

EEECS 2021

Program and Abstracts

The 8th International Conference on Electronics,
Electrical Engineering, Computer Science 2021

July 21-23, 2021
Jeju, Korea



Sponsored by

Korea Culture & Contents Technology Association (KOCTA), Immersive Content Display Center (ICDC),
Computer and Communication Engineering for Capacity Building (CCC)



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1 Messages

1.1 Message from General Chair

It is a great pleasure for me to welcome you to the 8th International Conference on Electronics, Electrical Engineering, Computer Science (8th EEECS 2021) from July 21 to December 23, 2021. This year's conference marks the eighth EEECS starting from 2016. The EEECS is a conference of the Korea Culture & Contents Technology Association (KOCTA) and represents large number of gatherings of researchers and industry professionals in the corresponding fields.

This year's conference brings together more than 50 delegates from around the Asian countries to discuss the latest advances in this vibrant and constantly evolving field. The topics covered in the program include overall areas in Electronics, Electrical Engineering, and Computer Science. In line with recent research trends, many artificial intelligence-related papers have been accepted with the diligent work of the technical program committee.

2021 has been a very challenging year due to the COVID-19 pandemic like 2020. Due to the COVID-19 spread out, it has been converted to a hybrid conference. Nonetheless this difficulty situation, the committee would thank all participants and paper authors contributing this conference more active. Through this hybrid conference platform, EEECS 2021 continues to share an insight into the recent research and cutting-edge technologies in those fields of ICT.

The EEECS2021 has been made up by many volunteers who contributed to the various processes and it would not be possible for me to name all of them in this short message. In particular, the Technical Program Committee, led by our indefatigable TPC Chairs and supported by the TPC members, completed a thorough peer-review process of technical and special session papers to select a comprehensive and high-quality technical program for the conference. This program is augmented and complemented by two Keynote Speeches, four special sessions and several regular sessions. In addition, all Organizing Committees worked tirelessly to ensure the best quality experience for the delegates during the technical sessions and the social programs.

Also, I would like to thank the groups of KOCTA and ICDC, Kwangwoon University, Korea and CCC, Mae Fah Luang University. Next EEECS will be scheduled to have events at Chiang Mai University at the end of this year. I would like to ask for your interest and support in preparing this event. Finally, I would also like to thank all participants and supporters for their contribution to the conference. It is a fantastic experience for me to serve as the General Chair of EEECS2021 and it is my hope that you find the conference stimulating, fulfilling and enjoyable. Please enjoy the conference!

8th EEECS 2021 General Chair

Taek Keun Hwangbo



2 Committee

2.1 Organizing Committee

Honorary Chair

Kosin Chamnongthai, KMUTT, Thailand

General Chair

Taek-Geun HwangBo, Gachon University, Korea

Technical Program Co-Chairs

Seung Hyun Lee, Kwangwoon University, Korea

Kyoungro Yoon, Konkuk University, Korea

Worawit Janchai, Chiang Mai University, Thailand

Chayapol Kamyod, Mae Fah Luang University, Thailand

Special Session Chairs

Jeong-Dong Kim, Sunmoon University, Korea

Dongmyung Shin, LSware Inc., Korea

Gi-Taek Hur, DongShin University, Korea

Workshop Chairs

Young-Ho Seo, Kwangwoon University, Korea

Youngseop Kim, Dankook University, Korea

Sangwoon Lee, Namseoul University, Korea

Nam Kim, Chungbuk National University, Korea

Publicity Chairs

Sang Kyun Kim, Myongji University, Korea

Hae Chul Choi, Hanbat National University, Korea

Jeong-geun Kim, Yonsei University, Korea

Publication Chairs

Youngmo Kim, Soongsil University, Korea

Su-Kyung Yoon, Chonbuk National University, Korea

Finance & Registration Co-Chairs

Seok Hee Oh, Gachon University, Korea

Cheong Ghil Kim, Namseoul University, Korea

Local Arrangement Chair

YongHwan Lee, Wonkwang University, Korea

Information System Chair

Seungmin Lee, Namseoul University, Korea

Ui Jin Jang, Soongsil University, Korea

General Secretaries

Dae Seung Park, Namseoul University, Korea

2.2 Technical Program Committee

Chair

Seung Hyun Lee, Kwangwoon University, Korea

Kyoungro Yoon, Konkuk University, Korea

Worawit Janchai, Chiang Mai University, Thailand

Chayapol Kamyod, Mae Fah Luang University, Thailand

Members

Nam Kim, Chungbuk National University, Korea

Chang Choi, Gachon University, Korea

KangYoon Lee, Gachon University, Korea

Youngho Lee, Gachon University, Korea

Worawit Janchai, Chiang Mai University, Thailand

Pradorn Sureephong, Chiang Mai University, Thailand

Manissaward Jintapitak, Chiang Mai University, Thailand

Suepphong Chernbumroong, Chiang Mai University, Thailand

Jiman Hong, Soongsil University, Korea

Hidehiro Kanemitsu, Tokyo University of Technology, Japan

Jin Young Kim, Kwangwoon University

Young-Ho Seo, Kwangwoon University, Korea

Kosin Chamnongthai, KMUTT, Thailand

Punnarumol Temdee, Mae Fah Luang University, Thailand

Hamed Yahoui, Universit?? Lyon 1, France

Youngmo Kim, Soongsil University, Korea

Roungsan Chairsrichaoren, Mae Fah Luang University, Thailand

Jun-yu Dong, Ocean University of China, China

Muwei Jian, Shandong University of Finance and Economics, China

Nattapol Aunsri, Mae Fah Luang University, Thailand

Seok Hee Oh, Gachon University, Korea

Santichao Wicha, Mae Fah Luang University, Thailand

Chayapol Kamyod, Mae Fah Luang University, Thailand

Sang Kyun Kim, Myongji University, Korea

Su-Kyung Yoon, Chonbuk National University, Korea

Seok Yoon Kim, Soongsil University, Korea

Ji Hwan Kim, Sogang University, Korea

Hae Chul Choi, Hanbat National University, Korea
Ui Jin Jang, Soongsil University, Korea
Moo Wan Kim, Tokyo University of Information Sciences, Japan
Youngseop Kim, Dankook University, Korea
Tae Young Byun, Daegu Catholic University
Su-Yeon Kim, Deagu University
Apiradee Ampawasiri, Provincial Electricity Authority, Thailand
Cheong Ghil Kim, Namseoul University, Korea
Choong Pyo Hong, Hoseo University, Korea
Chompoo Suppatoomsin, Vongchavalitkul University, Thailand
Byung In Moon, Kyungpook National University, Korea
Fumitaka Ono, Tokyo Polytechnic University, Japan
Guodong Wang, Qingdao University, China
Hae Kyung Chung, Konkuk University, Korea
Hui Xia, Qingdao University, China
Jae-sang Cha, Seoul National University of Science and Technology, Korea
Je Ho Park, Dankook University, Korea
Jia Zhao, Nanchang Institute of Technology, China
Jianbo Li, Qingdao University, China
Jin Ho Ahn, Hoseo University, Korea
Jung Hoon Lee, Gyeongsang National University, Korea
Seungmin Lee, Namseoul University, Korea
Sunghwa Lim, Namseoul University, Korea
Kyoungro Yoon, Konkuk University, Korea
Worawit Janchai, Chiang Mai University, Thailand
Muhammad Arshad Awan, Allama Iqbal Open University, Pakistan
Qian Zhang, Taishan University, China
Sang Woon Lee, Namseoul University, Korea
Sasalak Tongkaw, Songkhla Rajabhat University, Thailand
Sooncheol Kwon, Kwangwoon University, Korea
Takaaki Ishikawa, Waseda University, Japan
Won Gee Hong, Daegu University, Korea
Woo Chan Park, Sejong University, Korea
Taebum Lim, KETI, Korea
Yiying Zhang, Tianjin University of Science&Technology, China
Yong Hwan Lee, Wonkwang University, Korea
Yongsoo Choi, Sungkyul University, Korea
Young Choong Park, KETI, Korea
Young Ho Seo, Mokwon University, Korea

Jeong-Geun Kim, Yonsei University, Korea

Jeong-Dong Kim, Sunmoon University, Korea

3 Keynote Speeches

Thursday, 22nd July 2021, 13:40 – 14:20

Personalized Environment: Application for Applied Intelligence and Context-aware Computing

Prof. Dr. Punnarumol Temdee

Mae Fah Luang University, Thailand

Abstract

The personalized environment is one of the applications of smart systems which can be described with the sense of context-aware computing and artificial intelligence. From context-aware computing's point of view, this smart system requires different types of contexts for executing the behaviors that are satisfied by the user. For Applied Intelligence, a lot of data is manipulated by Artificial Intelligence based methods to provide a smart decision and response. This talk focuses on demonstrating the examples of the personalized environment in 2 different application domains including learning and healthcare. Personalized learning is a novel pedagogical approach for individual learning. At the same time, personalized healthcare can transform patients' lives by delivering care customized to the individual. Both environments share the same principle that is to know who the user is and provide what they need appropriately.

Biography



Assoc. Prof. Dr. Punnarumol Temdee received B.Eng. in Electronics and Telecommunication Engineering, M. Eng in Electrical Engineering, and Ph.D. in Electrical and Computer Engineering from the King Mongkut's University of Technology Thonburi. Currently, she is a lecturer at the School of Information Technology, and the head of Computer and Communication Engineering for Capacity Building research center, Mae Fah Luang University, Thailand. Her research interests are artificial intelligence and machine learning, applied intelligence, and context-aware computing.

Thursday, 22nd July 2021, 14:20 – 15:00

Artificial Intelligence on Semiconductor Design and Test

Prof. Sung-Kyu Lim

Georgia Institute of Technology, USA

Abstract

Current information processing paradigms handle IoT data, multimedia streams, large volume file, and so on. Objectives of such information processing involves data analysis, data format transformation, and calculation. In IoT systems, various kinds of data should be processed efficiently in heterogeneous systems across regions to share information sharing, e.g., among smart cities. As for the processing system, a virtualized environment such as cloud and container-based ones have been adopted for utilize application processes among computational resources. Thus, one of current and future issues in terms of various data processing models is how each "task" should be processed across heterogeneous virtualized systems. In this presentation, I introduce our research topics for container-based task allocation and scheduling schemes on multiple clouds. The topic includes algorithms for chaining each container-based service function (SF) in order to process IoT data efficiently.

Biography



Prof. Sung Kyu Lim received the B.S., M.S., and Ph.D. degrees from the University of California, Los Angeles in 1994, 1997, and 2000, respectively. He joined the School of Electrical and Computer Engineering, Georgia Institute of Technology in 2001, where he is currently a full professor. His research focus is on the architecture, circuit design, and physical design automation for 3D ICs. His research on 3D IC reliability is featured as Research Highlight in the Communication of the ACM (2014). Dr. Lim received the NSF CAREER Award in 2006. He received several Best Paper Awards from ACM and IEEE conferences and has published 400 papers on 2.5D and 3D ICs.

4 Program at a Glance

Wednesday, 21st July 2021

14:00 – 15:15	Regular Session 1: Smart Contents, Systems, Applications Chair: Chang Choi (Gachon University, Korea) Papers: RS1-1, RS1-2, RS1-3, RS1-4, RS1-5
	Regular Session 2: Smart Contents, Systems, Applications Chair: Nam Kim (Chungbuk National University, Korea) Papers: RS2-1, RS2-2, RS2-3, RS2-4, RS2-5
15:15 – 15:30	Break
15:30 – 16:45	Regular Session 3: Smart Contents, Systems, Applications Chair: Su-Kyung Yoon (Jeonbuk National University, Korea) Papers: RS3-1, RS3-2, RS3-3, RS3-4, RS3-5
	Special Session 1: Recent Advances in Artificial Intelligence with Application Chair: Jeong-Dong Kim (Sunmoon University, Korea) Papers: SS1-1, SS1-2, SS1-3, SS1-4, SS1-5

Thursday, 22nd July 2021

08:30 – 09:00	Pre-arrangement
09:00 – 10:15	Regular Session 4: Smart Contents, Systems, Applications Chair: Young-Ho Seo (Kwangwoon University, Korea) Papers: RS4-1, RS4-2, RS4-3, RS4-4, RS4-5
	Regular Session 5: Smart Contents, Systems, Applications Chair: Kang Yoon Lee (Gacheon University, Korea) Papers: RS5-1, RS5-2, RS5-3, RS5-4, RS5-5
10:15 – 10:30	Break
10:30 – 11:45	Regular Session 6: Smart Contents, Systems, Applications Chair: Youngho Lee (Gacheon University, Korea) Papers: RS6-1, RS6-2, RS6-3, RS6-4, RS6-5

	<p>Regular Session 7: Smart Contents, Systems, Applications</p> <p>Chair: Seokhwan Kang (Gacheon University, Korea)</p> <p>Papers: RS7-1, RS7-2, RS7-3, RS7-4, RS7-5</p>
	<p>Special Session 2: Copyright Protection and Use Activation Technology</p> <p>Chair: Dongmyung Shin (LSware Inc., Korea)</p> <p>Papers: SS2-1(Tutorial), SS2-2, SS2-3, SS2-4, SS2-5</p>
11:45 – 13:20	Lunch Break
13:20 – 13:30	Pre-arrangement
13:30 – 13:40	<p>Plenary Session:</p> <p>Chair: Haechul Choi (Hanbat National University, Korea)</p>
13:40 – 14:20	<p>Message from General Chair:</p> <p style="text-align: center;">Taek-Geun HwangBo (Gachon University, Korea)</p>
14:20 – 15:00	<p>Keynote Speech: Personalized Environment: Application for Applied Intelligence and Context-aware Computing</p> <p>Invited Speaker: Prof. Dr. Punnarumol Temdee (Mae Fah Luang University, Thailand)</p>
15:00 – 15:15	<p>Keynote Speech: Artificial Intelligence on Semiconductor Design and Test</p> <p>Invited Speaker: Prof. Sung-Kyu Lim (Georgia Institute of Technology, USA)</p>
15:15 – 16:30	<p>Break</p>
	<p>CT Forum 1: Metaverse & Contents Technology</p> <p style="text-align: center;">“Metaverse Service”</p> <p>Chair: Kyoungro Yoon (Konkuk University, Korea)</p> <p>Panel Discussions: Haechul Choi, Sangkyun Ki, Youngseop Kim, Gi-Taek Hur, Seunghyun Lee, Young-Ho Seo</p>
	<p>CT Forum 2: Metaverse & Contents Technology</p> <p style="text-align: center;">“Metaverse & NFT”</p> <p>Chair: Youngmo Kim (Soongsil University, Korea)</p>

	Panel Discussions: Hyunsik Kim (KETI), Hakhee Kim (KOLAA), Youngho Seo (Kwangwoon Univ.), Dongmyung Shin (LSware Inc.)
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Friday, 23rd July 2021

09:00 – 10:15	Regular Session 8: Smart Contents, Systems, Applications Chair: Eung-Hee Kim (Sunmoon University, Korea) Papers: RS8-1, RS8-2, RS8-3, RS8-4, RS8-5
	Special Session 3: Computational Intelligence for Smart Health Chair: Jeong-Dong Kim (Sunmoon University, Korea) Papers: SS3-1, SS3-2, SS3-3, SS3-4, SS3-5
10:15 – 10:30	Break
10:30 – 12:00	Regular Session 9: Smart Contents, Systems, Applications Chair: Hyun Lee (Sunmoon University, Korea) Papers: RS9-1, RS9-2, RS9-3, RS9-4, RS9-5, RS9-6
	Regular Session 10: Smart Contents, Systems, Applications Chair: Seokhee Oh (Gachon University, Korea) Papers: RS10-1, RS10-2, RS10-3, RS10-4, RS10-5, RS10-6
	Special Session 4: Copyright Services for Smart Media Chair: Youngmo Kim (Soongsil University, Korea) Papers: SS4-1, SS4-2, SS4-3, SS4-4, SS4-5
12:00 – 12:10	Conference Closing and Award

5 Technical Program

RS1 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 14:00 – 15:15

Chair: Chang Choi (Gachon University, Korea)

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|--------------|---|-----------------|
| RS1-1 | Object-based Compression Method of IR Images for Machine Vision Tasks | <i>EEECS620</i> |
| | Yegi Lee, Shin Kim, Kyoungro Yoon (Konkuk University), Hanshin Lim, Hyon-Gon Choo, Jeongil Seo (Electronics and Telecommunications Research Institute) | |
| RS1-2 | Face recognition-based automatic attendance system through multiple face detection | <i>EEECS626</i> |
| | Sang hun Lee, Seongwon Na, Kyoungro Yoon (Konkuk University) | |
| RS1-3 | Neural network feature map coding for object detection | <i>EEECS630</i> |
| | Heeji Han, Heachul Choi (Hanbat National University), Sangwoon Kwak, Joungil Yun, Won-Sik Cheong, Jeongil Seo (Electronics and Telecommunications Research Institute) | |
| RS1-4 | One-shot Video Frame Interpolation | <i>EEECS631</i> |
| | Minseop Kim, Haechul Choi (Hanbat National University) | |
| RS1-5 | The New Framework to Construct 3d Models Through 2d Data from Mobile Device | <i>EEECS656</i> |
| | WooSung Shin, JaeEun Min, YoungSeop Kim (Dankook University), WooRi Han (Satreci), Chang-Woo Kim (Kyung Hee University) | |

RS2 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 14:00 – 15:15

Chair: Nam Kim (Chungbuk National University, Korea)

- | | | |
|--------------|--|-----------------|
| RS2-1 | Video Streaming Scenario Based on Blockchain State Channels Combining with IoT Camera | <i>EEECS665</i> |
| | Min Hyuk Jeong, Sang-Kyun Kim (Myongji University) | |
| RS2-2 | Video Coding for Machine Use Case with Object of Interest | <i>EEECS666</i> |
| | Hoe Yong Jin, Sang-Kyun Kim (Myongji University), Jin Young Lee, HeeKyoung Lee, Won-Sik Cheong (Electronics and Telecommunications Research Institute) | |
| RS2-3 | GCN Based Quantitative Risk Assessment Model Analysis for Nuclear Sabotage Risk Level Assessment | <i>EEECS627</i> |
| | Namgyu Jung, Chang Choi (Gachon University) | |

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|--------------|--|-----------------|
| RS2-4 | Research to Prevent Security Problems in MEC Environment | <i>EEECS628</i> |
| | Seungwon Lee, Chang Choi (Gachon University) | |
| RS2-5 | Low-power corner feature comparison acceleration system using low-power RBF accelerator | <i>EEECS655</i> |
| | Inpyo Cho, Jaekyu Lee, SangYub Lee (Korea Electronics Technology Institute) | |

RS3 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 15:30 – 16:45

Chair: Su-Kyung Yoon (Jeonbuk National University, Korea)

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|--------------|---|-----------------|
| RS3-1 | Digital Content Generation for Holographic Stereogram Printer Based on IDP Algorithm | <i>EEECS635</i> |
| | Anar Khuderchuluun, Munkh-Uchral Erdenebat, Ki-Chul Kwon, Erkhembataar Dashdavaa, Nyamsuren Darkhanbaatar, Oh-Seung Nam, Nam Kim (Chungbuk National University), Sang-Keun Gil (Suwon University) | |
| RS3-2 | Air-Writing Recognition Using a Fusion Cnn-Lstm Neural Network | <i>EEECS636</i> |
| | Md. Shahinur Alam, Ki-Chul Kwon, Shariar Md Imtiaz, Md. Biddut Hossain, Shindae Rupali, Joon Hyun Kim, Nam Kim (Chungbuk National University) | |
| RS3-3 | Implementation of Sound Rendering with Multi-Thread Technique | <i>EEECS667</i> |
| | Eunjae Kim, Woo-Chan Park (Sejong University), Cheong Ghil Kim (Namseoul University) | |
| RS3-4 | A Comparison of Sound Rendering Performance with Various Devices | <i>EEECS668</i> |
| | Suk-Won Choi, Eunjae Kim, Jiyoung Kim, Woo-Chan Park (Sejong University) | |
| RS3-5 | A Study of Indoor Interactive Digital Signage with Context-Awareness Recommendation | <i>EEECS701</i> |
| | Dae Seung Park, Sang Won Lee, Cheong Ghil Kim (Namseoul University) | |

RS4 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 09:00 – 10:15

Chair: Young-Ho Seo (Kwangwoon University, Korea)

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|--------------|--|-----------------|
| RS4-1 | Data augmentation for improving model to pre-screening depression | <i>EEECS610</i> |
| | Min Kang, Seok-hwan Kang, Youngho Lee (Gachon University) | |
| RS4-2 | Colorectal Cancer Chemotherapy Recommendation Model Using RE-GBM | <i>EEECS611</i> |
| | Seohyun Oh, Kyung-Su Oh, Seok-hwan Kang, Youngho Lee (Gachon University), Jeong-Heum Baek (Gil Medical Center) | |

RS4-3	Classification Model implementation of COVID-19 suspected infection with Non-contact bio-signals and Symptom	<i>EEECS614</i>
	Tae-Ho Hwang, KangYoon Lee (Gachon University)	
RS4-4	Smart Emulator Model by Energy Consumption prediction	<i>EEECS615</i>
	Tae-Ho Hwang, JuHui Lee, KangYoon Lee (Gachon University)	
RS4-5	Virtual Joystick System for VR Application	<i>EEECS632</i>
	Suwon Lee (Gyeongsang National University), Yong-Ho Seo (Mokwon University)	

RS5 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 09:00 – 10:15

Chair: Kang Yoon Lee (Gacheon University, Korea)

RS5-1	Fire Detection Method Using Yolov3 Network	<i>EEECS629</i>
	Akmalbek Abdusalomov, Nodirbek Baratov, Taeg Keun Whangbo (Gachon University)	
RS5-2	A New Approach to 3d Color Space Metrics Quantifies Light-Induced Color Shift in Hologram Picture	<i>EEECS637</i>
	JongHo Jeong, JiYoun Lee, Eung-Jo Kim, SungJae Ha, Soon Chul Kwon, Seunghyun Lee (Kwangwoon University)	
RS5-3	A Study on the Implementation Method of AR Hologram Display Using Holographic Optical Element for Performance and Exhibition Utilization	<i>EEECS638</i>
	Yongjung Kim, Leehwan Hwang, Jungho Kim, Sungjae Ha, Soonchul Kwon, Seunghyun Lee (Kwangwoon University)	
RS5-4	A Gamified Approach for Optimal Waste Management Based on Deep Reinforcement Learning	<i>EEECS639</i>
	Shabir Ahmad, Taeg Keun Whangbo (Gachon University)	
RS5-5	Similarity Measurement Method for the Musculoskeletal Movement Analysis Content	<i>EEECS651</i>
	Jun-Hyeong Park, Yun-Su Park, Eun-Seok Kim, Gi-Taek Hur (Dongshin University)	

RS6 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Youngho Lee (Gacheon University, Korea)

RS6-1	Phase Unwrapping-based Hologram Super-Resolution	<i>EEECS640</i>
	Woosuk Kim, Jin-Kyum Kim, Ji-Won Kang, Byung-Seo Park, Dong-Wook Kim, Young-Ho Seo (Kwangwoon University), Cheong Ghil Kim (Namseoul University)	

RS6-2	A Comparison of Python Web Framework for Deep Learning	<i>EEECS643</i>
	Seyun Choi, Hoijun Kim, Seunghyun Lee, Soonchul Kwon (Kwangwoon University)	
RS6-3	A Study of Humanoid Simulating Motion to Obtain EMG Signal from Leg Amputee	<i>EEECS644</i>
	Woosung Shim, Munyong Lee, Seunghyun Lee, Soonchul Kwon (Kwangwoon University)	
RS6-4	Digital Watermarking for Print-Cam Application	<i>EEECS645</i>
	Byung-Seo Park, Dong-Wook Kim, Young-Ho Seo (Kwangwoon University)	
RS6-5	A New Calibration of Multi-View Cameras Using Multiple Resolution	<i>EEECS646</i>
	Jung-Tak Park, Byung-Seo Park, Young-Ho Seo (Kwangwoon University)	

RS7 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Seokhwan Kang (Gacheon University, Korea)

RS7-1	A Study of Full-Face Landmark Recognition based on Deep Learning Method	<i>EEECS648</i>
	Jaeseung Kim, Hoijun Kim, Seunghyun Lee, Soonchul Kwon (Kwangwoon University)	
RS7-2	Salient Object Detection using two encoder blocks and Channel/Spatial Attention	<i>EEECS649</i>
	Yeongseok Jang, Dong Woo Lee, Seunghyun Lee, Kwang Chul Son (Kwangwoon University)	
RS7-3	UnSingle Image Super-Resolution Using Channel and Spatial Attention	<i>EEECS650</i>
	Dongwoo Lee, Kyeongseok Jang, Kwangchul Son, Seunghyun Lee (Kwangwoon University)	
RS7-4	3d Feature Point Estimation Based on a Single RGB Camera	<i>EEECS653</i>
	Jin-Kyum Kim, Byung-Seo Park, Sol Lee, Young-Ho Seo (Kwangwoon University), Cheong-Ghil Kim (Namseoul University)	
RS7-5	Dynamic Integration of Multi-Layered Mesh Surface for Multiple Imaging System	<i>EEECS654</i>
	Byung-Seo Park, Dong-Wook Kim, Young-Ho Seo (Kwangwoon University), Cheong Ghil Kim (Namseoul University)	

RS8 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 09:00 – 10:15

Chair: Eung-Hee Kim (Sunmoon University, Korea)

RS8-1	Full Body 3d Scanning Systems: A Review	<i>EEECS657</i>
	Jahanzeb Hafeez, Junyung Park, Soonchul Kwon, Seunghyun Lee (Kwangwoon University)	
RS8-2	Deep Learning-Based Phase-Only Hologram Watermarking	<i>EEECS658</i>
	Jang-Hwan Choi, Ji-Won Kang, Woo-Suk Kim, Byung-Seo Park, Dong-Wook Kim, Young-Ho Seo (Kwangwoon University)	
RS8-3	Design of Low Power Cache Replacement Policy for Large Scale Memory Systems	<i>EEECS662</i>
	Su-Kyung Yoon (Jeonbuk National University)	
RS8-4	Nursing Students' Web-Based Simulation Practice Experience	<i>EEECS703</i>
	Kyung Sook Kim (Namseoul University)	
RS8-5	A Study on AI and IT Research Trends Related to Care for the Elderly	<i>EEECS704</i>
	So Yun Choi (Namseoul University)	

RS9 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Hyun Lee (Sunmoon University, Korea)

RS9-1	Workload-aware Prefetching for Hybrid Main Memory Systems	<i>EEECS661</i>
	Su-Kyung Yoon (Jeonbuk National University)	
RS9-2	A Combination Between Scaler Algorithms and Entropy-Based Discretization on Metagenomic Data	<i>EEECS659</i>
	Nhi Yen Kim Phan, Hoa Huu Nguyen, Hai Thanh Nguyen (Can Tho University), Toan Bao Tran (Duy Tan University)	
RS9-3	Service Robot with Smart Device for a Monitoring System	<i>EEECS633</i>
	Yong-Ho Seo (Mokwon University)	
RS9-4	Production of Immersive Contents for Preventing in the Elderly using 3D Depth Camera	<i>EEECS652</i>
	Dae-Bok Kim, Yun-Su Park, Eun-Seok Kim, Gi-Taek Hur (Dongshin Univesity)	
RS9-5	A Study of Designing Conversational AI Chatbot with Emotion Using NLP and NLU	<i>EEECS702</i>
	Daeseung Park, Yeol Woo Sung, Cheong Ghil Kim (Namseoul University), Jeong-geun Kim (Yonsei University)	
RS9-6	Single Reflection Removal Algorithm on Mobile Device	<i>EEECS698</i>
	Yong-Hwan Lee (Wonkwang University), Yu-Kyong Lee (BeakSeok Culture University)	

RS10 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Seokhee Oh (Gachon University, Korea)

- | | | |
|---------------|---|-----------------|
| RS10-1 | A Robust Edge Detection Algorithm for Observation-marker Recognition in Noisy Image Samples | <i>EEECS691</i> |
| | Hyeongjin Kim, Howoong Lee, Chung-Pyo Hong (Hoseo University) | |
| RS10-2 | A CNN-based salivary pattern detection technique for fertility confirmation | <i>EEECS692</i> |
| | Jaehyeon Park, Chung-Pyo Hong, Howoong Lee (Hoseo University) | |
| RS10-3 | NFMsim: An Flexible Near-Far Memory System Simulator | <i>EEECS693</i> |
| | Jeong-Geun Kim, Shin-Dug Kim (Yonsei University) | |
| RS10-4 | Research on a temperature control system using the KNN algorithm | <i>EEECS696</i> |
| | Wonjun Jeong, Seokhee Oh (Gachon University) | |
| RS10-5 | Development of virtual reality serious game and data visualization platform based on spinal cord rehabilitation exercise machine | <i>EEECS697</i> |
| | Jehyun Kim, Seokhee Oh (Gachon University) | |
| RS10-6 | Implementation of an Arbitrary Waveform Generator for Built Off Self Test | <i>EEECS705</i> |
| | Changjin Lee, Donghyuk Kim, Jin-Ho Ahn (Hoseo University) | |

SS1 Special Session: Recent Advances in Artificial Intelligence with Application

Wednesday, 21st July 2021, 15:30 – 16:45

Chair: Jeong-Dong Kim (Sunmoon University, Korea)

- | | | |
|--------------|--|-----------------|
| SS1-1 | A Design and Implementation of Cursive Character Recognition based on Deep Learning | <i>EEECS671</i> |
| | Hyeong-Cheol Yoo, Seon-Min Kim, Hyein Lee, Eung-Hee Kim, Jeong-Dong Kim (Sunmoon University) | |
| SS1-2 | An Implementation of Illegal Parking Recognition Service Based on YOLOV3 | <i>EEECS673</i> |
| | Yoo Bin Song, Ji Hyeon Park, E Seul Kim, Kyung Min Jung, Min Gyu Park, Joong Hyun Park (Sunmoon University) | |
| SS1-3 | An implementation of Yolo-based application for based situation recognition on real-time | <i>EEECS682</i> |
| | Sang Uk Lee, Chae Yeon Seo, Soo Bin Lee, Se Yeon Hong, Yun Gyeong Song, Young Sup Hwang (Sunmoon University) | |

- SS1-4 Multi-recognition Product Searching with Deep Learning** *EEECS680*
 Hyeon Hak Kim, Dong Geon Lee, Yun Yeol Yang, Ju Hyeok Jung, Jeung min Lee, Yoon Young Park (Sunmoon University)
- SS1-5 An Implementation of Stock Investment Service based on Reinforcement Learning** *EEECS683*
 Pill Joong Kim, Seung Sik Hong, So Young Kim, Seong Jun Yoo, Jeong Yeon Park, Hyun Lee (Sunmoon University)

SS2 Special Session: Copyright Protection and Use Activation Technology

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Dongmyung Shin (LSware Inc., Korea)

- SS2-2 A Study on Suspected Copyright Infringement Detection For Educational Content And Recommendation Of Alternatives** *EEECS689*
 Hakhee Kim, Kyungmi Choi, Haeseong Park, Kimin Oh, Won-gyum Kim (Korea Literature, Academic works and Art Copyright Association)
- SS2-3 A Music Usage Sensitive Information Encrypion Method on Blockchain Network** *EEECS686*
 Seyoung Jang, Ulugbek Ruzive, Byeongchan Park, Youngmo Kim, Seok-Yoon Kim (Soongsil University)
- SS2-4 Introduction to the Fair Distribution and Transparent Settlement of Theme, Background, and Signaling Music Licensing Fees Using Hyperledger Fabric** *EEECS608*
 Hyoungsung Kim, Yong-Suk Park, Hyun-Sik Kim (Korea Electronics Technology Institute)
- SS2-5 One Pass Value Prefetching for reducing read delay of Blockchain** *EEECS616*
 YongJoon Joe, KyungYeob Park, HyunSoo Kim, Dong-Myung Shin (LSware Inc.)

SS3 Special Session: Computational Intelligence for Smart Health

Friday, 23rd July 2021, 09:00 – 10:15

Chair: Jeong-Dong Kim (Sunmoon University, Korea)

- SS3-1 Machine Learning for Stress Detection Using Data from Wearable Sensors: A Review Study** *EEECS674*
 Phataratah Sa-nguannarm, Jeong-Dong Kim (Sunmoon University)
- SS3-2 Stress Detection Based on Deep Learning Model by Using Wearable Multimodal Data** *EEECS676*
 Phataratah Sa-nguannarm, Jeong-Dong Kim (Sunmoon University)

SS3-3	Gait Patterns Analysis Based on K-Nearest Neighbor Algorithm	<i>EEECS679</i>
	Kwonwoo Lee, Minkyu Kim, Jayeon Sim, Dongho Jang, Jeong-Dong Kim (Sunmoon University)	
SS3-4	Rff-Machine Learning Based For Personalized Workout Monitoring	<i>EEECS687</i>
	Ermal Elbasani, Jeong-Dong Kim (Sunmoon University)	
SS3-5	Classification of Various Sounds Wavelength Based on Deep Learning for Hearing-Impaired People	<i>EEECS678</i>
	Soualilhou Ngnamsie Njimbouom, Ermal Elbasani, TaeWoon Nam, DongHwan Yoon, SoonWoo Jung, Jeong-Dong Kim (Sunmoon University)	

SS4 Special Session: Copyright Services for Smart Media

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Youngmo Kim (Soongsil University, Korea)

SS4-1	A 30gbps-Class High-Capacity Traffic Processing Method Using Core Isolation	<i>EEECS663</i>
	Youngsun Kwon, Byeongchan Park, Hoon Chang (Soongsil University)	
SS4-2	Non-Oracle external interaction by simultaneous mutual validation consensus	<i>EEECS617</i>
	YongJoon Joe, Yeseul Lee, Joo-Sung Kim, Dong-Myung Shin (LSware Inc.)	
SS4-3	An Ndpi Protocol Collection Method for Supports 20gbps-Class Traffic Processing Speed	<i>EEECS664</i>
	Youngsun Kwon, Byeongchan Park, Hoon Chang (Soongsil University)	
SS4-4	A Settlement and Distribution Data Generation Method for Theme, Background and Signal Music Based on Blockchain Network	<i>EEECS642</i>
	Byeongchan Park, Youngmo Kim, Seok-Yoon Kim (Soongsil University)	
SS4-5	A Real-Time Bus Arrival Notification System for Visually Impaired Using Deep Learning	<i>EEECS670</i>
	Taegyun Son, Hayeon Kim, Dongwoon Kim, Ingyu Bang, Hoon Chang (Soongsil University)	

6 Abstracts

RS1 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 14:00 – 15:15

Chair: Chang Choi (Gachon University, Korea)

RS1-1 Object-based Compression Method of IR Images for Machine Vision Tasks EEECS620

Yegi Lee	Konkuk University
Shin Kim	Konkuk University
Kyoungro Yoon	Konkuk University
Hanshin Lim	Electronics and Telecommunications Research Institute
Hyon-Gon Choo	Electronics and Telecommunications Research Institute
Jeongil Seo	Electronics and Telecommunications Research Institute

With the recent development of deep learning technology, it has been used in various fields such as smart cities, autonomous vehicles, surveillance, and the Internet of Things. Accordingly, the needs for machine vision tasks, not for human consumption, are increasing. Infrared images are widely used in industry because they can produce consistent quality images even in the challenging condition such as rain and night. This paper proposes the object-based compression method that is a convenient and efficient compression method of Infrared images for machine vision tasks. We perform different compression rates according to the importance of information in an image. Therefore, the object part that the machine is interested in and considers important is compressed with a low quantization parameter(QP). The background part considered to be relatively less important is compressed with a higher QP. This proposed method with different QPs increases the compression efficiency and the object detection accuracy with the decoded image.

RS1-2 Face recognition-based automatic attendance system through multiple face detection EEECS626

Sang hun Lee	Konkuk University
Seongwon Na	Konkuk University
Kyoungro Yoon	Konkuk University

Recently, face recognition techniques have received social attention due to the prolonged duration of covid-19. It is used in various platforms such as airport immigration systems, personal authentications, and online classes. However, face recognition applications are often targeting a single person recognition, and in platforms that require multiple face recognition, the accuracy and processing speed get lower as the number of targetted persons increases. To attack this problem, in this paper, we propose a multiple face recognition method based on frontal face detection methods and regional elimination methods at recognition. We validated our proposed method by applying to an online attendance system, and confirmed that the average number of processed frames increases using the regional elimination method with large number of faces, and the face recognition accuracy of 97.2% is achieved with 36 people present.

RS1-3 Neural network feature map coding for object detection EEECS630

Heeji Han	Hanbat National University
Heachul Choi	Hanbat National University

Sangwoon Kwak	Electronics and Telecommunications Research Institute
Joungil Yun	Electronics and Telecommunications Research Institute
Won-Sik Cheong	Electronics and Telecommunications Research Institute
Jeongil Seo	Electronics and Telecommunications Research Institute

Recently, neural network-based technologies using images or videos have been diversified, and tasks processed by neural networks are becoming more diverse and complex. As the neural network task becomes more diverse and complex, it requires more video data, so an effective method for coding video data is needed. MPEG, an international standardization organization, is in the process of standardizing Video Coding for Machines (VCM) to develop a video coding standard for neural network-based tasks. In VCM, pipeline2 is discussed for feature map coding. In this paper, feature map channel reordering is proposed to increase the coding efficiency by increasing the similarity between feature map channels. The feature map of C2 is extracted from the backbone network of X101-FPN, which is an evaluated network for object detection and then the feature map channels of C2 are reordered according to similarity between channels so that the channels with high temporal correlation are grouped. The proposed method is implemented based on a VCM anchor on OpenImages. For 360 images selected from 5000 images used in, the experimental results show an average BD-rate of -2.07%. BPP decreased in all QPs and the accuracy of the object detection task was almost maintained.

RS1-4 One-shot Video Frame Interpolation

EEECS631

Minseop Kim	Hanbat National University
Haechul Choi	Hanbat National University

Recently, the demand for high-quality videos is increasing due to the spread and performance improvement of high-resolution and high frame rate displays. Video frame interpolation is one of the high-quality video generation methods, which generates spatio-temporal coherent frames for given consecutive frames. The conventional video frame interpolation methods have been mainly studied to generate a single frame. However, these methods have high complexity and require a lot of resources to predict multiple frames. This paper proposes an one-shot video frame interpolation method to generate multiple frames in parallel. This For the parallel processing, the frame of an arbitray time interval need to be interpolated in one inference. The proposed method gives temporal weights to the output of the intermediate optical flow network and warps the input frames with the temporal-weighted optical flows. In addition, by implementing the network with half precision, interpolation speed is improved through the trade-off between accuracy and speed. On the Vimeo90K septuplet benchmark dataset, the proposed method shows an interpolation speed that is almost twice as fast as the existing state-of-the-art method.

RS1-5 The New Framework to Construct 3d Models Through 2d Data from Mobile Device

EEECS656

WooSung Shin	Dankook University
JaeEun Min	Dankook University
YoungSeop Kim	Dankook University
WooRi Han	Satreci
Chang-Woo Kim	Kyung Hee University

This paper proposes a system that provides video streaming services from the Internet of Media Things using blockchain and cryptocurrency (token). The customer pays the token under the contract terms of the smart contract written on the blockchain through the distributed application (DApp). The IP camera paid the token constitutes a scenario in which the taken video is streamed to the customer in real-time. To investigate the possibility of a blockchain camera streaming service, we uploaded a smart contract for streaming service on Ethereum-based blockchain, and ERC20 tokens necessary for the transaction are created and implemented. To overcome the slow trading speed and the disability of proper refunding, the off-chain transaction, one of the blockchain scaling techniques, was applied and implemented in the system.

RS2 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 14:00 – 15:15

Chair: Nam Kim (Chungbuk National University, Korea)

RS2-1 Video Streaming Scenario Based on Blockchain State Channels Combining with IoT Camera *EEECS665*

Min Hyuk Jeong	Myongji University
Sang-Kyun Kim	Myongji University

This paper proposes a system that provides video streaming services from the Internet of Media Things using blockchain and cryptocurrency (token). The customer pays the token under the contract terms of the smart contract written on the blockchain through the distributed application (DApp). The IP camera paid the token constitutes a scenario in which the taken video is streamed to the customer in real-time. To investigate the possibility of a blockchain camera streaming service, we uploaded a smart contract for streaming service on Ethereum-based blockchain, and ERC20 tokens necessary for the transaction are created and implemented. To overcome the slow trading speed and the disability of proper refunding, the off-chain transaction, one of the blockchain scaling techniques, was applied and implemented in the system.

RS2-2 Video Coding for Machine Use Case with Object of Interest *EEECS666*

Hoe Yong Jin	Myongji University
Sang-Kyun Kim	Myongji University
Jin Young Lee	Electronics and Telecommunications Research Institute
HeeKyoung Lee	Electronics and Telecommunications Research Institute
Won-Sik Cheong	Electronics and Telecommunications Research Institute

This paper introduces use cases and pipelines for video coding for machines focusing on objects of interest. By expressing the CNN inference result of object detection and object segmentation through MPEG-7 descriptor binarization, the compression result with the original is compared. The inference results for object detection and object segmentation were compressed using MPEG-7 descriptors, and the sizes of various types of compressed files were measured and compared. As a result of the experiment, it was found that the method of expressing the MPEG-7 descriptor through binarization is more efficient than other compressed files.

RS2-3 GCN Based Quantitative Risk Assessment Model Analysis for Nuclear Sabotage Risk Level Assessment *EEECS627*

Namgyu Jung	Gachon University
Chang Choi	Gachon University

Nuclear power has greatly contributed to the development of the industry because of its high energy production efficiency compared to fossil fuels. The introduction of digital systems along with the development of information technology has utilized many digital systems such as security systems and emergency response systems in nuclear power plants and industrial fields. However, with the introduction of digital systems, they are exposed to various cyberattacks, and cyberattacks aimed at destroying power plants are occurring. Since the damage from nuclear sabotage is inherently very risky, quantitative risk assessment methods are needed to assess the level of risk. In this paper, we introduce the existing cybersecurity risk assessment guidelines and introduce a GCN based quantitative risk assessment model that can effectively evaluate the level of nuclear sabotage threats.

RS2-4 Research to Prevent Security Problems in MEC Environment *EEECS628*

Seungwon Lee

Gachon University

Chang Choi

Gachon University

Mobile Edge Computing (MEC) is a next-generation technology that can efficiently handle the insufficient performance of IoT systems. MEC will be utilized in various business fields worldwide, and studies also proceed in lots of research areas. MEC is a big technology with a bright future, but it is not yet optimized and not much research has been done in terms of security. In this paper, we reviewed various studies on security problems that may occur in the MEC environment. Through these studies, we find out how various problems have been solved and discuss future research directions..

RS2-5 Low-power corner feature comparison acceleration system using low-power RBF accelerator

EEECS655

Inpyo Cho

Korea Electronics Technology Institute

Jaekyu Lee

Korea Electronics Technology Institute

SangYub Lee

Korea Electronics Technology Institute

In this paper, a corner feature comparison acceleration system was implemented using a low-power, low-cost RBF (intellino) and a low-power, low-cost open HW (Raspberry Pi pico) used as a host device. Through the fast comparison operation of the accumulated feature vectors, the classification of the currently photographed image is performed faster than before, enabling the classification function by image even on a low-power, low-cost HW platform. As the classification function is improved by 230% compared to the previous one, the final image processing performance is improved from 9fps to 32fps, so that the image detection function can be processed at 30fps or higher in Raspberry Pi pico.

RS3 Regular Session: Smart Contents, Systems, Applications

Wednesday, 21st July 2021, 15:30 – 16:45

Chair: Su-Kyung Yoon (Jeonbuk National University, Korea)

RS3-1 Digital Content Generation for Holographic Stereogram Printer Based on IDP Algorithm

EEECS635

Anar Khuderchuluun

Chungbuk National University

Munkh-Uchral Erdenebat

Chungbuk National University

Ki-Chul Kwon

Chungbuk National University

Erkhembaatar Dashdavaa

Chungbuk National University

Nyamsuren Darkhanbaatar

Chungbuk National University

Oh-Seung Nam

Chungbuk National University

Nam Kim

Chungbuk National University

Sang-Keun Gil

Suwon University

Holographic stereogram (HS) printer is the most widely used technique in the field of the holographic printer. There are several methods proposed for HS by using one of the existing integral imaging techniques. In this paper, we proposed a digital content generation for HS printer utilizing inverse-directed propagation (IDP) algorithm based on computer-generated integral imaging to reduce the computation time of the content generation and provide accurate depth cues of a 3D object without degrading image quality. The configuration of the digital content generation of HS is composed of two main parts. First, the acquisition of the 3D object is implemented to adjust parameters of the 3D object including size, shading, texture, and lighting. Then, an array of the elemental images is generated by implementing computer-generated

integral imaging based on the IDP algorithm. Here sampled elemental image is defined as a light field of the object. In second, the sampled elemental image is transformed to a complex wavefront through the fast Fourier transform (FFT) and applying the Fresnel diffraction for a phase-modulated hogel (sub-hologram). Finally, the hogels are displayed on the reflective phase-only spatial light modulator (SLM) then recorded onto holographic material one-by-one in sequence, while motorized X-Y translation stage shifts the holographic material; so, the full-parallax HS is recorded on the photopolymer and 3D holographic visualization of the object is successfully observed. Numerical simulation and optical reconstructions are verified effective computation and image quality, respectively.

RS3-2 Air-Writing Recognition Using a Fusion Cnn-Lstm Neural Network

EEECS636

Md. Shahinur Alam	Chungbuk National University
Ki-Chul Kwon	Chungbuk National University
Shariar Md Imtiaz	Chungbuk National University
Md. Biddut Hossain	Chungbuk National University
Shindae Rupali	Chungbuk National University
Joon Hyun Kim	Chungbuk National University
Nam Kim	Chungbuk National University

Writing in the air can be characterized as writing digit or character in a 3D space by using a finger or marker movement. It enables a new form of interface that provides us to write through gesture or finger movement in the air. The written characters are rendered on an imaginary plane without haptic or visual feedback. In this research, a trajectory-based air writing character identification system using a fusion of convolution neural network (CNN) and long short-term memory (LSTM) named CNN-LSTM is proposed. Two publicly available datasets RTD and RTC were employed. The proposed network contains two CNN with consecutive pooling, two LSTM, and two dense layers. The input is set as the maximum number of character lengths (300 and 800 for RTD and RTC, respectively). A dropout rate of 0.4 is used in the dense layer to prevent overfitting. The output layer is variable here, the output size is 10 and 26 for RTD and RTC datasets, respectively. The accuracy for RTD and RTC datasets is 99.63% and 98.74%, respectively. The identification time was 14ms per character which is quick enough to implement in a real-time approach.

RS3-3 Implementation of Sound Rendering with Multi-Thread Technique

EEECS667

Eunjae Kim	Sejong University
Woo-Chan Park	Sejong University
Cheong Ghil Kim	Namseoul University

This paper proposes a multi-threaded sound rendering algorithm based on GA in real-time. The proposed method is implemented by two threads that process the sound path (direct, reflection, diffraction path) and late reverberation separately. In this paper, the performance was verified by comparing the single-thread and multi-thread method. The experimental results show that the performance of proposed method is improved by about 8.4% compared to the single-threaded method.

RS3-4 A Comparison of Sound Rendering Performance with Various Devices

EEECS668

Suk-Won Choi	Sejong University
Eunjae Kim	Sejong University
Jiyoung Kim	Sejong University
Woo-Chan Park	Sejong University

Physically based sound rendering requires complex calculations. In this paper, the performance of sound rendering was compared for various devices (embedded PC, high-performance PC, FPGA). As a result of the experiment, the

performance of FPGA is 10 to 20 times higher than that of embedded PC and 3 to 6 times higher than that of high-performance PC.

RS3-5 A Study of Indoor Interactive Digital Signage with Context-Awareness Recommendation *EEEC2021*

Dae Seung Park	Namseoul University
Sang Won Lee	Namseoul University
Cheong Ghil Kim	Namseoul University

Recently, digital signage is rapidly expanding as a new advertising medium. Although it is being expanded in the form of large electronic billboards in places with a lot of floating population at the beginning, it is also rapidly spreading to small environments that are very closely related to daily life, such as government offices, apartments, elevators, and so on. Considering this trend, this paper proposes a digital signage that enables context-aware personalized recommendation with user interactions. For this purpose, the digital signage will have a feature of enabling feedback on the contents displayed by communicating via Bluetooth between user's smartphones and equip with camera to get user information in an indoor environment. As a result, the most suitable digital signage content will be displayed by estimating the user's context through the indoor interactive digital signage.

RS4 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 09:00 – 10:15

Chair: Young-Ho Seo (Kwangwoon University, Korea)

RS4-1 Data augmentation for improving model to pre-screening depression *EEEC2021*

Min Kang	Gachon University
Seok-hwan Kang	Gachon University
Youngho Lee	Gachon University

Many studies to diagnose depression using electroencephalogram(EEG) are continue, but they are designed based on multi-channel EEG used in professional devices. So, we propose a model for early diagnosis of depression using low-channel EEG that can be easily used by individuals. For efficient training in a limited data environment, we applied the EEG Data Augmentation method. As a result, it was confirmed that the accuracy was improved by about 9% after augmentation.

RS4-2 Colorectal Cancer Chemotherapy Recommendation Model Using RE-GBM *EEEC2021*

Seohyun Oh	Gachon University
Kyung-Su Oh	Gachon University
Seok-hwan Kang	Gachon University
Youngho Lee	Gachon University
Jeong-Heum Baek	Gil Medical Center

In this study, the data imbalance of the dependent variable, 'chemotherapy', was severe, so we did oversampling and constructed a chemotherapy recommendation model. We use SMOTE and ADASYN techniques for oversampling and use GBM for classification. As a result of performance evaluation by applying RE-GBM, it was found that the true prediction ratio increased after oversampling. It was confirmed that RE-GBM has the advantage of oversampling flexibly according to the number of majority classes around the minority class in ADASYN.

RS4-3 Classification Model implementation of COVID-19 suspected infection with Non-contact bio-signals and Symptom *EEECS614*

Tae-Ho Hwang	Gachon University
KangYoon Lee	Gachon University

As COVID-19 pandemic becomes bigger, a model that can identify and classify based on COVID-19 patients' early symptoms. A non-contact method of model implementation is required. We studies a "COVID-19 Suspect Classification Method" based on non-contact methods like analyzing vital sign measurements and symptoms. The COVID-19 Suspect Classification Model looks at symptoms like cough, sore throat, fever, headache, myalgia or arthralgia. We suggest a "Ensemble Model", a Machine Learning (ML) classification model that can analyze its performance, make mild adjustments for improvement.

RS4-4 Smart Emulator Model by Energy Consumption prediction *EEECS615*

Tae-Ho Hwang	Gachon University
JuHui Lee	Gachon University
KangYoon Lee	Gachon University

Consumption and dependence on electricity in residential buildings are high worldwide. A system that can evaluate, predict electrical energy consumption and control (ON/OFF) electrical devices to reduce electrical energy is in need. As more research is done on Artificial Intelligence (AI), there are more attempts to apply AI technique on increasing energy efficiency and energy management in buildings. However, in places like houses, small offices and Small Stores, smart control devices are not usually included in existing home electrical devices. Thus, it is difficult to accurately measure and smart control electricity consumption. In this study, we used some sample data of a part of the U.S.A uploaded in Kaggle, analyzed electricity consumption pattern and came up with a "Electrical Energy Consumption Prediction Model" by applying the RNN and LSTM. The prediction model can be applied in "AI Smart Emulator System" and be used in electrical energy prediction and reduction.

RS4-5 Virtual Joystick System for VR Application *EEECS632*

Suwon Lee	Gyeongsang National University
Yong-Ho Seo	Mokwon University

Current input devices are typically expensive, not easily portable, and require a substantial amount of space. However, these limitations can be rectified with the use of virtual input devices. In this paper, we propose a virtual joystick system, which is a type of virtual input device. Our system detects a handheld stick and computes the direction of a user's hand position relative to a user-defined center. Experimentation demonstrated our system's performance, gauging accuracy and speed as compared with those produced using a real joystick.

RS5 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 09:00 – 10:15

Chair: Kang Yoon Lee (Gacheon University, Korea)

RS5-1 Fire Detection Method Using Yolov3 Network *EEECS629*

Akmalbek Abdusalomov	Gachon University
Nodirbek Baratov	Gachon University
Taeg Keun Whangbo	Gachon University

Today, sensor-based systems for fire and smoke detection are widely used all over the world. Further research shows that camera-based fire detection systems are achieving much better results than sensor-based methods. In this study, we present a method of real-time high-speed fire detection through deep learning. A new special convolution neural network has been developed to detect fire using the existing YOLOv3 algorithm. Since our real-time cameras are built on a banana board, we have adapted the YOLOv3 to the board level. By modifying the algorithm, we recorded the results of rapid and high-precision detection of fire, both day and night, regardless of shape and size. One more advantage is that the algorithm is also capable of detecting fires that are 1 meter long and 0.3 meters wide at a distance of 50 meters. Experimental results show that the proposed method successfully detects fire candidate areas and achieves seamless classification performance than other conventional fire detection frameworks.

RS5-2 A New Approach to 3d Color Space Metrics Quantifies Light-Induced Color Shift in Hologram Picture

EEECs637

JongHo Jeong	Kwangwoon University
JiYoun Lee	Kwangwoon University
Eung-Jo Kim	Kwangwoon University
SungJae Ha	Kwangwoon University
Soon Chul Kwon	Kwangwoon University
Seunghyun Lee	Kwangwoon University

Digital hologram images are applying to various fields in VR (virtual reality), AR (augmented reality), and the real 3D hologram industry. For a hologram image of the actual object, there are some capture systems with a rotating camera or object, and light sources. One of the noteworthy hologram capture systems is the light source to illuminate an object. The actual object could be shown under the light and the color of the object would be discerned. But, as different light spectrum even though the same color temperature of the light source, we could run into the different reflected colors. So, depending on the light source, the color of the hologram image would be shifted or clipped at the display. Since color chromaticity was introduced in 1931 in the color science field, CIE xy and u'v' chromaticity has been used to represent the color point, but there is a constraint that light intensity, named luminance could not be reflected in the 2D color chromaticity as color represents luminance hue and chroma. So the focus of this study is clearly how to calculate the position of shifted color points in the 3D color space. CIE $L^*a^*b^*$ which is one of 3D color space models to represent the color data is used to set the color position. The main calculation method is to define between color points inside and outside $L^*a^*b^*$ color space under the different light sources.

RS5-3 A Study on the Implementation Method of AR Hologram Display Using Holographic Optical Element for Performance and Exhibition Utilization

EEECs638

Yongjung Kim	Kwangwoon University
Leehwan Hwang	Kwangwoon University
Jungho Kim	Kwangwoon University
Sungjae Ha	Kwangwoon University
Soonchul Kwon	Kwangwoon University
Seunghyun Lee	Kwangwoon University

Floating hologram systems generally use transparent screens called half mirrors or foils. However, the system must have the same screen size as the image size in order to display a large-sized image. Further, the distance of the image can only be obtained from the distance between the projection screen and the display. These limitations can be overcome using holographic optical elements (HOE). HOE is made by recording the refractive force of the lens with holographic material. In this study, the numerical values of the reconstructed images were theoretically analyzed through optical ray tracing, and the theoretical design of the reconstructed image size and depth was subsequently measured and experimentally verified.

RS5-4 **A Gamified Approach for Optimal Waste Management Based on Deep Reinforcement Learning** *EEECS639*

Shabir Ahmad	Gachon University
Taeg Keun Whangbo	Gachon University

In this paper we presents a gamified approach for automated waste collection using deep reinforcement learning. The purpose is to go through a certain area and observe waste bins and based on the level of bins give reward. The states would be all of the sensor generating the level of waste in the bins. The actions could be go north, west, south, east to find bin. The rewards could be -1 at every time step if the bin has no overflow and 0 other wise. This way the the agent will learn (prioritize) to traverse the route with more rewards (bin overflow).

RS5-5 **Similarity Measurement Method for the Musculoskeletal Movement Analysis Content** *EEECS651*

Jun-Hyeong Park	Dongshin University
Yun-Su Park	Dongshin University
Eun-Seok Kim	Dongshin University
Gi-Taek Hur	Dongshin University

When you create the musculoskeletal movement analysis content using a motion recognition camera, it should be possible to determine how similar the user's joints are to the corresponding motion at a specific point in time. Since the length of the skeleton is different for each person, it is not easy to recognize the reference posture from the skeleton data of the user who uses the content. We suggest a posture recognition method by measuring each joint and angle of a person to determine the compatibility with the reference posture.

RS6 **Regular Session: Smart Contents, Systems, Applications**

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Youngho Lee (Gacheon University, Korea)

RS6-1 **Phase Unwrapping-based Hologram Super-Resolution** *EEECS640*

Woosuk Kim	Kwangwoon University
Jin-Kyum Kim	Kwangwoon University y
Ji-Won Kang	Kwangwoon University
Byung-Seo Park	Kwangwoon University
Dong-Wook Kim	Kwangwoon University
Young-Ho Seo	Kwangwoon University
Cheong Ghil Kim	Namseoul University

This paper proposes a method using phase unwrapping and deep learning-based super-resolution for increasing the resolution of low-resolution phase-only holograms. Using phase unwrapping, we generate correlation and continuity between neighbor pixels and solve the difficulty for CNN-based hologram learning. Figure 1 shows the total flow for the proposed learning method. The proposed method shows +0.5dB or higher performance than using the original hologram.

RS6-2 **A Comparison of Python Web Framework for Deep Learning** *EEECS643*

Seyun Choi	Kwangwoon University
Hojun Kim	Kwangwoon University
Seunghyun Lee	Kwangwoon University
Soonchul Kwon	Kwangwoon University

We had proceed comparing python-based web framework Flask and Django. Web has accessibility and familiar to user to give deep learning user experience. Deep learning in web should be researched. Most of deep learning code is based on python, and Flask and Django is most used, popular python web framework. Therefore, performance of python-based is important not only deep learning model's performance but also, web framework. To measure user experience, we measured two frameworks starting/loading time, responding time by concurrent connection that affect user experience. We measured responding time by concurrent connectors up to 6 requests. Responding time is major in comparing with measurement results. In this paper results of comparing Flask and Django showed Django has less responding time and revealed great results than Flask.

RS6-3 A Study of Humanoid Simulating Motion to Obtain EMG Signal from Leg Amputee *EEECSS644*

Woosung Shim	Kwangwoon University
Munhyong Lee	Kwangwoon University
Seunghyun Lee	Kwangwoon University
Soonchul Kwon	Kwangwoon University

Most leg amputation patients are unable to distinguish the muscle sensibility between having legs or not. This was a problem that Leg amputees cannot use properly when they wore prosthetic legs. For this reason, giving them a few motions using humanoid simulating in Augmented Reality (AR) can be used to leg amputation patients to adapt prosthetic leg easily in the future and restore muscle sensation. In this study, we proposed the method of providing 6 simulating motions using humanoid to obtain a signal from the patient's leg using Electromyography (EMG) sensor. This research was divided in two parts, signal processing and humanoid simulation. In the part of signal processing, we recognized the motions to obtain signal using EMG sensor. In second part, we used unity not only record animation clip and create a humanoid simulating motions but also, track and real-time mirroring patient's motion using Azure Kinect and 3D model.

RS6-4 Digital Watermarking for Print-Cam Application *EEECSS645*

Byung-Seo Park	Kwangwoon University
Dong-Wook Kim	Kwangwoon University
Young-Ho Seo	Kwangwoon University

In this paper, we propose a method of generating, embedding and extracting a watermark that is robust against geometric deformation in a Print-Cam environment. The data is distributed over the resolution of the input image to increase the probability of watermark extraction, embedding data through mask image and compositing so that data is not visible. When embedding data, the brightness value is maintained in consideration of the original RGB color. In the extraction, the distortion of the photographed image is corrected by calculating the homography matrix by matching feature points between the original watermarked image and the photographed image. Watermark extraction is performed through bitwise operation of the homography-converted image and the mask image.

RS6-5 A New Calibration of Multi-View Cameras Using Multiple Resolution *EEECSS646*

Jung-Tak Park	Kwangwoon University
Byung-Seo Park	Kwangwoon University
Young-Ho Seo	Kwangwoon University

The camera calibration process is essential in order to obtain an accurate image of the subject. A typical method of performing camera calibration is to find the feature point of an image using a chess board, then use the information of the photographed image and the original chess board to calculate how far the photographed image is different from the original to determine the camera position. However, since a hardware error inevitably occurs in the process of the camera taking an image, there is a difference between the captured image and the actual object, which prevents accurate calibration. Therefore, in order to find the more accurate position of the feature point, we propose a calibration method using the average of the position data of the feature point. A point cloud is created by shooting multiple RGB and depth frames at multiple resolutions using an RGB-D sensor, and then position data of feature points found in each point cloud is accumulated. Then, the average of the accumulated data is used as a feature point. In the error correction process, the distance between the feature points found in the point cloud and the actual measured horizontal and vertical lengths of the chess board are measured, and the distance between the feature points is matched to the actual length. In the optimization process, the rotation and translation matrices are modified to match the positions of the same feature point taken by multiple cameras, and the correct matrix is obtained. Therefore, by using the proposed method, the effect of errors caused by hardware problems can be overcome and calibration can be performed more accurately than the existing method.

RS7 Regular Session: Smart Contents, Systems, Applications

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Seokhwan Kang (Gacheon University, Korea)

RS7-1 A Study of Full-Face Landmark Recognition based on Deep Learning Method *EEECS648*

Jaeseung Kim	Kwangwoon University
Hoijun Kim	Kwangwoon University
Seunghyun Lee	Kwangwoon University
Soonchul Kwon	Kwangwoon University

In this paper, we proposed a deep learning-based full-face landmark method using face landmark and ear landmark. The conventional method consisted of face landmark datasets that do not include ear landmark. Due to this, when detecting a face, the ears are excluded. The proposed method used landmarks close to the ear to supplement the missing information on existing face landmark. The position of the ear was estimated by using the relationship of the landmarks close to the ear part. After calculating in the 3D spatial coordinate system, it was converted to the 2D coordinate system of the image. Through this process, an algorithm for detecting full-face landmark was proposed. The proposed method showed the results of detecting the ears to the conventional face landmark results.

RS7-2 Salient Object Detection using two encoder blocks and Channel/Spatial Attention *EEECS649*

Yeongseok Jang	Kwangwoon University
Dong Woo Lee	Kwangwoon University
Seunghyun Lee	Kwangwoon University
Kwang Chul Son	Kwangwoon University

In this paper, we deploy a network composed in parallel and propose Salient Object Detection utilizing Attention Mechanism, etc. to improve the disadvantage of Salient Object's detection rate dropping with a higher similarity between the color and background colors of objects. In the proposed method, we evaluate performance through F-measure, and MAE, showing improved results over existing models.

RS7-3 UnSingle Image Super-Resolution Using Channel and Spatial Attention*EEECs650*

Dongwoo Lee	Kwangwoon University
Kyeongseok Jang	Kwangwoon University
Kwangchul Son	Kwangwoon University
Seunghyun Lee	Kwangwoon University

Single Image Super-Resolution is a method of restoring a low-resolution image to a high-resolution image. Low-resolution images lack feature information to be restored to high-resolution images. In addition, Checkerboard Artifact occurs in the process of expanding the feature map. In this paper, we proposed a method of combining Channel Attention and Spatial Attention to solve the problem of these feature information and a method of using Sub-pixel Convolution to solve the Checkerboard Artifact. The proposed Super-Resolution showed improved results over the conventional method.

RS7-4 3d Feature Point Estimation Based on a Single RGB Camera*EEECs653*

Jin-Kyum Kim	Kwangwoon University
Byung-Seo Park	Kwangwoon University
Sol Lee	Kwangwoon University
Young-Ho Seo	Kwangwoon University
Cheong-Ghil Kim	Namseoul University

It is essential to recognize 3D space and objects in various fields using machine vision. Recently, augmented reality (AR), virtual reality (VR), and mixed reality (XR) fields have been in the spotlight, and technologies that provide various content services after recognizing 3D spaces and objects have been developed [1]. A wide variety of methods for recognizing 3D geometric information have been studied so far, and there are several ways to express them. The most widely used method for recognizing 3D space and objects is to use an RGB camera [2]. After analyzing the image captured using the RGB camera, the relationship between the camera and the environment is estimated using the analyzed result. Security is somewhat weak in image-based techniques because image data can be transmitted to the server. Therefore, in order to reduce the amount of data while maintaining security, we propose a method for generating 3D feature points. The disparity is calculated using the difference between feature points in a plurality of images captured by the user. 3D feature points are generated by adding parallax information and scaling information to the calculated disparity for the experimentally obtained depth. All data processing processes requiring security are performed on the client-side. The proposed algorithm consists of the server operation and the device operation. The server-side consists of the feature point matching, the disparity calculation, the disparity parallax adjustment, and the 3D feature point generation. The client-side consists of the 2D image capturing, intensity normalization, feature point estimation, perspective transform, and descriptor estimation. When compared with the actual depth value, it was experimentally proven that the generated 3D feature point has an error within 10% of the ground truth. Therefore, a valid 3D feature point can be generated using the proposed method.

RS7-5 Dynamic Integration of Multi-Layered Mesh Surface for Multiple Imaging System*EEECs654*

Byung-Seo Park	Kwangwoon University
Dong-Wook Kim	Kwangwoon University
Young-Ho Seo	Kwangwoon University
Cheong Ghil Kim	Namseoul University

Recently, RGB-D sensors (cameras) combined with RGB and depth sensors have become common and are widely used in various fields. The RGB-D camera helps extract the shape of an object and the 3D structure of the surrounding environment relatively accurately and quickly. As a result, RGB-D cameras have rapidly developed various fields such as SLAM and navigation, tracking, object recognition and localization, pose estimation, and 3D model reconstruction. In

RGB-D cameras, color information is typically obtained using an RGB camera. On the other hand, depth information is acquired using various methods such as time-of-flight (ToF) cameras, laser range scanners, and structured-light (SL) sensors. Since a distributed camera network based on such a camera uses a plurality of cameras, multiple cameras can photogrammetry an object or the same part of an object, and the point cloud can be overlapped. In the case of our camera system, after eight cameras shoot the same part at the same time, it can be registered in a similar location as a point cloud. The ToF camera we use has depth noise proportional to distance. An integrated point cloud generated from an object may have a lot of noise depending on its position relative to the cameras. Also, point clouds with a lot of overlap will have different densities. This affects the quality of the surface when acquiring a single surface from the integrated point cloud. Therefore, to solve this problem, we propose an algorithm for adjusting the spatial density of the point cloud while mitigating the depth noise. The proposed method consists of five main steps. 1) Calculate the camera parameters using the corners of the partial Chess Board obtained from the cameras as feature points. 2) By using the calculated camera parameters, the point cloud obtained from each camera is initial alignment. 3) Voxelizing space, calculating the distance between each Voxel and each camera, select a point cloud representing the Voxel on the initial alignment point cloud. 4) Based on the representative point cloud of Voxel, non-rigid registration with the remaining point cloud inside Voxel is carried out. 5) By sampling the point cloud that has completed non-rigid registration at regular intervals and connecting nodes, the polygons composing the surface are completed. This method solves the problems of depth noise and spatial density that occur in distributed camera networks and more accurately constructs a single surface with less error.

RS8 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 09:00 – 10:15

Chair: Eung-Hee Kim (Sunmoon University, Korea)

RS8-1 Full Body 3d Scanning Systems: A Review

EEECS657

Jahanzeb Hafeez	Kwangwoon University
Junyung Park	Kwangwoon University
Soonchul Kwon	Kwangwoon University
Seunghyun Lee	Kwangwoon University

The importance of 3D body capturing and digitizing with optical remote sensing sensors is well recognized at the international level. The continuous development of new sensors, data capturing methodologies and growing demands in multidisciplinary areas significantly contribute to the growth of research in this field. Therefore, we provide a quick review of the most commonly used 3D body scanning techniques and systems in this paper.

RS8-2 Deep Learning-Based Phase-Only Hologram Watermarking

EEECS658

Jang-Hwan Choi	Kwangwoon University
JI-Won Kang	Kwangwoon University
Woo-Suk Kim	Kwangwoon University
Byung-Seo Park	Kwangwoon University
Dong-Wook Kim	Kwangwoon University
Young-Ho Seo	Kwangwoon University

Recently, digital holograms are produced by numerically modeling, calculating and inferring the interference between the reference and object waves. Digital holograms are widely used in various fields such as the digital hologram compression standard of JPEG Pleno, the development of hologram printers, and the advent of various holographic displays. With the development of digital hologram content, interest in digital hologram security has been increased. Artificial intelligence (AI) using deep learning has been widely used in all fields. Similarly, digital watermarking using

deep learning has been rapidly increased. In this paper, we propose a new watermarking method using phase-only hologram (PoH) and deep learning. A digital spatial light modulator (SLM) is essential for a digital hologram display required for optically displaying holograms, and a phase-only hologram is widely used because a single-phase spatial light modulator is most commonly used in current hologram displays. We intend to try a new PoH watermarking using deep learning. The proposed network for deep learning consists of a resolution conversion network, a watermark embedding network, and a watermark extraction network. For invisibility and robustness of watermarking, four loss functions are used for training the network; L1 loss function for the hologram invisibility, L2 loss function for phase-unwrapping and rewrapping, L3 loss function for the invisibility of the reconstructed image, and L4 loss function for the watermark extraction. By using phase-unwrapping and rewrapping, we also increase the continuity and correlation between adjacent pixels. The proposed method to show invisibility and robustness has been tested against various attacks. Therefore, we numerically verify the results of robustness against various attacks and show the reliability of the proposed technique.

RS8-3 Design of Low Power Cache Replacement Policy for Large Scale Memory Systems

EEECS662

Su-Kyung Yoon

Jeonbuk National University

This paper is to propose the low power cache replacement policy for large-scale memory systems. Since data-centric applications such as big data, cloud computing, and artificial intelligence that are recently used do not show spatial/temporal localities, it is difficult to efficiently use the current cache system. In this paper, we design a cache replacement policy that effectively uses a small space of the cache and consumes low power. For performance evaluation, we designed a trace-driven cache simulator. According to the experimental results, the proposed cache replacement policy reduces power by 4.5% compared to the LRU manner.

RS8-4 Nursing Students' Web-Based Simulation Practice Experience

EEECS703

Kyung Sook Kim

Namseoul University

The purpose of this study was to explore the experience web-based simulation practice. All participants experienced web-based simulation practice and clinical practice in a general hospital through the nursing curriculum in 2020. After distributing pre-questionnaires, we selected 11 nursing students to do the focus group interview. The content analysis was used to find the meaning and theme of the experience. The study results revealed 2 categories and 6 subcategories, which were essential for nursing student's experiences in a web-based simulation practice. The two categories were: "Opportunities to improve nursing competency through exposure to virtual clinical situations" and "Limitations of web-based simulation practice". The results of the analysis suggest the web-based simulation practice has the advantage of giving confidence in performance and improving evidence-based practical skills through repetitive learning. However, the web-based simulation should use not a substitute way for hospital practice but complementary way.

RS8-5 A Study on AI and IT Research Trends Related to Care for the Elderly

EEECS704

So Yun Choi

Namseoul University

The purpose of this study is to examine the research trends in artificial intelligence and IT fields related to the care of the elderly in Korea, which is about to enter a super-aged society. In addition, the study seeks to explore the direction of development that should be considered in the area of community care service in order to realize human-centered technology in the future. Of the papers searched by the topic of elderly care through the Korea Citation Index of the National Research Foundation of Korea people, a total of 35 AI and IT-related research papers were found. As a result of analyzing the trends of these studies, most studies aimed at incorporating technologies to elderly care were mainly related to the living safety, care, and health of the elderly. On the other hand, there were no papers focused on the ethical issues that can arise from incorporating technology in elderly care in the field of human-centered technology, and no papers related to the ethical issues of technology were found in the field of social welfare studies. In the future, interdisciplinary in-depth discussions on how to integrate technology with priority on the rights and life satisfaction of the elderly should be systematically developed.

RS9 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Hyun Lee (Sunmoon University, Korea)

RS9-1 Workload-aware Prefetching for Hybrid Main Memory Systems

EEECS661

Su-Kyung Yoon

Jeonbuk National University

This paper proposes a workload-aware prefetching technique for hybrid memory with DRAM and PCM. The current data-centric computing environment requires a large-capacity memory system. To this end, we present a hybrid memory system that uses next-generation non-volatile memory and DRAM. In addition, the proposed workload-aware prefetching technique is designed to provide a fast data access time in such a hybrid memory system. This prefetching technique analyzes the memory access patterns of the workload and applies it to prefetching. According to our evaluation results, the proposed prefetching technique reduces memory access time by 6.8%.

RS9-2 A Combination Between Scaler Algorithms and Entropy-Based Discretization on Metagenomic Data

EEECS659

Nhi Yen Kim Phan

Can Tho University

Hoa Huu Nguyen

Can Tho University

Hai Thanh Nguyen

Can Tho University

Toan Bao Tran

Duy Tan University

Metagenomics analysis has been increasing its importance in medicine with numerous recent research to investigate and explore the association of metagenomic data to human disease. Discretization approaches are proven as efficient tools to improve the disease prediction performance on metagenomic data. This study proposes a technique based on entropy and combining some scaler algorithms to conduct bins for discretizing metagenomic data to perform disease classification tasks. Our disease prediction results on six bacterial species abundance metagenomic datasets with the discretization method based on entropy have revealed promising results comparing to the Equal Width Binning with AUCs of 0.955, 0.826, 0.893, 0.692, 0.798, 0.765 classified by a One-dimensional Convolutional Neural Network on data including samples related to Liver Cirrhosis, Colorectal Cancer, Inflammatory Bowel Disease (IBD), and two datasets of Type 2 Diabetes (namely, T2D, and WT2D), respectively.

RS9-3 Service Robot with Smart Device for a Monitoring System

EEECS633

Yong-Ho Seo

Mokwon University

Smart device based robot system attempts to replace traditional robot applications with laptop based system recently. The proposed system is composed of a service robot platform and a smart device for a monitoring system application. Through a simulation study using image processing, the feasibility of the proposed robot monitoring system using a service robot was verified.

RS9-4 Production of Immersive Contents for Preventing in the Elderly using 3D Depth Camera

EEECS652

Dae-Bok Kim

Dongshin University

Yun-Su Park

Dongshin University

Eun-Seok Kim

Dongshin University

Gi-Taek Hur

Dongshin University

We propose a method of producing immersive content for dementia prevention that can help the elderly improve their exercise and cognitive functions by using body movements and brain functions in a complex way without wearing any equipment. The proposed method recognizes motions suitable for the characteristics of the elderly using a 3D Depth Camera and improves accessibility to immersive content by eliminating the inconvenience of wearing equipment. As a result of applying the proposed method to produce game-type activity content familiar to the local elderly, there was a correlation between the cognitive decline and the score obtained by executing the content.

RS9-5 A Study of Designing Conversational AI Chatbot with Emotion Using NLP and NLU *EEECSS702*

Daeseung Park	Namseoul University
Yeol Woo Sung	Namseoul University
Cheong Ghil Kim	Namseoul University
Jeong-geun Kim	Yonsei University

Due to the global pandemic caused by COVID-19, the interest in non-face-to-face services and technology development are rapidly increasing in various fields of society. In particular, chatbots, which are automatic conversation agents running on artificial intelligence (AI) interactions between users and machines with software based natural language processing technology, are potentially the most promising and advanced form of future human-machine interaction technology. It is not difficult to predict that the use of conversational chatbots will have many advantages in the healthcare field, which basically requires a lot of human interaction. The evolution of a chatbot that uses a conversational interface capable of empathic interaction with the user beyond the early chatbots that operate with just a request and response structure should be designed to understand and learn the user's language to communicate like a human. This paper examines the cases of conversational AI chatbot with emotion and the structural features of each one, and tries to find the future direction of chatbots.

RS9-6 Single Reflection Removal Algorithm on Mobile Device *EEECSS698*

Yong-Hwan Lee	Wonkwang University
Yu-Kyong Lee	BeakSeok Culture University

Undesired negative image in photographs is occurred through partial reflections such as glass window and electronic display. Efficient removing undesired reflections can help for generating better images, and pre-processing step to use on image analysis. In this paper, we present and implement a single reflection removal algorithm, which is specially designed for the use of smart devices. This method requires an application to take two input photos of the same scene, which one is taken with flash on and another is with flash off. We then find a flash spot from the photos, match the features to align the two photos, transform the color space of the input images, and combine the images with Gaussian mask to make the result. Finally, we get a result image with reflection removed and much more natural looking.

RS10 Regular Session: Smart Contents, Systems, Applications

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Seokhee Oh (Gachon University, Korea)

RS10-1 A Robust Edge Detection Algorithm for Observation-marker Recognition in Noisy Image Samples *EEECSS691*

Hyeongjin Kim	Hoseo University
Howoong Lee	Hoseo University
Chung-Pyo Hong	Hoseo University

Recently, as the digital healthcare market has grown in size, various healthcare devices have been commercialized and released. Therefore, it is possible to check personal health and perform analysis conveniently at home in various ways without visiting a hospital. In this regard, research is being actively conducted in various fields such as hardware and software, as well as data analysis and statistics. In particular, in the field of dynamic analysis such as density, activity, and straightness of a specific biological sample, detecting an effective area of a camera image is a very important research topic. This is because the location or size of the effective area may change according to the sample acquisition environment of each individual when using the commercialized services. Therefore, it is very important to study a method capable of effectively detecting an effective region of any given sample images. In the existing method, it was difficult to properly detect a region due to problems such as image noise or difference in shading. This is a serious problem that leads to erroneous analysis results. To overcome these limitations, this study proposes an algorithm that can be adaptively applied to various environments and conditions. In particular, Through the proposed algorithm, we want to detect a region of interest in an noisy image without loss of information. In the proposed method, three image processing steps are performed. First, by superimposing multiple image frames rather than a single image frame, a clearer area outline can be obtained. Second, moderated segmentation is performed through image binarization using the average threshold value for each region of the segmented image. Third, it achieves the final goal by applying the erode function, which holds unstable outlines, and the morphology function, which reinforces broken pixels. Through this, noise is removed and broken contours are reinforced to effectively detect the region of interest. For performance verification, a container for observing the sample at the cell-level was designed and implemented, and an observation-area marker was engraved on the container. After injecting the liquefied sample into the corresponding container, microscopic-level images were obtained through close-up photography. Marker detection performance was compared by applying the one-frame reference algorithm and the proposed multi-frame-based algorithm to the image, respectively. As a result, the proposed method shows a 90% performance improvement in area detection accuracy.

RS10-2 A CNN-based salivary pattern detection technique for fertility confirmation

EEECS692

Jaehyeon Park	Hoseo University
Chung-Pyo Hong	Hoseo University
Howoong Lee	Hoseo University

In recent years, industries in various fields are growing rapidly due to the development of electronics, IOT, and artificial intelligence technologies. In particular, digital health care technology is expanding its industrial scale significantly with the development of artificial intelligence technology. The development of digital health care makes it possible to check an individual's condition without visiting a hospital. For example, a user can make a basic diagnosis for a possible disease, and a woman who wants to become pregnant can check her fertility through a simple tool. In particular, a woman in the ovulation period can determine whether she is fertile through a specific pattern of a dried saliva sample. As a woman approaches the day of ovulation, female hormones increase, and a specific shape pattern is found in the salt crystals in the mouth. In this paper, we propose an algorithm based on CNN to discover specific salt crystal patterns in samples of dried women's saliva. For this, the proposed algorithm created a machine learning model by first training the unmanipulated saliva image samples of fertile and non-fertile women as 2-classed training data. After that, as a second step, another machine learning model was created that trained specific patterns in sample images of ovulatory female. The trained models are sequentially applied to a given female saliva sample to determine whether ovulation occurs. As a result of the performance verification, the mean average precision (mAP) when only the first step was applied was 0.13, and when the second step was applied, the mAP was 0.15. When both steps are applied, it shows a 15% improvement in performance compared to when only step 1 is applied.

RS10-3 NFMsim: An Flexible Near-Far Memory System Simulator

EEECS693

Jeong-Geun Kim	Yonsei University
Shin-Dug Kim	Yonsei University

The memory subsystem is now considered as the main bottleneck when running modern applications, including deep-learning workloads and in-memory processing applications. Currently, these kinds of programs require a large working memory area and low latency with high sustainable bandwidth. In addition, some of these memory-intensive

workloads generate complex memory access patterns that are hard to be handled by traditional memory management techniques (e.g., migration or replacement management based on heuristic algorithms). To mitigate this problem, many computer architects have tried to apply next-generation memory technologies into conventional memory hierarchy such as hybrid main memory and near-far memory systems. While several ideas about configuring new memory hierarchies have been suggested, there were just a few system simulators that can model hybrid or heterogeneous memory systems, released as an open-source tool. In this work, we introduce a work-in-progress version of NFMSim, a flexible near-far memory architecture simulator that can be easily connected with various standalone CPUs, GPGPU, and Processing-in-Memory (PIM) system simulators. NFMSim models wide ranges of modern memory architecture including hybrid (heterogeneous) and near-far memory systems. And it provides a wide range of system performance metrics and also supports a flexible interface to attach user-defined designs (e.g., replacement policies and prefetch/migration methods) for managing the near-far memory system. We plan to implement the remainder parts of the simulator and also plan to release NFMSim as an open-source tool.

RS10-4 Research on a temperature control system using the KNN algorithm

EEEC2021

Wonjun Jeong

Gachon University

Seokhee Oh

Gachon University

Deep learning-based AI technology is bringing innovative changes in various fields, but the reality is that most of them rely on high-spec H/W, large-capacity storage, and the cloud. For this reason, it is challenging to apply deep learning technology in an embedded system environment, where it is practically difficult to use high-end devices. Therefore, it is necessary to apply low-power/low-spec lightweight AI technology. We study a system that predicts the optimum temperature considering the external climatic conditions using the KNN algorithm. Existing temperature control systems cannot control external variables such as humidity changes and sudden changes in temperature due to climatic factors because the optimal temperature is determined with only one thermometer sensor. Therefore, we want to improve the problem of the existing system by using the KNN algorithm. For learning the KNN algorithm, we obtained 10,000 climate data from 2020 to 2021 in Sokcho, Gangwon-do, Korea. The K-Value is 3, and the test accuracy is 97%. It can be further improved through iterative learning using advanced datasets. This study will be possible to secure embedded system-based embedded ai service and software engineering technology required for major industries by applying lightweight ai technology that can be operated independently.

RS10-5 Development of virtual reality serious game and data visualization platform based on spinal cord rehabilitation exercise machine

EEEC2021

Jehyun Kim

Gachon University

Seokhee Oh

Gachon University

Existing rehabilitation exercise devices for rehabilitation training of spinal cord disorders have a disadvantage in that it is difficult to induce the patient's attention from simple repetitive exercises through simple rehabilitation training, and the training persists. To solve this problem, in this study, the development of a virtual reality functional game that can be linked with a rehabilitation exercise device to increase the continuity of training and motivate the training by inducing the patient's interest in the rehabilitation exercise device for rehabilitation training of the spinal cord impairment. Proceeded. Each game is implemented in the form of a circular motion, a push motion, a wheel-propelled motion provided by the rehabilitation exercise device, a rowing game, a pump game, and a racing game. The exercise data collected through the virtual reality device sensor and the rehabilitation exercise device is implemented so that the patient can be active, exercise frequently, and provide it in the form of a web platform.

RS10-6 Implementation of an Arbitrary Waveform Generator for Built Off Self Test

EEEC2021

Changjin Lee

Hoseo University

Donghyuk Kim

Hoseo University

Jin-Ho Ahn

Hoseo University

AI semiconductors are expected as a key technology that will lead the 4th Industrial Revolution era. Since, most AI IC has analog logic to mimic human neural network, waveform oriented test are required for IC testing. Arbitrary Waveform Generator(AWG) is a dedicated hardware to make various waveform for analog testing. In this paper, we propose an FPGA-based AWG and its algorithm suitable to built off self test(BOST).

SS1 Special Session: Recent Advances in Artificial Intelligence with Application

Wednesday, 21st July 2021, 15:30 – 16:45

Chair: Jeong-Dong Kim (Sunmoon University, Korea)

SS1-1 A Design and Implementation of Cursive Character Recognition based on Deep Learning *EEECS671*

Hyeong-Cheol Yoo	Sunmoon University
Seon-Min Kim	Sunmoon University
Hyein Lee	Sunmoon University
Eung-Hee Kim	Sunmoon University
Jeong-Dong Kim	Sunmoon University

Recently, deep learning is one of the main technologies used in various applications. In this paper, we design and implement an application service for cursive character recognition based on deep learning. For the application service, to learn DenseNet, the image data was matrixed and then trained. Accuracy of 95.6%, Precision, Recall, and F1-Score of the model was derived with 97% accuracy, and the DenseNet model was converted into a TFlite version model and applied to the Android application service.

SS1-2 An Implementation of Illegal Parking Recognition Service Based on YOLOV3 *EEECS673*

Yoo Bin Song	Sunmoon University
Ji Hyeon Park	Sunmoon University
E Seul Kim	Sunmoon University
E Seul Kim	Sunmoon University
Min Gyu Park	Sunmoon University
Joong Hyun Park	Sunmoon University

The existing illegal parking control service is one in which the administrator determines illegal parking with pictures taken and reported by citizens. The problem with this process is that it may consist of many inaccuracies. In this paper, we intend to address this problem by developing a service that utilizes YOLOv3 and OpenCV to detect illegal parking and using OpenCV and Tesseract-OCR to identify license plate numbers of said detected vehicles. We aim to apply these combined factors to CCTV API, one of the public APIs, in order to establish a service that automatically determines illegal parking on the road.

SS1-3 An implementation of Yolo-based application for based situation recognition on real-time *EEECS682*

Sang Uk Lee	Sunmoon University
Chae Yeon Seo	Sunmoon University

Soo Bin Lee	Sunmoon University
Se Yeon Hong	Sunmoon University
Yun Gyeong Song	Sunmoon University
Young Sup Hwang	Sunmoon University

Many researches are being conducted due to the possibility of autonomous vehicles. Autonomous vehicles require not only cameras but also multiple sensors needed for lidar and driving technologies. In particular, the most important factor in the performance and practicality of autonomous vehicles is how well features are extracted from data on the road through cameras. To confirm this practicality, we would like to implement a real-time road situation recognition application using only cameras. The detection model used Yolov4, and the test application would like to conduct experiments on practicality with Jetson Xavier NX and Android Studio.

SS1-4 Multi-recognition Product Searching with Deep Learning

EEECSS680

Hyeon Hak Kim	Sunmoon University
Dong Geon Lee	Sunmoon University
Yun Yeol Yang	Sunmoon University
Ju Hyeok Jung	Sunmoon University
Jeung min Lee	Sunmoon University
Yoon Young Park	Sunmoon University

We developed PlzFind by using Deep learning algorithms. PlzFind can give an experience to multi-recognition when we take pictures to find object information. If consumers do not know the name of the objects they want to buy, it is possible to find several products at the same time through the application unlike the multi-recognition inability of existing product search services. In addition, by connecting to market sites that sell goods, it is possible to induce them to make quick purchases, so that retailers can expect a rise in profits. We used Android Studio, Python Flask, YOLOv3, LabelImg, and Yolomark in this project. We used Fast-RNN to speed detecting up and apply Image Augmentation considering several environmental variables during Image Detecting to improve the object recognition rate.

SS1-5 An Implementation of Stock Investment Service based on Reinforcement Learning

EEECSS683

Pill Joong Kim	Sunmoon University
Seung Sik Hong	Sunmoon University
So Young Kim	Sunmoon University
Seong Jun Yoo	Sunmoon University
Jeong Yeon Park	Sunmoon University
Hyun Lee	Sunmoon University

Recently, the number of stock account openings has increased sharply due to growing interest in stocks. However, damage from stock investment or misinformation is also increasing. As a result, we have developed a web service that provides information to refer to investments and helps ensure accurate and safe investments. In this paper, we propose a method to use reinforcement learning to learn buying, selling points and infer results. The actor network is trained to produce policies that can increase return on investment using A3C techniques. As a result, agent sold or bought, and then restored or boosted its value in anticipation of when the stock price would rise and fall. The learned model shows stock investment information through a web service developed by the django framework.

SS2 Special Session: Copyright Protection and Use Activation Technology

Thursday, 22nd July 2021, 10:30 – 11:45

Chair: Dongmyung Shin (LSware Inc., Korea)

SS2-2 A Study on Suspected Copyright Infringement Detection For Educational Content And Recommendation Of Alternatives EEECS689

Hakhee Kim	Korea Literature, Academic works and Art Copyright Association
Kyungmi Choi	Korea Literature, Academic works and Art Copyright Association
Haeseong Park	Korea Literature, Academic works and Art Copyright Association
Kimin Oh	Korea Literature, Academic works and Art Copyright Association
Won-gyum Kim	Korea Literature, Academic works and Art Copyright Association

The purpose of this study is to reduce the copyright infringement factors of teachers who produce educational content due to the corona and non-face-to-face educational environment. To help teachers it is needed to create educational content without worrying about copyright. In this point of view, this study is to detect suspected copyright infringement in educational content using artificial intelligence technology. Furthermore, it provides even recommending a similar alternative content for the detected as infringing copyright.

SS2-3 A Music Usage Sensitive Information Encrypion Method on Blockchain Network EEECS686

Seyoung Jang	Soongsil University
Ulugbek Ruzive	Soongsil University
Byeongchan Park	Soongsil University
Youngmo Kim	Soongsil University
Seok-Yoon Kim	Soongsil University

Recently, the copyright interests in the in theme, background, and signal music are growing. The advantage of blockchain is that the transaction information contained in the block is shared with all participants in the network, ensuring the integrity and transparency of the information. However, since anyone can check the information on the blockchain network, leakage of personal and corporate information may occur. In this paper, we propose an encryption method for sensitive information in music usage history processed theme, background, and signal music blockchain network.

SS2-4 Introduction to the Fair Distribution and Transparent Settlement of Theme, Background, and Signaling Music Licensing Fees Using Hyperledger Fabric EEECS608

Hyongsung Kim	Korea Electronics Technology Institute
Yong-Suk Park	Korea Electronics Technology Institute
Hyun-Sik Kim	Korea Electronics Technology Institute

In Korea, distribution of royalties paid in compensation for the use of theme, background, and signaling (TBS) music has often been a matter of dispute due to the inconsistent fee distribution policies set by the music licensing management organizations. Distributed ledger technology, such as blockchain, replicates identical ledgers with transaction records across all member nodes in a network, providing transaction transparency, trust, and system security. In this paper, a blockchain-based TBS music distribution system is proposed to achieve fair distribution and transparent settlement of

TBS music licensing fees. Specifically, the Hyperledger Fabric framework is used for the blockchain-based solution development.

SS2-5**One Pass Value Prefetching for reducing read delay of Blockchain***EEECS616*

YongJoon Joe	LSware Inc.
KyungYeob Park	LSware Inc.
HyunSoo Kim	LSware Inc.
Dong-Myung Shin	LSware Inc.

Reading value on blockchain ledger is a one of the biggest bottlenecks of blockchain performance. We approach this problem by one pass value prefetching with RWKS(Read/Write Key Set information); a by-product of the distributed computing planning. This paper shows how to optimize value reading time by one pass value prefetching.

SS3 Special Session: Computational Intelligence for Smart Health**Friday, 23rd July 2021, 09:00 – 10:15****Chair: Jeong-Dong Kim (Sunmoon University, Korea)****SS3-1 Machine Learning for Stress Detection Using Data from Wearable Sensors: A Review Study***EEECS674*

Phataratah Sa-nguannarm	Sunmoon University
Jeong-Dong Kim	Sunmoon University

Today there is enough evidence that stress is a key factor to cause and worsen many diseases. On the other side, Machine Learning techniques are becoming a powerful tool in the healthcare domain for analyzing health data for detection and prediction. Recent tendency for healthcare monitoring is on using non-invasive wearable physiological sensors. Smart devices are becoming the most important mean of Data Science to generate real-time of daily living activities. In healthcare domain stress detection is becoming a practical method, supported by the means of wearable devices able to measure Heart Rate, and activity context features. The main focus of this review study is to show how current methods are addressing the stress issue inside the Machine Learning methods. In addition, to bring up the trend and challenges of assuring high performance of detecting stress level in practical and daily living activities.

SS3-2 Stress Detection Based on Deep Learning Model by Using Wearable Multimodal Data*EEECS676*

Phataratah Sa-nguannarm	Sunmoon University
Jeong-Dong Kim	Sunmoon University

Stressful behaviour is a high risk factor in daily life that can lead to dangerous diseases. Stress can be detected by physiological signals that are obtained from wearable sensors. To prevent critical risks in daily life, this paper proposes a stress detection model that analyses multimodal data from wearable sensors. The proposed model utilizes data normalization and feature generation methods to represent the data which is compatible with a bidirectional recurrent neural network (RNN) based model. We have used an available benchmark dataset to evaluate our model called wearable stress and affect detection dataset (WESAD) that was obtained from wearable devices. This dataset provides 4 states of stress including baseline, amusement, stress and meditation. The model archives average accuracy 95%. The result shows that our model is precise and robust for stress detection.

SS3-3 Gait Patterns Analysis Based on K-Nearest Neighbor Algorithm*EEECS679*

Kwonwoo Lee	Sunmoon University
Minkyu Kim	Sunmoon University
Jayeon Sim	Sunmoon University
Dongho Jang	Sunmoon University
Jeong-Dong Kim	Sunmoon University

Gait is the most important activity for people. People in 111 countries walk an average of about 5,000 steps a day. Like this, it is one of the most important activities as many people walk. However, if their walking posture is not good, diseases such as arthritis and a herniated disc can occur, which affects their health. In this paper, we proposed an application for Gait Patterns Analysis using k-Nearest Neighbor Algorithm. The k-Nearest Neighbor Algorithm, which is machine learning, is used to perform well on numerical-based data classification tasks and is suitable for our dataset. Gait datasets classify as normal and abnormal classes. In this study, the abnormal data consists of out toeing gait, in toeing gait, tiptoeing gait. We created the dataset through direct experiments to collect insufficient datasets. An IMU sensor is attached to the fourth part of a person's metatarsus to collect normal and abnormal walking data. Sensors that analyze gait patterns use IMU sensors that consist of a gyroscope sensor, an acceleration sensor, and a geomagnetic sensor. We aim to easily measure our own walking posture data through sensors and to recognize whether our walking posture is normal or abnormal through walking pattern analysis algorithms.

SS3-4 Rff-Machine Learning Based For Personalized Workout Monitoring

EEECS687

Ermal Elbasani	Sunmoon University
Jeong-Dong Kim	Sunmoon University

The busy lifestyle and financial problems, of many people make them to exercise independently in their indoor environment. Although convenient, if an exercise properly performed, can cause serious injuries in the long term plan. The general observation is that even people who go to gym and do fitness regularly find it difficult to perform the proper steps correctly of specific exercise. In order to help in this case, this work tends to provide assistance in form of a feedback while performing a workout. This paper proposes a data driven approach based on machine learning with dataset of exercises obtained from wearable sensors and data is annotated by a health training expert. A particular contribution of the model is the combination of Random Fourier Features with Long-Short Term Memory, which provides solution even in small scale of datasets. The results indicate that the proposed model performs more effectively than conventional health data analysis methods, and the proposed approach can yield a satisfactory of personalized workout monitoring.

SS3-5 Classification of Various Sounds Wavelength Based on Deep Learning for Hearing-Impaired People

EEECS678

Soualilhou Ngnamsie Njimbouom	Sunmoon University
Ermal Elbasani	Sunmoon University
TaeWoon Nam	Sunmoon University
DongHwan Yoon	Sunmoon University
SoonWoo Jung	Sunmoon University
Jeong-Dong Kim	Sunmoon University

Hearing impairment is a defect of parts of the ear causing inability in hearing sound. The loss of hearing capacity slows down the development of one's language, speech, and cognitive skills as well as increases the risk of secondary accidents due to the inability to hear sound when an accident occurs. People with hearing disorders almost have twice as likely the chance of experiencing an accident compared to those having excellent hearing. According to the World Health Organization (WHO) report made in 2011, approximately 15% of the adult population and 32 million children in the world suffer from some degree of hearing loss. This may be caused by either chronic ear infections, childhood deafness or Age-related Hearing loss. An urgent need for a solution to ease the life of deaf people in giving them a feeling of security in their different environments and minimizing the risk of secondary accidents after the occurrence of an accident

is needed. This paper proposes a deep learning model for sound wavelength analysis to detect different types of sounds and clearly inform an hearing-impaired person of his surroundings. Our model achieves a 97.66% accuracy in successfully identifying different classes of sound.

SS4 Special Session: Copyright Services for Smart Media

Friday, 23rd July 2021, 10:30 – 12:00

Chair: Youngmo Kim (Soongsil University, Korea)

SS4-1 A 30gbps-Class High-Capacity Traffic Processing Method Using Core Isolation EEECS663

Youngsun Kwon	Soongsil University
Byeongchan Park	Soongsil University
Hoon Chang	Soongsil University

Recently, with the development of ICT technology, network traffic for information delivery is increasing incapacity. With the increase in network traffic, cyber threats are also increasing, increasing the importance of traffic analysis. In this paper, we propose an efficient packet processing method capable of handling large-capacity traffic over 30Gbps. By processing raw packets of copying from packet reception, packet detection, and statistics, the execution time of each operation was minimized, and the performance of high-performance computing systems can be improved compared to the existing packet processing engine.

SS4-2 Non-Oracle external interaction by simultaneous mutual validation consensus EEECS617

YongJoon Joe	LSware Inc.
Yeseul Lee	LSware Inc.
Joo-Sung Kim	LSware Inc.
Dong-Myung Shin	LSware Inc.

Interaction between blockchain and the exterior is the complicate issue at the aspect of security and availability. We approach this problem by simultaneous mutual validation before consensus. This consensus structure allows to interact with exterior blockchain without security threat and uncertainty.

SS4-3 An Ndpi Protocol Collection Method for Supports 20gbps-Class Traffic Processing Speed EEECS664

Youngsun Kwon	Soongsil University
Byeongchan Park	Soongsil University
Hoon Chang	Soongsil University

As society's dependence on networks increases due to the information age, the intensity of security attacks is also intensifying. Accordingly, there is a need for a security device that can scan the integrated traffic of the entire network at high speed. In this paper, we propose an nDPI-based protocol collection method that supports 20Gbps-class traffic processing speed. Through the proposed method, it is possible to perform fast and accurate abnormal traffic detection by analyzing the data payload of large-capacity traffic in real-time and identifying the nDPI protocol and application.

SS4-4 A Settlement and Distribution Data Generation Method for Theme, Background and Signal Music Based on Blockchain Network *EEECS642*

Byeongchan Park	Soongsil University
Youngmo Kim	Soongsil University
Seok-Yoon Kim	Soongsil University

Theme, background and signal(TBS) musics played on broadcasters and personal broadcasting platforms have the same right holders as in normal music, and their copyright fees should be transparently settled and distributed over the right holders as much as the music is used. In this paper, we propose a method of generating settlement and distribution data for music used in the TBS music networks. The generated settlement and distribution data can ensure integrity and transparency, and enable reliable settlement and distribution to the right holders in a transparent and fair manner.

SS4-5 A Real-Time Bus Arrival Notification System for Visually Impaired Using Deep Learning *EEECS670*

Taegyun Son	Soongsil University
Hayeon Kim	Soongsil University
Dongwoon Kim	Soongsil University
Ingyu Bang	Soongsil University
Hoon Chang	Soongsil University

In modern society, using public transportation location information, people can easily obtain public transportation information to use and use public transportation easily. Although the information provides location information on various applications and public transportation facilities, there are many difficulties in using these services for the visually impaired. In this paper, we propose an installation-type bus arrival notification system that deals with buses during public transportation and notifies the arrival of buses through image analysis at bus stops. Object detection is used to analyze the image, and the model used for object detection is trained through machine learning to avoid recognizing objects that are not necessary for recognizing the bus. The proposed system was used to provide services with higher accessibility and convenience to the visually impaired.