confirmed that the presented model works as expected.

Development of Simulation to Support IoT and Neuromorphic System

Jisu Park, Seoyeon Kim, Jaehyeok Jeong, Jinman Jung and Young-Sun Yun (Hannam University, Korea (South))

In this paper, we designed and implemented a simulation of an integrated development environment that supports IoT and neuromorphic systems. When we ask the server for information using Node.js about a component written in a web-based client, the server passes the data to the client in the form of a text file and builds a simulator based on the received data. The components provided by the server are classified into two types according to the characteristics of the IoT and neuromorphic system. The first I-component is an IoT-enabled component and receives the output value of the sensor in real time. The second X-component and the NA component are intelligent components that support the neuromorphic system. It loads the data set, trains the component for object recognition and classification, and evaluate it and displays the results. Probe components can be connected to any point except the final output to determine the value at that point. It can be set the type, time, simulation widget and more in the properties of each component to effectively visualize the changing values by graphs, images, and audio through simulators.

P-CIS2: Poster 4

Room 3 | Chair: Duckki Lee (Yonam Institute of Technology, Korea (South))

Development of a ECG Monitoring Device for Homecare

JiHye Hyun (Medical Innovation Foundation & Medial Device Development Center, Korea (South)); Hun-Wook Kim, SukTae Seo and Joo Hyun Hong (Daegu-Gyeongbuk Medical Innovation Foundation, Korea (South))

By global aging, home healthcare which is possible to monitoring patient's vital sign is being magnified in healthcare field. Therefore, this paper presents one-channel electrocardiogram device with mobile terminal for the medical treatment only. The effectiveness of the proposed system is demonstrated by experimental results using a simulator between 60 ~ 120 bpm under the serial communication environment.

Gyroscope based Abrupt Steering Detection for Enhancing Driving Safety

Sunghyun Lee, Jongmoo Choi and Seong-je Cho (Dankook University, Korea(South))

This paper proposes a new abrupt steering detection scheme that has the following three features. First, it is generic and easy-to-deployment since it is based on the pervasive Smartphone's gyroscope sensor without requiring any special hardware equipment. The second feature is that it is efficient since it can limit additional CPU usage within 5%, which eventually can reduce the energy consumption. Finally, it is accurate, revealing that it can detect abrupt steering with an accuracy of 0.91 on average.

Artificial Intelligence Approaches for Previsualization

Kyuhong Lee (Chung-Ang University, Korea (South)); Joseph Mfitumukiza (Chung-Ang University, Korea (South)); TaeYong Kim (GSAIM, Chung-Ang Univ, Korea(South))

For production in Computer Graphics (CG), it takes a lot of time and skilled manpower. Because of the point, research to utilize artificial intelligence in CG production has been actively progressed. The peculiarities of CG production often lead to more time to make corrections or find solutions for specific issues, which also affects production costs. Previsualization (Previs) in Pre-production stage has reason of existence. Artists can find possibilities of any issues together from Previs reel and unify the project direction, so it brings the result that decrease the chance of the loss in production. Therefore, many production companies recognize this importance because it is much efficient. In this paper, we review the existing studies of story generations and video generations, and propose artificial intelligence approaches that can be useful for Previs.

XAI-based Automation for Customer Journey Analysis

Chanyil Jung and Hoojin Lee (HansungUniversity, Korea(South))

Traditional process mining has automatically generated process models based on the log of information systems, but still requires a lot of expertise and experience to analyze process models. Thus, in this paper, we proposed an efficient algorithm for the process mining causal analysis automation, which adopts deep learning and eXplainable artificial intelligence (XAI) algorithm for the process model analysis. We have also proved that this algorithm discovers the same analysis results as process mining experts, by applying them to the actual customer journey analysis performed on the mobile app log of the online music streaming company.

Adaptive Distributed Facial Feature Recognition for Authenticated Door Access

Joseph Mfitumukiza (Chung-AngUniversity,Korea(South)); Kyuhong Lee (Chung-AngUniversity,Korea(South)); TaeYong Kim (GSAIM,Chung-AngUniv,Korea(South))

Face recognition algorithms is a well-established process whereby the face can be detected and identified out of the image throughout features. In this paper, the adaptive distributed facial feature recognition is used for authenticated door access. The key point of this research is all about enhancing the performance of existing door access by adding the intelligent and contactless function of accessing door using facial information. Thus, it increases the authenticity and privacy while reducing risks of pin code duplication. The Raspberry Pi (RPi) as credit-sized and full capabilities similar to PC, is used for end user node to capture and extract the facial features and transfer to the server considered as a gateway of the system. The use of RPi and server has given a new orientation of research of image processing and computer vision into the field of Internet of Things (IoT). The facial feature extraction techniques such as Gabor filter, HOG and LBP are examined with computer vision open-source libraries like OpenCV to extract features from end user (client) side, and the image processing algorithms among PCA, FLDA and FPBM is applied to the server side for recognition. Based on various image resolution, the comparative analysis based feature extraction time, size of data and the accuracy output are presented in this paper. Through this research the system has proven as portability, costless, lightweight and low powered system that meet the authentication requirements in a variety of applications in modern infrastructures.

Wednesday, February 5 3:00 - 3:20

Coffee Break

Rooms: Room 1, Room 2, Room 3

Wednesday, February 5 3:20 - 4:50

Recruiting Session

Room 3

O-MSP: Multimedia and Signal Processing

Room 1 | Chair: Sag-ug Kang (SangMyung University, Korea (South))

An Investigation on Amplitude Distribution for Controlling Side-lobe Level of Sparse Cylindrical Sonar Arrays

Nguyen Dinh Tinh and Trinh Dang Khanh (Le Quy Don Technical University, Vietnam)

This paper proposes a new solution calculating amplitude distribution for mitigating side-lobe level (SLL) of sparse cylindrical sonar array (SCSA) based on the explicit expression of the beam pattern, the separation of amplitude distribution into the row and the column, and simulation tools. With the proposed solution, the amplitude distribution is determined in order to satisfy the particular requirements.

Multiple Quantization Tables based Cross-domain for JPEG Inversible Watermarking

Pham Huy (Electric Power University, Vietnam); Ta Minh Thanh (Tokyo Institute of Technology, Japan)

Reversible data hiding (RDH) techniques for JPEG images have big challenges in order to improve the capacity, quality, and flexible embedding method. In this paper, we propose a new cross-domain using combination of multiple quantization tables in JPEG algorithm. We survey the efficiency of quantization coefficients on the DCT tables in order to decide the way to embed the watermark information. Compared to the conventional method, our experimental results show that our proposed method has better performance in term of both the increasing capacity and improving the quality of embedded JPEG images after data embedding.

Image Quality Assessment Using Numerical and Statistical Analysis

Amanda Kyung (Choice Research Group, USA)

In this research, a mathematical, statistical and computational simulations were performed with several modified functions to reduce the ringing effect and improve the resolution of an bio-image. Proposed an efficient function as a new low pass filter was proved to save operation time and process. In the digital imaging process, when the domain of the proposed function over the frequency domain is narrow, it showed that the resolution of the final image was low due to the insufficient amount of frequency data from K-space. The main purpose of this research was to find better low pass filter that would both improve the quality of the resolution of an image using mathematical, statistical and computational analysis. Result shows work time was decreased by substantial amount of time to produce final image. Also non-traditional function and its behavior of image statistics were studied in this analytic analysis.

Study on User's Emotional Response in VR environment through Biosignal Analysis
Jiyoung Kang (Dankook University, Korea (South))

This study investigates users' emotional responses in a virtual reality (VR) environment for developing a biosignal-based interface. Users' electroencephalography (EEG) and pulse rate biosignal data were collected and used together to examine the correlation between biosignal data for emotional responses. Test subjects wearing an HMD watched three VR movies containing four emotional elements-happiness, sadness, fear, and surprise-and their biosignal data were collected and analyzed to examine how these data changed for different emotional elements. As a result, test subjects' EEG signals and pulse rates for the same emotional state showed similar patterns on average; however, different biosignal data were seen for different emotional states. Furthermore, the same emotional element was further subdivided according to a movie's story, and the biosignal emotional response data for these showed different patterns.

Automatic Icon Arrangement for Smartphone UI
Seongbae Eun (Hannam University, Korea (South)); Sun-Sup So (Kongju National University, Korea (South)); Young-Sun Yun and Jinman Jung (Hannam University, Korea (South)); Emily Oh (Daeduk High School, Korea (South))

Smartphones have dozens of applications built in. As the use of applications continues to grow, so does the demand for services that manage the arrangement of application icons. In this paper, we present an algorithm that automatically arranges icons so that the smartphone screen is balanced. In this case, we prove that in a $m \times n$ screen layout where the height is m and the width is n , if n is an odd number then the total screen can always be arranged to be balanced, regardless of the value of m . We proved it through mathematical induction. Our algorithm can be used when developing launchers.

Wednesday, February 5 4:50 - 5:00

Break

Rooms: Room 1, Room 2, Room 3

Wednesday, February 5 5:00 - 6:00

Welcome Reception

Rooms: Room 1, Room 2, Room 3

Thursday, February 6

Thursday, February 6 9:00 – 10:30

P-CI2: Poster 5

Room 3 | Chair: Yong-Gyu Jung (Eulji University, Korea (South))

Measuring and testing of Multi medium based Underwater Communication Systems
Sun-Ho Yum (Kookmin University & Special Communication Convergence Service Research Center, Korea (South)); Jinyoung Lee and Jung-Il Namgung (Kookmin University, Korea (South)); Soo-Young Shin (University of Kookmin, Korea (South)); Soo-Hyun Park (Kookmin University, Korea (South))

This paper deals with test procedures and test environment design methods to record performance indicators of Multi-medium based Underwater Communication systems, which have been studied since 2017 to satisfy both "real-time" and "reliability" of underwater communication technology systems. Referring to the process in which radio wave-based mobile communication technology has become so closely settled in our lives, the author proposes the preparation/progress/evaluation procedure of effective testing and the necessary environmental design in order to reduce the difficulties of system testing for the diffusion and acceleration of Multi-medium based UWC research. The author argues that through the implementation and application of this design, it will be easy to secure the necessary Empirical data for the development of the Multi-medium based UWC channel model in human-capable underwater areas and improve the reliability of the data. However, the improvement is needed through the researchers' experience and accumulation of performance in the OpenSea phase since the actual test phase performed for the preparation of the paper ended in Peer.

Development of Neuromorphic Architecture Integrated Development Environment
Young-Sun Yun, Seoyeon Kim, Jisu Park, Hoinam Kim, Jinman Jung and Seongbae Eun (Hannam University, Korea (South))

In this paper, we introduced Neuromorphic Architecture Integrated Development Environment (NAIDE). The NAIDE is designed to support the development of autonomous Internet of Things (IoT) application based on neuromorphic architecture. The IDE is consisting of five representative modules in order to manage both neuromorphic architecture based neural network (NN) models and traditional artificial NN models. Four modules are embedded in a NAIDE screen as a flow editor (NA-Ed), a component manager (NA-COM), and a simulator (NA-SIM) and logger (NA-LOG). One connects each module and supports all functionalities of NAIDE. NAIDE connects several IoT devices, manages their data and transfers them to other services via various communications. Through collaboration of neuromorphic and deep learning modules in the NAIDE, we can easily implement and utilize the autonomous IoT applications. We expect that the proposed NAIDE can provide convenient IoT program environment based on neuromorphic architecture. In this paper, we introduced Neuromorphic Architecture Integrated Development Environment (NAIDE). The NAIDE is designed to support the development of autonomous Internet of Things (IoT) application based on neuromorphic architecture. The IDE is consisting of five representative modules in order to manage both neuromorphic architecture based neural network (NN) models and traditional artificial NN models. Four modules are embedded in a NAIDE screen as a flow editor (NA-Ed), a component manager (NA-COM), and a simulator (NA-SIM) and logger (NA-LOG). One connects each module and supports all functionalities of NAIDE. NAIDE connects several IoT devices, manages their data and transfers them to other services via various communications. Through collaboration of neuromorphic and deep learning modules in the NAIDE, we can easily implement and utilize the autonomous IoT applications. We

expect that the proposed NAIDE can provide convenient IoT program environment based on neuromorphic architecture.

A study for IoT relationship based on ICT Ethics and Digital Transformation between Korea and Vietnam

Seung Chang Park (KITELA Institute & IT-ethics and POSEN, Korea (South)); Hoang Thi Bich Hanh (Vietnam MIC, Vietnam)

This paper studies for IoT relationship based on ICT Ethics and Digital Transformation between Korea and Vietnam to make our nations sustainable with fusion of literature, art, science and technology. IoT(Internet-of-Things) is a part of longterm evolution which is improving the human-lives and contents related to the green energy harvesting, the food and clothes and houses, the earth climates and environments, the solar system including galaxy. So this paper is the second pilot study for creation of the IoT value-chain of industry, economy, and trade between Korean ICT and Vietnamese ICT businesses.

Connection Algorithm of Computing Resources

Jang-Geun Ki (Kongju National University, Korea (South)); KeeYoung Kwon (Kongju National University, Korea (South))

With evolving demands for data centers, optical networks are critical points to supports reconfigurable topology of data center resources. Many have interests in dynamic control of resource connection network. In this paper, we proposed dynamic algorithms for controlling switching cell behavior of optical switch connection structures proposed in Nirmal Kumbhare's JITA infrastructure that has high performance and low latency. Resulting performance evaluation by simulation shows that the proposed algorithm in this paper improves about 3% to 7% in connection success probability.

Fairness-Aware Secrecy Rate Maximization for Downlink NOMA Systems

Van-Phuc Bui and Hieu V. Nguyen (Soongsil University, Korea (South)); Kha Hung Nguyen (Soongsil University, Korea (South)); Oh-Soon Shin (Soongsil University, Korea (South))

This paper considers a downlink (DL) non-orthogonal multiple access (NOMA) system where a NOMA-assisted base station (BS) simultaneously serves DL users (UEs) in the presences of eavesdroppers (Eves). We aim to maximize the minimum secrecy rates (SR) for all legitimate UEs by utilizing artificial noise to degrade the Eves' channel capacities. To efficiently solve the resulting problem, we propose a low-complexity iterative algorithm based on an inner approximation method. Numerical results verify the effectiveness of the proposed algorithm.

W: Workshop

Room 1 | Chair: Intae Ryoo (Kyung Hee University, Korea (South))

Gateway Deployment for Efficient IoT Power Infrastructure System Operation

Yoonkyung Jang, Sun-Ho Choi, Bum Il Hong, Hyowon Seo and Intae Ryoo (Kyung Hee University, Korea (South))

As a cutting-edge technology, IoT (Internet of Things) that will lead the fourth industrial revolution is now not only receiving a great attention, but also playing an important role in the area of electrical power. It makes us possible to reduce the direct human intervention in maintenance. Sensors attached to power-line tower collect various data through gateways. Because one sensor is attached to each and every power-line tower currently, it needs more than necessary installation cost as well as energy consumption. In this paper, we study a method for increasing the efficiency of IoT technology in the area of electrical power by proposing a way of gateway deployment.

Advanced AGR-MAC Scheme using WiFi HaLow and BLE

Ahreum Shin, Jungyun Kim and Intae Ryoo (Kyung Hee University, Korea (South))

Korea Electric Power Corp. is developing a technology that automatically monitors transmission and distribution systems using various sensors. In order to make the system maintenance easier, data collected by sensors should be efficiently delivered to a sink. AGR-MAC has been proposed for the environment with fixed sensors and mobile sensors. However, the topology proposed in AGR-MAC is different from the real networks by KEPCO. Since various sensors are attached at one utility pole, several fixed sensors are densely located at one point. Considering this characteristic, we propose an advanced AGR-MAC scheme using WiFi HaLow and BLE. It makes the sensors at one utility pole form an area by BLE and the area is connected to another area by WiFi HaLow. Since WiFi HaLow and BLE operate in different frequency bands, it is possible to lessen the interference. Also, by binding the sensors on the same utility pole, it is possible to make the system be more structured.

A Study on WiFi-based Low Power MAC Protocol

Myeongseung Han (Kyung Hee University, Korea (South)); Jun-hyuk Lee (Sahmyook Health University, Korea (South)); Intae Ryoo (Kyung Hee University, Korea (South))

With the development of IoT technology, various sensors are used in the IoT field. Temperature sensors collect a small amount of data, but camera sensors collect a lot of data. Collected data is transmitted to a gateway using wireless communication technology. After being processed and analyzed, data is provided as information to a human. Sensors have limited energy resources. If any sensor runs out of energy, it affects the entire WSNs system. This is why the energy efficiency of sensors is important. We propose a method to apply Group Management MAC(GM-MAC) protocol to improve the energy efficiency of WiFi.

Design and Implementation of Group Management MAC using Bluetooth Low Energy

Yuvin Rho (Kyung Hee University, Korea (South)); Hangki Joh (WETOONE Co., LTD., Korea (South)); Eun-Sung Cho (WETOONE Co., Ltd., Korea (South)); Intae Ryoo (Kyung Hee University, Korea (South))

This paper implements Bluetooth Low Energy (BLE)-based Group Management Medium Access Control (GM-MAC) using nRF52840DK from Nordic Semiconductor to improve the lifetime of Wireless Sensor Networks. As Internet of Things (IoT) has developed a lot, interest and importance for wireless sensors have increased accordingly. Sensor nodes that collect data from various locations communicate with each other and eventually pass data to sink (gateway). Since sensor nodes operate on low capacity batteries, such as coin cells, it is important to use batteries efficiently. If the battery is replaced frequently, the topology of wireless sensor networks changes, which adversely affects the lifetime of wireless sensor network. In case many sensor nodes are used randomly, maintenance or overhead are bound to grow even more.

The lead halide perovskite-polymer composites for the piezoelectric nanogenerators as power generator

Hyun Gi Kim and Sung Soo Kim (Kyung Hee University, Korea (South))

Recently, energy harvesting technologies based on the piezoelectric effect has attracted considerable interest. The perovskite nanoparticles are emerging as promising piezoelectric materials due to a high piezoelectric coefficient. In this study, lead halide perovskite materials were employed to fabricate the piezoelectric nanogenerators (PENGs). A piezoelectric formamidinium lead halide perovskite (FAPbBr₃) nanoparticles were synthesized with cubic perovskite structure. The piezoelectric NGs based on a composite of FAPbBr₃ nanoparticles and polymer was prepared to evaluate the piezoelectric output voltage and current density. It could be achieved the comparable piezoelectric outputs, which was enough for applications in electronic devices, and smart sensors.

The growth of ZnO nanorods on ITO film for the piezoelectric nanogenerators as power generator

Hyun Gi Kim and Sung Soo Kim (Kyung Hee University, Korea (South))

Recently, the piezoelectric nanogenerators(NGs) based on flexible substrates have attracted considerable interest. In this study, ZnO nanorods were employed to fabricate the piezoelectric NGs. We examined the effect of seed-layer on the structural properties of ZnO nanorods grown on flexible ITO substrate by hydrothermal method. The effect of reaction time and temperature on the growth of ZnO nanorods are also investigated. We have studied the performance enhancement of piezoelectric NGs with optimal ZnO nanorod structure on flexible ITO substrate. The maximum output current, which was enough for driving of microelectronics could be measured. Our NGs are expected to provide effective and useful approach for the smart sensor devices.

Thursday, February 6 10:30 - 10:50

Coffee Break

Rooms: Room 1, Room 2, Room 3

Thursday, February 6 10:50 - 12:20

O-CI2: Communication and IoT - 2

Room 1 | Chair: Byung-Seo Kim (Hongik University, Korea (South))

Ambient Environmental IoT System for Cargo Port in Da Nang
Nam Hoang Nguyen (Hanoi University of Science and Technology, Vietnam)

The system of continuous monitoring of meteorological and hydrological parameters is a combination of many components. Energy supplied to the autonomous operating system is taken from solar panels and stored in battery. This battery is charged by the MPPT (Maximum Power Point Tracker) solar charger circuit and will be the energy source for the system. Measured parameters from sensors such as water level, ambient temperature and humidity, inside-box temperature and humidity and the voltage of battery will be sent to Thingspeak cloud server by 3G connection. The system is designed and installed permanently in the cargo port area in Da Nang, Vietnam.

A Joint Precoding and Equalization Design for MIMO FBMC-OQAM Systems
Bui Quoc Doanh (Le Quy Don Technical University, Vietnam); Do Thanh Quan (Yokohama National University, Japan & Le Quy Don Technical University, Vietnam); Pham Thanh Hiep and Ta Chi Hieu (Le Quy Don Technical University, Vietnam)

The filter bank multicarrier (FBMC) transmission technique has become a key transmission technique for multiple-input multiple-output (MIMO) systems. In this paper, we proposed a new joint design of precoding and equalization based on the equal error method to decrease the bit error rate (BER) of MIMO FBMC systems utilized offset quadrature amplitude modulation (OQAM). The impact of the overlapping coefficient on the system performance was also discussed. The simulation results demonstrate that the proposed design significantly improves system performance.

Generalized Fading Model for Beyond 5G Networks
Young Jin Chun (City University of Hong Kong, Hong Kong)

The wireless channel of future wireless networks beyond 5G will have unique characteristics (e.g., finite number of dominant specular components or clustered scatter waves) that can not be fully apprehended by the traditional fading models. This motivates us to find a more general fading model that incorporates multiple specular components with clustered diffuse scattered waves but achieves analytical tractability at the same time. To this end, we introduced the Multiple-Waves with Generalized Diffuse (MWGD) fading model that allow an arbitrary number of specular components and assume generalized diffuse scattered model. We derive the distribution functions of the signal envelop in closed form, evaluate the performance metrics of future wireless networks and obtain important design insights for beyond 5G networks through numerical simulations.

An Ant Colony Optimization-based Mesh Routing Protocol supporting QoS in Mobile Overlay Cognitive Radio Ad-hoc Networks
HyukChun Oh, Kyusung Shim and Beongku An (Hongik University, Korea(South))

This paper exploits an ant colony optimization (ACO)-based mesh routing protocol supporting quality of services (QoS) in mobile overlay cognitive radio ad-hoc networks. Since the proposed routing protocol, called ACOMR protocol, utilizes various route information, the ACOMR protocol effectively establishes routes by supporting the users' requirements and avoids the coverage of primary user. Additionally, according to ACO, the ACOMR protocol randomly selects the next node from the routing table to avoid the broken link. Through the performance evaluations, the proposed routing protocol can support the network performance metrics such as PDR and average distance between PU and SUs.

A Compact Decoupling Structure Applied in MIMO Antennas for Wideband Radar Applications
Hung Viet Nguyen (Post and Telecommunications Institute of Technology&IETR, UniversitédeRennes1, Vietnam); Dang Anh Tuan (Vietnam Research Institute of Electronics, Informatics and Automation, Vietnam); Thanh Tu Duong (Posts and Telecommunications Institute of Technology, Vietnam); Quang Tu Le (PostsandTelecommunicationsInstituteofTechnology,Vietnam)

In this paper, a novel decoupling structure is proposed to depress mutual coupling among closely-spaced elements of MIMO antenna, for the distance of 0.1457λ . Basing on gradient line, the proposed design has reduced mutual coupling in a wide range of frequency, for over 800MHz around 9.5GHz, the conventional operating frequency of radar application. The proposed structure was analyzed using equivalent circuit and applied in MIMO and array antenna designs to reduce mutual coupling and distortion of radiation pattern. The measured results were also presented and are agreed well with simulated ones.

P-CNS/GR: Poster 6

Room 3 | Chair: Eun-Sung Jung (Hongik University, Korea (South))

Blockchain-based Medical Data Management Model with Zero-knowledge Proof
Shin-Ok Lee (Sookmyung Women's University, Korea (South)); Kwangman Ko (Sangji University, Korea (South)); Young-Hoon Park (Sookmyung Women's University, Korea (South))

Data preservation and authentication are important concerns in medical industry due to the security issues. To provide both data integrity and authenticity, blockchain can be employed to the medical data management system. With only the blockchain, however, another security issue such that data leakage problem can be occurred. With some encryption schemes, security of the stored medical data can be solved, but confidentiality of the transmitted data due to the third party's request may not be protected. To accomplish this, in this paper, we propose a blockchain based medical data management model with zero knowledge proof. With the zero knowledge proof, the stored data need not be decrypted even when they are transmitted, so the privacy of the patients must be guaranteed.

Deep Learning Approach for Malware Classification
Seong Oun Hwang (Hongik University, Korea (South)); Vu Duc Ly (PTIT)

Malware classification tasks have traditionally been solved using hand-crafted features obtained through heuristic processes by experts and machine learning methods. It requires much domain knowledge of malware and feature design. To address this problem, we propose DeepMal, an automatic malware classification based on deep learning which combines convolutional and recurrent neural network over raw assembly code inputs. Our results show that DeepMal outperforms the traditional API call frequency and the n-gram approach.

Hidden Message Detection in MS-Word File by Analyzing Abnormal File Structure
Hyung-Woo Lee and Han Seong Lee (Hanshin University, Korea (South))

Messages can be concealed by exploiting the internal structural features of MS-Word (docx) files, which are saved as ZIP files. In the MS-Word file which is stored based on ZIP structure, messages can be hidden through structural forgery and modification process. This can also be applied to JPG and PNG images included in OOXML-based internal files. Therefore, it is necessary to analyze forgery and alteration of digital document through internal structure analysis of MS-Word file. In this paper, we examine the vulnerability of OOXML-based MS-Word file structure, and analyze how data can be concealed in MS-Word file. As a detection mechanism, we implemented a software to identify hidden message on MS-Word file efficiently for responding forgery attacks.

Malware Classification Using Static and Dynamic Analysis
Seong Oun Hwang (Hongik University, Korea (South)); Vu Duc Ly (PTIT, Vietnam)

In recent years, the malware industry has become a well organized market involving a large amount of money. One of the major challenges that anti-malware faces today is the vast amount of data and files which need to be evaluated for potential malicious intent. In order to be effective in classifying such a large amount of malware, we propose a new classification model that describes malware characteristics and their behaviors in terms of integrated static and dynamic indicators. The experimental results show that our solution can achieve high classification accuracy (96.3%) with small feature space (500 features).

Effect of Grating Phase on Threshold Gain in DFB Lasers
KeeYoung Kwon (Kongju National University, Korea (South)); Jang-Geun Ki (Kongju National University, Korea (South))

In order to reduce the threshold gain of DFB laser diodes, we should increase κL so the Bragg scattering of an index grating which provides optical feedback. In order to prevent higher order mode lasing, we should choose the phase of one mirror facet = π and $\kappa L=10$, which maximizes the threshold gain difference between the 1st mode and higher order modes in DFB lasers and therefore causes a stable single mode operation.

Renewable Energy-based Distributed Power Supply Activation Issue
Se-Hwan Park (ENF Inc., Korea (South))

This study explains the economic value of renewable energy sources that can determine the market capacity of environmentally friendly renewable energy sources with a high preference of power consumers. Based on this, it will explain the government's 2nd-3rd Energy Basic Plan(2014/2019-2040) and the necessity and expected effect to enable decentralized power supply projects based on renewable energy. The reason renewable energy sources are attracting attention is because the expansion of the focus on areas such as greenhouse gas reduction and energy security has become an important agenda. We will be able to pursue the sustainability of the electricity industry by expanding the supply of decentralized power based on renewable energy.

A Secure Personal Data Management Model over Outsourced Blockchain

Young-Hoon Park (Sookmyung Women's University, Korea (South)); Kwangman Ko (Sangji University, Korea (South))

As blockchain is employed to personal information management, privacy becomes one of the important issues. Moreover, most of the personal information management company outsources the blockchain, so that possibility of the data leakage becomes a new major concern. In this paper, we propose a new personal data management model over outsourced blockchain. To overcome the outsourcing company issue, we adopt homomorphic encryption scheme that can process equations without decryption. With this cryptographic scheme, the encrypted personal data is processed without being decrypted, plaintext of the personal data is not revealed to the outsourcing company. In turn, we may conclude that the proposed system guarantees the user privacy.

P-MSP: Poster 7

Room 2 | Chair: YongSoo Choi (Sungkyul University, Korea (South))

Introduction of a ECG prediction module for a Medical Device Development Platform

Dae Gwan Kim, Joo Hyun Hong, SukTae Seo, JiHyoung Roh and JongKyun Choi (Daegu-Gyeongbuk Medical Innovation Foundation, Korea (South))

The electrocardiogram (ECG) is an important test that measures the electrical activity of the heartbeat. In this study, we proposed an ECG signal prediction module for a medical device development platform. The proposed module is composed of detection and classification phases. This study aims to help medical equipment developers to determine what module is applied for appropriate procedures of ECG signal classification. The proposed module provides a result of the ECG prediction using effective visualizations.

Reliability and Delivery Management for the Object Material of IoT Devices

Kyutae Lee and HyunChang Lee (Kongju National University, Korea (South)); DoHyeun Kim (Jeju National University, Korea (South)); Sang Yep Nam (College of Kookje, Korea (South))

As copyright disputes increase due to the illegal use of information Device, evaluation of similarity to systems is demanded. However, due to the characteristics of the system, it is required to secure material for reliability and secure reliability of movement. Object data, used as data for appraisals, is important basic data provided to appraisers in dispute handling office such as courts and police stations. The object material has a process of movement, which is submitted by the parties to the dispute to the Copyright Commission and finally delivered to the evaluation expert. However, if the parties to the dispute are not satisfied with the result of the assessment, they will challenge the credibility of the object material. In particular, it is recognized that software evaluation objects can be modified or modified in a file format. The method of giving objectivity to the object material is examined in various ways, and forensic is proposed as one method. This study shows how to secure reliability through the evaluation process of real cases.

Strong/Weak Flash Image Fusion for Low Light Enhancement

Jong-Ok Kim (Korea University, Korea (South)); Hyung-Kun Park (KOREATECH, Korea (South)); Yun Seop Yu (Hankyong National University, Korea (South))

In this paper, we propose the acquisition of strong and weak flash images and their fusion for low light enhancement with simultaneous flash artifact suppression. Using high-speed capture, strong and weak flash images are obtained, then a neural network fuses them. We obtain artifact-free fusion results with adequate brightness and color saturation, with the added advantage that the trained model can also be applied to conventional exposure fusion tasks, where the proposed fusion method also performs well.

Shadow removal from facial images using generative adversarial network

Kamran Javed (Sungkyunkwan University, South Korea); Seong Oun Hwang (Hongik University, Korea (South))

Face photograph taken in bright sunny day or floodlights contains unnecessary shadow on face. To best of our knowledge, there is no work to remove shadow from facial images. Face have complex semantic structure, due to which shadow removal is challenging in this case. The aim of this research is to remove shadow from facial images. We propose a novel generative adversarial network (GAN) based image-to-image translation approach for shadow removal in facial images. In addition to GAN loss, we exploit low level L1, structural level SSIM and perceptual loss from pre-train loss network for better texture and perceptual quality respectively. Since there is no paired dataset for shadow removal problem, we created synthetic shadow dataset for training our network in supervise manner. Proposed approach effectively remove shadow from real and synthetic test samples, while retaining complex facial semantics semantic. Experimental evaluations consistently show the advantages of proposed method over several representative state-of-the-art approaches.

A novel deep learning approach on detection of fetal hypoxia

Muhammad Shahid Jabbar (Sungkyunkwan University, Korea (South)); Seong Oun Hwang (Hongik University, Korea (South))

Cardiotocography (CTG) signal monitoring is routinely inspected visually to detect fetal hypoxia during labor for emergency surgical delivery so that death or brain damage to the child might be prevented. The subjective interpretation and complex nature of fetal heart rate (FHR) and uterine contraction (UC) patterns from CTG might lead to unnecessary C-section. Time and spectral feature selection and machine learning methods have been employed for automated fetal hypoxia detection but development of robust and effective scheme is still a challenge. This work addresses the problem by developing a deep network architecture combining deep convolution layers and long short term memory (LSTM) networks to learn short and long-term dependencies in order to achieve data-driven automated classification for normal and abnormal cases of fetal monitoring. The raw CTG signals are pre-processed for random spikes and missing values removal and fed to end-to-end trained deep learning model to return output class without manual feature extraction and feature selection. Experimental results validate the model performance with class imbalance data for both normal and abnormal cases.

Connecting Camera Model and Source Identification using Knowledge Transfer of Deep Networks

Sang-ug Kang (SangMyung University, Korea (South)); Changhee Kang (Sangmyung University, Korea (South))

The goal of this paper is to extend camera source identification further from the category of the model to the device within each model. In deep network, CNN has powerful ability to extract images features for classification. Recently, camera model identification based on PRNU has a good performance using of CNNs. However, this shows in distinguishing models, but limits appear in devices in the same model. Because, devices in the same model have very similar noise patterns that occur when making by the same manufacturer. In this paper, we proposed method to preprocessing of dataset and convolutional neural networks structure for camera device identification. We selectively use a model with at least five devices in the Dresden dataset and discard vertically taken images to consistent. We process the proposed method for each device image dataset and then proceed device identification experiments through proposed CNNs structure. This shows that it is difficult to distinguish devices from same model and that proposed method is better than not being processed by CNNs.

Robust Image Hash Generation Method utilizing Advanced Histogram Merging
YongSoo Choi (Sungkyul University, Korea (South))

Image hash as a descriptor or identifier can be used to measure similarity in images. Among all image hash functions, a histogram-based method shows better robustness to common signal processing operations and various geometric attacks. In this paper, a new image hash method is proposed, which adopts image quantization (P-ary representation) and symmetrical windowing, improves the performance of hash function by utilizing these two pre-processing steps. In order to evaluate the performance of image hash generation functions, Type I and II error magnitudes of the proposed method, SVD (singular value decomposition) based algorithm is adopted as the hash feature extraction. According to our experiment, the proposed algorithm simultaneously satisfies the ability of identification and discrimination

Fast HEVC Inter Coding Using Scene Change Information of Input Video
Kwang-deok Seo (Yonsei University, Korea (South))

In this paper, we propose a preprocessing procedure to obtain scene change information using spatial down-scaled input image for efficient encoding of super-high resolution image and propose a reconstruction of reference picture list (RPL) in HEVC inter prediction using this information. Using the proposed algorithms, the experimental results show that both the encoding time and encoding efficiency could be simultaneously improved.

Thursday, February 6 12:20 - 1:30

Lunch

Rooms: Room 1, Room 2, Room 3

Thursday, February 6 1:30 - 2:10

K2: Keynote Speech II (Ballroom)

Rooms: Room 1, Room 2, Room 3

Thursday, February 6 2:10 - 2:30

Coffee Break

Rooms: Room 1, Room 2, Room 3

Thursday, February 6 2:30 - 4:00

O-CI3/GR: Communication and IoT - 3 / Green Technology

Room 1 | Chair: Van-Phuc Hoang (Le Quy Don Technical University, Vietnam)

TCP Behavior on Multi-gigabit IEEE 802.11ad Link
Kien Nguyen and Hiroo Sekiya (Chiba University, Japan)

The IEEE 802.11ad technology, which is a member of the IEEE 802.11 family, promisingly extends the operation of Wi-Fi networks to the unlicensed 60 GHz band. In such a case, the Wi-Fi network can support the throughput of multi-gigabit per second. Since TCP plays a vital role in Wi-Fi networks, it is necessary to understand the TCP performance in that multi-Gbps condition. This paper investigates the performance of popular TCP variants on the IEEE 802.11ad wireless link. We conduct the experiments with TCP CUBIC, CDG, BBR, which are typically loss-based, delay-based, and model-based, in different loss conditions. The results show that in a no-loss scenario, CUBIC and CDG keep good throughput at the cost of high TCP latency. Meanwhile, BBR has excellent performance even under the high loss scenario.

On outage probability of AF scheme Cooperative Communication Networks with Radio Frequency Energy Harvesting

Vu Son (Le Quy Don Technical University, Vietnam); Dinh Trieu Duong (VNU, Vietnam); Hoang Tran Manh (Faculty Telecommunication, Vietnam); Tran Viet Vinh (Telecommunications University, Vietnam); Anh Bui Tien and Pham Thanh Hiep (Le Quy Don Technical University, Vietnam)

A radio frequency energy harvesting dual hops cooperative communication system with amplify and forward scheme is taken into consideration, in this system, relays harvest energy from radio frequency for forwarding the received signals which are transmitted by a source, and the source can communicate with a destination directly or via the selected relay. The destination is equipped with selection combination technique to select the best relay. The performance of system is presented by outage probabilities over Nakagami- m fading channel. The close-form of outage probabilities is proposed, and then the calculation results are compared with the Monte Carlo simulation results. The perfect match between calculation results and simulation results in several scenarios verifies the proposed mathematical analysis method.

On the Power and Bandwidth of NLOS Optical Scattering Communications Over M'Alaga Fading

Sudhanshu Arya, Thinn Yu Aung and Yeonho Chung (Pukyong National University, Korea (South))

In this paper, we present a novel statistical model to study an important figure-of-merit, i.e., the trade-off between the power and the bandwidth requirements for the non-line-of-sight (NLOS) optical scattering communication links with each scattered path M'Alaga distributed. The model efficiently includes components scattered by the off-axis eddies in addition to the eddies on the propagation axis, thus permitting accurate evaluation of the scattered UV communication. With the aid of the developed model, it is shown that for a constant bit rate and link configuration, the power requirement for pulse position modulation (PPM) and differential PPM decreases as the length of the symbols increases; however, the bandwidth requirement increases.

The Development of Optimization Technology for the Reliability in Vacuum Glass
Chang Soo Kang (Yuhan University & 590 Kyuninro Sosagu Pucheon City Kyunggido The Republic of Korea, Korea (South))

Derivation of mass production concept to easily lower the pressure inside the vacuum glass. Existing vacuum glass seals the edges of the glass and forms a cap to form a vacuum through the cap, which requires pumping for more than 3 hours to form a vacuum degree ($<10^{-3}$ Torr) to satisfy the thermal insulation performance. However, the pumping time of the vacuum glass is reduced to less than 10 minutes by making a equipment with the concept of joining two pieces of glass after pumping the two pieces of glass in the vacuum chamber. The existing method uses the method of melting the glass frit after sealing. it is by raising the temperature between 500 degrees and 600 degrees. At this time, the choice of filler material has narrowed down due to high temperature use, and there are many problems in using high temperature sealing material in the correct position in the vacuum chamber. The method proceeded in this project was to expand the choice of filler by secondary sealing the substrate at atmospheric pressure after the first adhesion using an elastic sealing agent in the vacuum chamber using epoxy, metal tape, etc. Existing method is the conventional method is to produce a vacuum glass by sealing the two pieces of glass using glass frit and pumping through the vacuum forming cap. Since the vacuum is formed by using the vacuum forming cap, the vacuum forming time is long and there is a problem of increase in manufacturing cost, durability, and reliability for making the cap, but after the vacuum glass is separated from the vacuum chamber and pumped, the two substrates are reached. It was developed the sealing method to secure the cost saving method by removing the cap and solved the durability and reliability problems.

Prediction of the Location of Sea Turtles Based on Bio-Logged Data
Yuki Hayashi (Aoyama Gakuin University, Japan)

Bio-logging is important to understand the ecological system as well as the behavior of each animal. In contrast to previous works where its main focus remains as the analysis of the collected data, we investigate the possibility of predicting the future location using machine learning. Specifically, we compare the accuracy of location prediction for different spatial granularity.

O-CIS: Control and Intelligent System

Room 3 | Chair: Ta Chi Hieu (Le Quy Don Technical University, Vietnam)

sgRHCM: String Grammar Relational Hard C-Means

Apiwat Bouthwong, Sansanee Auephanwiriyakul and Nipon Theera-Umpon (Chiang Mai University, Thailand)

Normally a clustering algorithm is performed on feature vectors representing objects. Sometimes, data comes in a form of relation between objects. The relational clustering algorithm is then needed. However, an object can be represented by a string or a sequence of symbols describing a shape or a characteristic of an object. The relation between this type of data is also generated. Hence, in this paper, we proposed a string grammar Hard C-Means (sgRHCM) that can cluster a relational data from a string grammar data set. The result shows that the sgRHCM yields 94.28% correct classification in the Tool 2D database v 1.0.

S-band RF Sensor for Implantable Continuous Glucose Monitoring System

Jagannath Malik (Ulsan National Institute of Science and Technology & Indian Institute of Technology Roorkee, India); Franklin Bien (Ulsan National Institute of Science and Technology, Korea (South))

In the paper, we discuss feasibility of a miniature RF sensor for continuous blood glucose monitoring from interstitial fluid. The compact sensor can measure and map glucose concentration based on the dielectric property of the blood with different level of glucose. The perdition accuracy can be significantly improved based on our regression and correlation model with a shorter calibration time.

Android Malware Detection System Using Deep Learning and Code Item

Seung-Pil William Coleman (Sun Moon University, Korea (South))

This paper proposes an improved method for detecting android malware which is based on converting android malware APK binaries into images and then applying machine learning techniques for classification. Existing image-based methods use either the whole executable file (e.g. DEX file) of the target app or a huge portion of them which often contains redundant information. Our method, however, generates grayscale images solely using the code item section of the data section within the DEX file. This greatly reduces the size of data while retaining the most representative features needed for classification. The images are then used with a state-of-the-art Convolutional Neural Networks (CNN) for classification. Our technique exhibits positive results relating to the execution time and memory usage compared to the existing methods.

Doppler-Radar Feature Vector-based Passenger-Detection Scheme for a Smart Vehicle
Eugin Hyun (DGIST, Korea (South))

In this paper, we propose a passenger-detection scheme using Doppler radar for use in a smart vehicle. Radar-based feature vectors are extracted from the received signals, and human motions and the movements of other objects can be distinguished. To verify the proposed algorithm, a test bed, radar sensor, and data acquisition module are built. We find that the passenger detection rate exceeds 90 %.

User Preference Classification Model for Atypical Visual Feature
Jaeho Oh (Dongguk University, Gyeongju, Korea (South)); Sang-Woo Ban (Dongguk University, Korea (South))

In this paper, we propose a preference inference model for image data in a specific domain and analyze atypical visual preferences through the classification of preference objects in the inter-domain. To implement an image-based preference inference model, we used CNN(convolutional neural networks), a deep learning based supervised learning model. In addition, dataset for the verification of the model was used Fashion- MNIST and LFW. The preferences in these dataset consist of two classes, preference and non-preference. Experiments using transfer learning were also conducted to analyze the classification characteristics according to the preference between domains. Experimental results show that the performance of the proposed model in a specific domain is up to 95.07%, and the performance of up to 76.78% for the domain inference model. In the model to which the transfer learning was applied, the performance was improved by 1.02%.

O-SWHW: SW/HW Design, Architecture & Development

Room 2 | Chair: Luong Duy Manh (Le Quy Don Technical University, Vietnam)

Left Hand and Right Hand Circularly Polarized Antenna for 5G Devices
Tan Minh Cao and Hong Son Vu (HUST, Vietnam); Thi Duyen Bui (Electric Power University, Vietnam); Minh Thuy Le (Hanoi University of Science and Technology (HUST) & School of Electrical Engineering (SEE), Vietnam)

A novel wideband circularly polarized reconfigurable antenna for 5G devices is presented in this paper. Left hand and right hand circular polarizations were achieved using the feeding network based on butler matrix. The proposed antenna has a wide bandwidth of 35% and antenna gain is stable over the operating bandwidth with the peak gain of 9.8 dBi and 10.3 dBi in left hand circular polarization (LHCP) and right hand circular polarization (RHCP) mode, respectively. At 3.75 GHz, the degree of circular polarization is 420 in LHCP mode and 510 in RHCP mode showing the potential of this proposed antenna for modern 5G terminal devices.

Modeling of Single-Electron Transistor in Advanced Design System
Huong Thi Thu Tran, Manh Duy Luong and Nguyen Huy Hoang (Le Quy Don Technical University, Vietnam)

Single-electron transistor (SET) was successfully modeled in Advanced Design System (ADS) software. Simulation of the model in ADS (modeled SET) showed typical characteristics of SET including Coulomb blockade (CB) region and Coulomb oscillations. The simulated results of the modeled SET were compared with those of a commercial SIMON simulator in certain ranges of drain-source voltage and temperature validating accuracy of the modeling method.

A Novel Circuit Combining a Dual-band Antenna with a RF Diplexer for Concurrent Dual-band RF Energy Harvesting Applications

Luong Duy Manh (Le Quy Don Technical University, Vietnam)

This paper proposes a circuit structure consisting of an RF diplexer and a dual-band antenna for RF energy harvesting applications. The dual-band antenna was fabricated on microstrip line using a FR4 substrate. The RF diplexer was implemented using lumped components. The proposed circuit aims at designing for operating concurrently at 900-GSM and 2.4 GHz bands. The designed circuit offers superior advantages in terms of low-loss and compactness. Measurements agree well with simulations validating accuracy of the designed circuit. The proposed circuit aims to be used in concurrent dual-band RF energy harvesting applications.

Disaster Detection Model using LSTM

Young-Bok Choi (Tongmyong University, Korea (South))

In this paper, we propose a deep learning model that quickly detects disasters by analyzing people's behaviors when panic occurs in public indoor spaces such as subways, airports and cruise ships due to fires, earthquakes and terrors. Through simulations, the time of occurrence of actual disaster and the time of detection of disaster in the model were found to be within 0.5 seconds.

Prefix-based Multi-Pattern Matching on FPGA

Hoang-Gia Vu and Yen Hoang Thi (Le Quy Don Technical University, Vietnam)

Multi-pattern matching refers to the search for multiple patterns in a given text at the same time. This matching on FPGA is expected to scale with the number of patterns in hardware consumption. In this paper, we propose a matching architecture that compares the prefixes of multiple patterns with the prefix of the matching window in parallel. The comparison will continue with the body of each pattern if the corresponding prefix is matched. This architecture is called the prefix-based multi-pattern matching architecture. Our implementation on FPGA shows that the proposed matching architecture achieves much higher performance than the implementation on CPU, while the hardware cost is low.

MTSW: Towards Tracking Wild Animals Using Only Accelerometer and Landmarks

Michiki Hara, Yuki Hayashi, Akihito Taya and Yoshito Tobe (Aoyama Gakuin University, Japan); Hiroki Kobayashi (University of Tokyo, Japan)

Tracking wild animals is essential for understanding the ecology of our planet. There have been an abundant amount of research results with the real data, but the most of wildlife is still unknown. Therefore, we need to establish a way of tracking wild animals with a simple method. Unlike conventional works, we aim at using only an accelerometer attached to an animal to be tracked and several landmarks to reduce the energy consumption with GPS. In this paper we describe MTSW, the method of tracking wild animals and show an experiment result of MTSW using a robot simulating the behavior of wild animals.

Thursday, February 6 4:00 - 6:00

Social Tour

Rooms: Room 1, Room 2, Room 3

Thursday, February 6 6:00 - 8:00

Banquet

Rooms: Room 1, Room 2, Roo

Friday, February 7

Friday, February 7 9:00 – 10:20

BoF: Birds-of-a-Feather Session (Ballroom)

Rooms: Room 1, Room 2, Room 3 | Chair: Hyunsik Ahn (Tongmyong University, Korea (South))

Friday, February 7 10:20 - 10:40

Coffee Break

Rooms: Room 1, Room 2, Room 3

Friday, February 7 10:40 - 12:00

Committee Panel Discussion (Ballroom)

Rooms: Room 1, Room 2, Room 3 |
Chair: Kyutae Lee (Kongju National University, Korea (South))