The 16th International Conference on Future Information Technology (FutureTech 2021)
&
The 15th International Conference on Multimedia and Ubiquitous Engineering (MUE 2021)

April 22-24, 2021
Jeju, Korea

Organized by

FutureTech, MUE & KIPS CSWRG

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KIPS CSWRG Korea Information Processing Society Computer Software Research Group
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2021 International Conferences

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The 5th The International Conference on Big data, IoT, and Cloud Computing (BIC 2021)
- August 16-18, Jeju, Korea
- http://bic-conference.org/2021

The 13th International Conference on Computer Science and its Applications (CSA 2021)
- December 15-17, 2021, Jeju, Korea
- http://www.csa-conference.org/2021

The 15th KIPS International Conference on Ubiquitous Information Technologies and Applications (CUTE 2021)
- December 15-17, 2021, Jeju, Korea
- http://www.cute-conference.org/2021

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Message from the FutureTech 2021 General Chairs

FutureTech 2021 is the 16th event of the series of international scientific conference. This conference takes place on April 22-24, 2021 in Jeju, Korea. The aim of the FutureTech 2021 is to provide an international forum for scientific research in the technologies and application of information technology. FutureTech 2020 is the next edition of FutureTech 2020(Jeju, Korea), FutureTech 2019(Xian, China), FutureTech 2018 (Salerno, Italy), FutureTech 2017 (Seoul, Korea), FutureTech 2016 (Beijing, China), FutureTech 2015 (Hanoi, Vietnam), FutureTech 2014 (Zhangjiajie, China), FutureTech 2013 (Gwangju, Korea), FutureTech 2012 (Vancouver, Canada), FutureTech 2011 (Loutraki, Greece), FutureTech 2010 (Busan, Korea, May 2010) which was the next event in a series of highly successful the International Symposium on Ubiquitous Applications & Security Services (UASS-09, USA, Jan. 2009), previously held as UASS-08 (Okinawa, Japan, Mar. 2008), UASS-07 (Kuala Lumpur, Malaysia, August, 2007), and UASS-06 (Glasgow, Scotland, UK, May, 2006).

The conference papers included in the proceedings cover the following topics: Hybrid Information Technology, High Performance Computing, Cloud and Cluster Computing, Ubiquitous Networks and Wireless Communications, Digital Convergence, Multimedia Convergence, Intelligent and Pervasive Applications, Security and Trust Computing, IT Management and Service, Bioinformatics and Bio-Inspired Computing, Database and Data Mining, Knowledge System and Intelligent Agent, Game and Graphics, and Human-centric Computing and Social Networks. Accepted and presented papers highlight new trends and challenges of future information technologies. We hope readers will find these results useful and inspiring for their future research.

We would like to express our sincere thanks to Steering Chair: James J. (Jong Hyuk) Park (SeoulTech, Korea) and Young-Sik Jeong (Dongguk University, Korea). Our special thanks go to the Program Chairs: Dohyun Kim(Catholic University of Pusan, Korea), Pradip Kumar Sharma(University of Aberdeen, UK), Ka Lok Man(Xi'an Jiaotong-Liverpool University, China), S. Vimal(National Engineering College, India, all Program Committee members, and all reviewers for their valuable efforts in the review process that helped us to guarantee the highest quality of the selected papers for the conference.

We cordially thank all the authors for their valuable contributions and the other participants of this conference. The conference would not have been possible without their support. Thanks are also due to the many experts who contributed to making the event a success.

This work was supported under the framework of international cooperation program managed by National Research Foundation of Korea (2020K2A9A1A13114861)

FutureTech 2021 General Chairs

Jungho Kang, Baewha Women′s University, Korea
Yang Xiao,The University of Alabama, USA

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Message from the FutureTech 2021 Program Chairs

Welcome to the 16th International Conference on Future Information Technology (FutureTech 2021), which will be held in Jeju, Korea on April 22-25, 2021. FutureTech 2021 will the most comprehensive conference focused on the various aspects of information technologies. It will provide an opportunity for academic and industry professionals to discuss recent progress in the area of future information technologies. In addition, the conference will publish high quality papers which are closely related to the various theories and practical applications in multimedia and ubiquitous engineering. Furthermore, we expect that the conference and its publications will be a trigger for further related research and technology improvements in these important subjects.

For FutureTech 2021, we received many paper submissions, after a rigorous peer review process, we accepted only articles with high quality for the FutureTech 2021 proceedings, published by the Springer. All submitted papers have undergone blind reviews by at least two reviewers from the technical program committee, which consists of leading researchers around the globe. Without their hard work, achieving such a high-quality proceeding would not have been possible. We take this opportunity to thank them for their great support and cooperation. Finally, we would like to thank all of you for your participation in our conference, and also thank all the authors, reviewers, and organizing committee members. Thank you and enjoy the conference!

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Pradip Kumar Sharma, University of Aberdeen, UK
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Message from the MUE 2021 General Chairs

MUE 2021 is the 15th event of the series of international scientific conference. This conference takes place on April 22-24, 2021 in Jeju, Korea. The aim of the MUE 2021 is to provide an international forum for scientific research in the technologies and application of Multimedia and Ubiquitous Engineering. Ever since its inception, International Conference on Multimedia and Ubiquitous Engineering has been successfully held as MUE 2021(Jeju, Korea), MUE 2019(Xian, China), MUE 2018 (Salerno, Italy), MUE 2017 (Seoul , Korea), MUE 2016 (Beijing, China), MUE 2015 (Hanoi, Vietnam), MUE 2014 (Zhangjiajie, China), MUE 2013 (Seoul, Korea), MUE 2012 (Madrid, Spain), MUE 2011 (Loutraki, Greece), MUE 2010 (Cebu, Philippines), MUE 2009 (Qingdao, China), MUE 2008 (Busan, Korea), and MUE 2007 (Seoul, Korea).

The conference papers included in the proceedings cover the following topics: Multimedia Modeling and Processing, Multimedia and Digital Convergence, Ubiquitous and Pervasive Computing, Ubiquitous Networks and Mobile Communications, Ubiquitous Networks and Mobile Communications, Intelligent Computing, Multimedia and Ubiquitous Computing Security, Multimedia and Ubiquitous Services, Multimedia Entertainment. Accepted and presented papers highlight new trends and challenges of Multimedia and Ubiquitous Engineering. We hope readers will find these results useful and inspiring for their future research.

We would like to express our sincere thanks to Steering Chair: James J. (Jong Hyuk) Park (SeoulTech, Korea). Our special thanks go to the Program Chairs: Ji Su Park (Jeonju University, Korea), Fei Hao (Xi'an Normal University, China), Alireza Souri(Islamic Azad University, Iran), Sherali Zeadally,(University of Kentucky, USA), Piao Changhao(Chongqing University of Post and Telecom, China) all Program Committee members and all reviewers for their valuable efforts in the review process that helped us to guarantee the highest quality of the selected papers for the conference.

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MUE 2021 General Chairs

Byung Seok Shin, Inha University, Korea
Yi Pan, Georgia State University USA
Vincenzo Loia, University of Salerno, Italy

Message from the MUE 2021 Program Chairs

Welcome to the 15th International Conference on Multimedia and Ubiquitous Engineering (MUE 2021), which will be held Jeju, Korea on April 22-24, 2021. MUE 2021 will the most cophmprehensive conference focused on the various aspects of multimedia and ubiquitous engineering. It will provide an opportunity for academic and industry professionals to discuss recent progress in the area of multimedia and ubiquitous environment. In addition, the conference will publish high quality papers which are closely related to the various theories and practical applications in multimedia and ubiquitous engineering. Furthermore, we expect that the conference and its publications will be a trigger for further related research and technology improvements in these important subjects.

For MUE 2021, we received many paper submissions, after a rigorous peer review process, we accepted only articles with high quality for the MUE 2021 proceedings, published by the Springer. All submitted papers have undergone blind reviews by at least two reviewers from the technical program committee, which consists of leading researchers around the globe. Without their hard work, achieving such a high-quality proceeding would not have been possible. We take this opportunity to thank them for their great support and cooperation. Finally, we would like to thank all of you for your participation in our conference, and also thank all the authors, reviewers, and organizing committee members. Thank you and enjoy the conference!

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Sherali Zeadally, University of Kentucky, USA
Piao Changhao, Chongqing University of Post and Telecom, China

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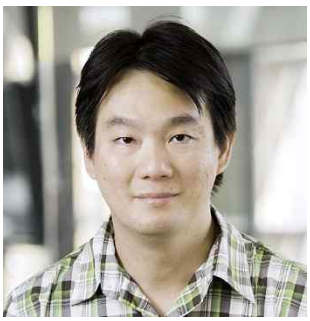

Internet of Things (IoT) cyber security and threat intelligence: What are the research challenges and opportunities?

Dr. Kim-Kwang Raymond Choo
The University of Texas at San Antonio (UTSA)
Department Editor of IEEE Transactions on Engineering Management

Abstract

Internet of Things (IoT) devices are becoming commonplace in our society, due to their widespread applications (e.g., environmental monitoring, smart cities, healthcare, surveillance, and battlefields such as Internet of Battlefield Things). Such devices are also generally capable of capturing a broad range of information, including digital artifacts that can be used for cyber threat intelligence and inform security mitigation strategy formulation. There are, however, a number of challenges associated with designing IoT cyber security and threat intelligence solutions. In addition to the technical challenges, there are also associated legal and policy challenges that need to be considered in the design and deployment of such solutions in practice.

In this presentation, we will explore the challenges from technical, legal and policy perspectives. For example, how do we use machine/deep learning to facilitate detection of real-time attacks against IoT devices and systems, and how can we automatically identify and collect digital evidence in a forensically sound manner which can be subsequently used for cyber threat intelligence? In the event that the attackers use sophisticated tools to obfuscate their trails, can we design machine/deep learning techniques to unobfuscate and/or identify and exploit vulnerabilities to get access to digital evidence? What are the potential legal implications and challenges? Can we also design explainable AI techniques to facilitate the explanation and inclusion of such digital evidence and cyber threat intelligence in court proceedings or presentations to C-level or boards in organizations? Based on these discussed challenges, we will identify potential opportunities for stakeholders in academia (e.g., students and researchers), industry and government.

Biography

Kim-Kwang Raymond Choo received the Ph.D. in Information Security in 2006 from Queensland University of Technology, Australia. He currently holds the Cloud Technology Endowed Professorship at The University of Texas at San Antonio (UTSA). He serves as Department Editor of IEEE Transactions on Engineering Management; Associate Editor of IEEE Transactions on Dependable and Secure Computing, Computers & Electrical Engineering, Data & Knowledge Engineering, Digital Communications and Networks, IEEE Access, and IEEE Transactions on Big Data; Technical Editor of IEEE Network Magazine; Editor of Future Generation Computer Systems; and on the editorial board of Computers & Security, Cluster Computing, Electronic Commerce Research, IEEE Blockchain Technical Briefs, IEEE Internet of Things Journal, and Journal of Network and Computer Applications. He is an IEEE Computer Society Distinguished Visitor (2021 - 2023), and included in Web of Science's Highly Cited Researcher in the field of Cross-Field - 2020. In 2015, he and his team won the Digital Forensics Research Challenge organized by Germany's University of Erlangen-Nuremberg. He is the

recipient of the 2019 IEEE Technical Committee on Scalable Computing (TCSC) Award for Excellence in Scalable Computing (Middle Career Researcher), the 2018 UTSA College of Business Col. Jean Piccione and Lt. Col. Philip Piccione Endowed Research Award for Tenured Faculty, the Outstanding Associate Editor of 2018 for IEEE Access, the British Computer Society's 2019 Wilkes Award Runner-up, the 2014 Highly Commended Award by the Australia New Zealand Policing Advisory Agency, the Fulbright Scholarship in 2009, the 2008 Australia Day Achievement Medallion, and the British Computer Society's Wilkes Award in 2008. He has also received best paper awards from the IEEE Consumer Electronics Magazine for 2020, EURASIP Journal on Wireless Communications and Networking (JWCN) in 2019, IEEE TrustCom 2018, and ESORICS 2015; the Korea Information Processing Society's Journal of Information Processing Systems (JIPS) Survey Paper Award (Gold) 2019; the IEEE Blockchain 2019 Outstanding Paper Award; and Best Student Paper Awards from Inscrypt 2019 and ACISP 2005.

PROGRAM Schedule for FutureTech 2021 & MUE 2021

Day 1, April. 22, 2021		
Time	**Min**	**HALL A**
08:40-09:00	20	**Registration**
09:00-10:20	80	**Session A-1** **Presentation of young researchers (FutureTech 2021 & MUE 2021)** **Chair: Pradip Kumar Sharma** **Vice-Chair: Yan Li**
10:20-10:30	10	**Coffee Break**
10:30-11:50	80	**Online Session A-2** **MUE 2021** **Chairs:**
11:50-13:00	70	**Lunch**
13:00-13:50	50	**Symposium & Keynote Speech** **Dr. Kim-Kwang Raymond Choo** **“Internet of Things (IoT) cyber security and threat intelligence: What are the research challenges and opportunities?”** **Chair:**
13:50-14:00	10	**Coffee Break**
14:00-15:20	80	**Online Session A-3** **FutureTech 2021** **Chair :**
15:20-15:30	10	**Coffee Break**
15:30-16:40	70	**Session A-4** **Chongqing University** **Chair: Mingjie Liu**
16:40-16:50	10	**Coffee Break**
16:50-18:00	70	**Session A-5** **Chongqing University** **Chair: Xu Zhang**

Day 2, April. 23, 2021		
Time	**Min**	**HALL A**
10:00-12:00	120	**Organizing Committee Meeting I (Only for Invited Members)**
12:00-13:00	60	**Lunch**
13:00-15:00	120	**Local Arrangement Committee Meeting (Only for Invited Members)**

Day 3, April. 24, 2021		
Time	**Min**	**HALL -A**
10:00-12:00	120	**Organizing Committee Meeting II (Only for Invited Members)**
12:00-13:00	60	**Lunch**
13:00-15:00	120	**Executive Meeting - Organized by FutureTech 2021, MUE 2021 (Only for Invited Members)**

1. **A paper presentation should be made by one of authors of the paper for 15 minutes. (10 minutes for the presentation itself and 5 minutes for Q/A)**
2. **All speakers of each session should meet the session chair at their room 10 minutes before the session begins.**
3. **Windows 7 laptops running the Adobe Reader and Microsoft Office for paper presentations will be prepared. Please prepare for your presentation.**

DETAILED SCHEDULE FOR
The 16th International Conference on Future Information Technology (FutureTech 2021)
&
The 15th International Conference on Multimedia and Ubiquitous Engineering (MUE 2021)

Day 1, April 22, 2021 (Thursday)

08:40-09:00 Registration

09:00-10:20 Session A-1 : Presentation of young researchers (FutureTech & MUE)
(HALL A)
(Chair: Pradip Kumar Sharma)

1. **Wireless Terminal Identification System Using Machine Learning**
   Youngwoo Cho, Yoojae Won
2. **Design and implementation of AKA protocol using Lightweight Encryption Algorithm**
   Seonghwan Cho, Cheolmin Yeom, Yoojae Won
3. **Hardening the Windows Embedded OS using a Mandatory Access Control Method**
   Chaeho Cho, Yoojae Won
4. **Dynamic Hand Gesture Recognition Based on Inflated 3D Residual Neural Network**
   Zongjing Cao, Yan Li, Byeong-Seok Shin
5. **Prediction of Hypertension in Korean Men using the Outlier Detection Method**
   Khongorzul Dashdondov, Mi-Hye Kim
6. **A Guide for Better Graphical Password System Development**
   Gi-Chul Yang

10:20-10:30 Coffee Break

10:30-11:50 Online Session A-2 : MUE 2021
(HALL B)
(Chair: Byoungwook Kim)

1. **Large-Scale High-Resolution Dataset for Trash Detection**
   Min-Seok Jo, Seong-Soo Han, Chang-Sung Jeong
2. **Image Matching Module for Screen Captured Image using Deep learning**
   Hye-Won Chun, Seong-Soo Han, Chang-Sung Jeong
3. **Motion blur based on backward search in Gaussian-distribution motion boundary**

Jin Feng, Oh Kyoungsu

4. **Concept Stability Analysis for Attribute Reduction of Three-way Concept Lattices**
   Fei Hao, Yanqi Gong, Yixuan Yang, Wenqing Huang, Doo-Soon Park
5. **A Dataset for Screen Widget Image Classification on CNN**
   SungChul Byun, Seong-Soo Han, Chang-Sung Jeong
6. **Effect of Augmented Reality Affordance on Motor Performance: In the Sports Climbing**
   Myeong-Hyeon Heo, Dongho Kim
7. **Variability Modeling Technique for Sensor-based Monitoring Product Line**
   JeongAh kim, Han Park
8. **Design of building a learning data set for representative spatio-temporal document classification**
   Byoungwook Kim, Yeongwook Yang, Hong-Jun Jang, Ji Su Park

11:50-13:00 Lunch

13:00-13:50 Invited Speaker
(Chair: Yan Li)

Internet of Things (IoT) cyber security and threat intelligence: What are the research challenges and opportunities?
Dr. Kim-Kwang Raymond Choo
The University of Texas at San Antonio (UTSA)
Department Editor of IEEE Transactions on Engineering Management

13:50-14:00 Coffee Break

14:00-15:20 Online Session A-3 : FutureTech 2021
(HALL A)
(Chair: Yan Li)

1. **Developing a Smartphone-based Hand-Held Radius Measurement Using Laser Triangulation System**
   Long Hoang Pham, Duong Nguyen-Ngoc Tran, Rhie Chul Hong, Jae Wook Jeon
2. **An Improved Sub-Pixel Laser Center Extraction Using Peak Position and Contour Detection Methods**
   Long Pham, Duong Nguyen-Ngoc Tran, Chul Hong Rhie, Jae Wook Jeon
3. **Cyber Situation Awareness Framework for Defense Network Threat Protection Using ATT&CK and DARPA Intrusion Data Sets**
   GwangHyun Ahn, Ji Won Kang, Dongil Shin, Dongkyoo Shin
4. **Benchmark of segmentation model on edge device**
   Duong Nguyen-Ngoc Tran, Long Hoang Pham, Jae Wook Jeon
5. **A Survey of Memory Attack and Defense**
   Ara Hur, Youngjin Joo, Yeonseung Ryu
6. **Case Study of Quality Attribute Driven SW Architecture**

JeongAh kim, Han Park

7. **A Study on Information Security Techniques Using Federated Learning Based on Edge Blockchain**
   Hyun-Jong Cha, Ho-Kyung Yang, You-Jin Song

15:20-15:30 Coffee Break

15:30-16:40 Online Session A-4 : Chongqing University
(HALL A)
(Chair: Min Choi)

1. **A Quality Adaptive Scheme for Real-time Video Transmission with Intra-only Coding over Wireless Network**
   Shu Tang, Yuanhong Deng, Peng Yang
2. **A Windowed-Total-Variation Regularization Constraint for Blur Kernel Estimation**
   Ganghua Liu, Tian Wei, Yushun Luo, Juncheng Zou, Shu Tang
3. **Anti-disturbance control of quadrotor UAV hovering based on ADRC**
   Changhao Piao, Gong Li, Mingjie Liu, Huishuang Shao
4. **Combining Head Information for Pedestrian Detection**
   Chen Yong, Xie Wenyang, Huang Meiyong, Wang Bo, Liu Huanlin
5. **Multi-scale Pedestrian Detection Based on Attention Module and Feature Fusion**
   Chen Yong, Jin Manli, Chen Dong, Liu Huanlin, Xie Wenyang
6. **Research on Pipeline Leak Identification Based on Optical Fiber Sensor**
   Yong Chen, zihan Yu, HuanLin Liu, Tao Jiang

16:40-16:50 Coffee Break

16:50-18:00 Online Session A-5 : Chongqing University
(HALL A)
(Chair: Xu Zhang)

1. **The obstacle detection of self-driving cars based on YOLOv5 in embedded microprocessor**
   Changhao Piao, Wei Zou, Yixin Xiong, Shunqi Zou, Kang Xiang, Mingjie Liu
2. **Research on temperature and energy efficiency control of high-speed environmental chamber based on fuzzy PID**
   Changhao Piao, Zihang Sang, Sheng Lu, Yang Zhao, Mingjie Liu, Ziyang Liu, Fanqiao Zeng, Junsheng Chen
3. **Human Mobility Pattern Discovery Based on Multi-modal Data**
   Shunjie Wen, Xu Zhang, Ruixu Cao
4. **Innovative Application of Blockchain Technology in Real Estate Registration**
   Liang Yan
5. **Few-shot Learning based CV Framework**
   Wei Pu,

Day 2, April 23, 2021 (Friday)

10:00-12:00 **Organizing Committee Meeting I**

12:00-13:00 **Lunch**

13:00-15:00 **Local Arrangement Committee Meeting**

Day 3, April 24, 2021 (Saturday)

10:00-12:00 **Organizing Committee Meeting II**

12:00-13:00 **Lunch**

13:00-15:00 **Executive Meeting – Organized by FutureTech 2021, MUE 2021**

Conference Venue

MAISON GLAD JEJU

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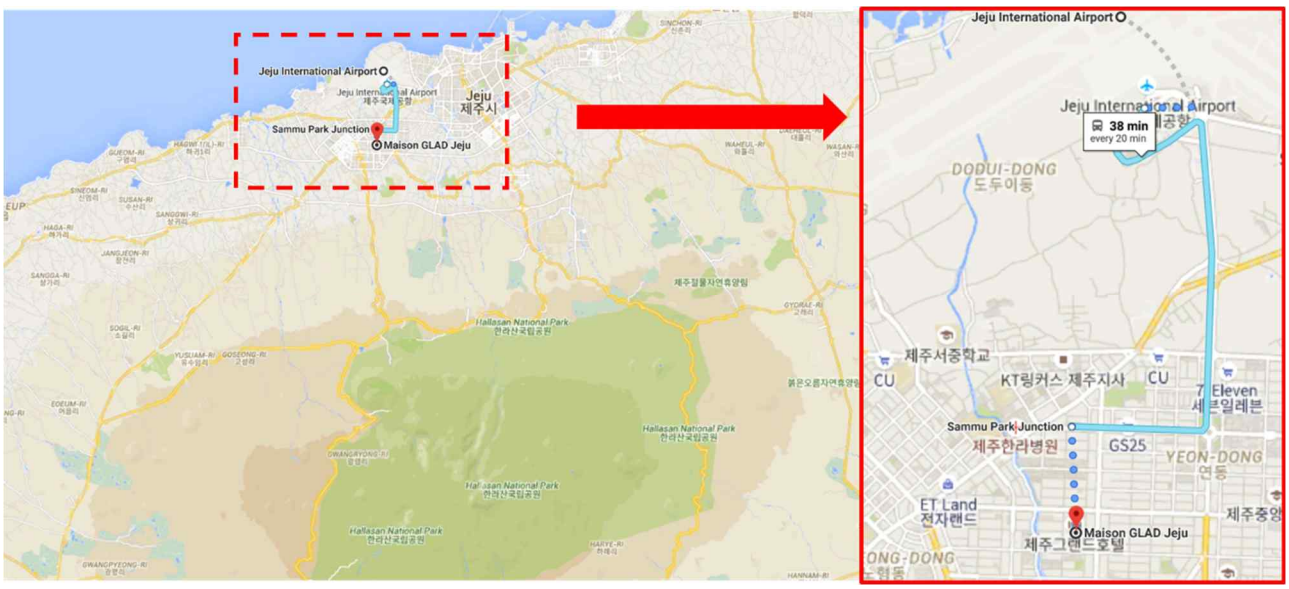

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