IIH-MSP 2018

The 14th International Conference on
Intelligent Information Hiding
and Multimedia Signal Processing

Program and Abstract

26-28 November, 2018
Sendai, Japan

TOHOKU UNIVERSITY

RIEC

RIEC
International Symposium

IIH-MSP 2018
The 14th International Conference on
Intelligent Information Hiding
and Multimedia Signal Processing

26–28 November, 2018
Sendai, Japan

The Fourteenth International Conference on Intelligent Information Hiding and Multimedia Signal Processing (IIH-MSP 2018), is technically co-sponsored by Research Institute of Electrical Communication, Tohoku University in Japan, Fujian University of Technology in China, Taiwan Association for Web Intelligence Consortium, Shandong University of Science and Technology in China, and IEEE Signal Processing Society Sendai Chapter.

The conference proceedings will be published in the book series of Smart Innovation, Systems and Technologies by Springer. Normally, papers in this series are indexed by EI.

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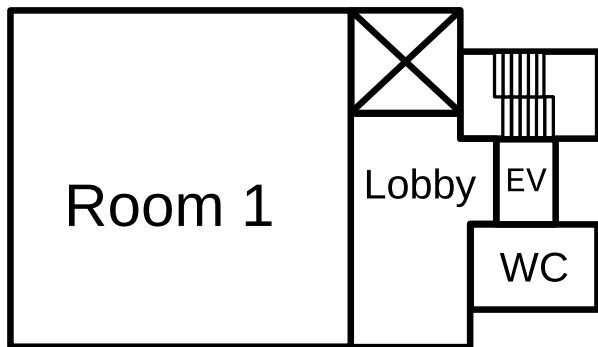- Ru Zhang (Beijing University of Posts and Telecommunications, China)

Conference Venue

Aoba Memorial Hall, Tohoku University
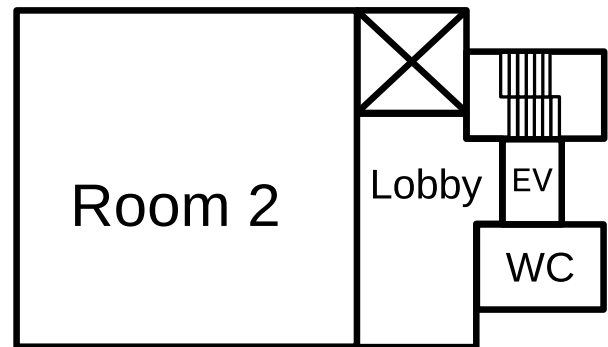6-6 Aramaki aza Aoba, Aoba-ku, Sendai 980-8579 Japan
Aobayama East Campus, Tohoku University

Floor Plan
Aoba Memorial Hall

Room 1	Lobby	EV
		WC

4F

Room 2	Lobby	EV
		WC

5F

Restaurant
Shikisai
(Four Seasons Club)

Reception on 25
Lunch on 26,27
Coffeebreak

EV

WC

3F

Directions to the campus

Access from Sendai Station

- **Subway[Sendai Subway Tozai Line]**
  From "Sendai" station, take the Subway bound to "Yagiyama Zoological Park". Get off at "Aobayama" station. It takes 9 minutes and the fare is 250 JPY.

- **Taxi**
  You may take a taxi to the School of Engineering from Sendai Airport or Sendai Station. Fares are about 6,000 yen from Sendai Airport and 1,600 yen from Sendai Station. Taxi can be found at the taxi stands in front of Sendai Airport or Sendai Station.
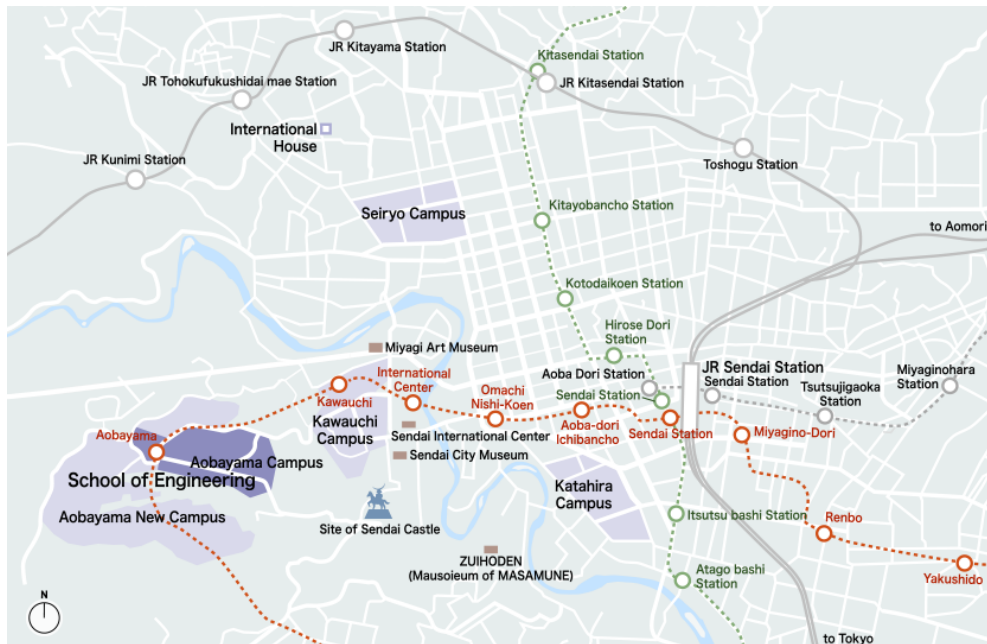
Campus Map
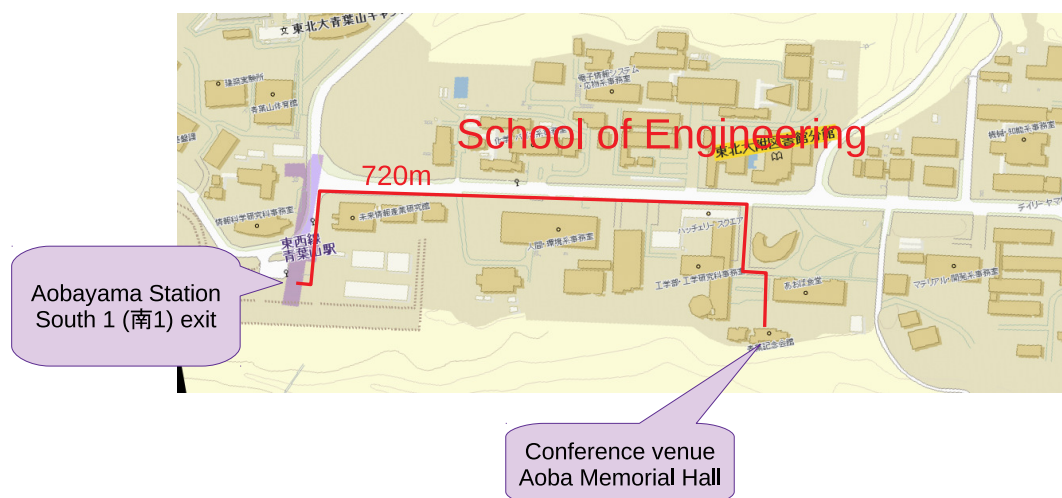
Social Events

Welcome reception

November 25 (Sun.) 6:00 PM
Restaurant *Shikisai* (Four Seasons Club), Aoba Memorial Hall 3F

Dinner

November 26 (Mon.) 6:30 PM
Hotel Metropolitan Sendai (next to Sendai Station)
https://www.sendaimetropolitan.jp/en-gb

Banquet

November 27 (Tue.) 7:00 PM
Restaurant *Shokeikaku*
Shokeikaku, a restaurant in the former Date family residence. Overlooking the splendid garden from a traditional Japanese style (Shoin style) room, you can taste various local dishes served in a small Sendai Tansu (a Japanese chest of drawers).

Excursion

November 28 (Wed.) 1:20 PM
Fee: free (including a lunchbox), reservation needed
A bus tour, visiting Matsushima Bay, one of the three scenic spots in Japan. In addition to the bay cruise using a pleasure boat, you will see the traces of the Great East Japan Earthquake and tsunami. The bus returns to Sendai Station in the evening.
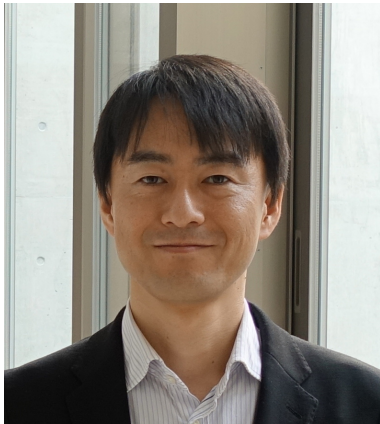
Program at a glance

Time	Day 0(25) Restaurant	Day 1(26) Room 1	Day 1(26) Room 2	Day 2(27) Room 1	Day 2(27) Room 2	Day 3(28) Room 1	Day 3(28) Room 2
9:00–9:20		Opening		Keynote 2		WEA1A Multimedia System and Intelligent Computing 1	WEA1B Emerging Trends in Multimedia Systems and Applications
9:30–10:20		Keynote 1					
10:20				Coffee break			
10:30		Coffee break				Coffee break	
10:40–12:00		MOA1A Recent Advances in Information Hiding and Signal Processing for Audio and Speech Signals	MOA1B Emerging Techniques and Its Applications in Computer Science 1	TUA1A Health Informatics and Intelligent Data Hiding	TUA1B Emerging Techniques and Its Applications in Computer Science 4	WEA2A Multimedia System and Intelligent Computing 2	WEA2B Internet of Things: Technologies and Applications
12:00–13:00		Lunch		Lunch			
13:10–14:50		MOP1A Advances in speech and language processing	MOP1B Emerging Techniques and Its Applications in Computer Science 2	TUP1A Cross-Disciplinary Approaches and Applications 1	TUP1B Advances in Machine Learning Technology for Industrial Applications 1	Excursion to Matsushima	
15:00	Registration	Coffee break		Coffee break			
15:20–17:20	Registration	MOP2A Deep Learning for Information Hiding	MOP2B Emerging Techniques and Its Applications in Computer Science 3	TUP2A Cross-Disciplinary Approaches and Applications 2	TUP2B Advances in Machine Learning Technology for Industrial Applications 2		
17:40		Move to Hotel Metropolitan		Move to Shokeikaku			
18:00	Reception						
18:30–20:20		Dinner		Banquet			

Keynote Speakers

Keynote 1: Hardware Security: Research Field Expanding in IoT Era

Prof. Naofumi Homma
Research Center for Electrical Communication,
Tohoku University
26 November, Room 1, 9:20-10:20

Abstract: Hardware security in mobile and embedded systems is drawing much attention in the context of the rapid growth of Internet-of-Things. Due to the easier accessibility, security threats and vulnerabilities for "things" located everywhere are more critical in comparison with PCs and servers in a room. In particular, the threats of side-channel attacks are non-trivial because they can be done by relatively low-cost equipment in a non-destructive manner. This talk will start with an overview of researches on hardware security, and then introduce the-state-of-the-art side-channel attacks and countermeasures.

Bibliography: Naofumi Homma received the PhD degrees in information sciences from Tohoku University, Sendai, Japan, in 2001. Since 2016, he has been a Professor in the Research Institute of Electrical Communication, Tohoku University. In 2009-2010 and 2016-2017, he was a visiting professor at Telecom ParisTech in Paris, France. His research interests include computer arithmetic, VLSI design methodology, and hardware security. He received a number of awards including the Best Symposium Paper Award at the 2013 IEEE International Symposium on Electromagnetic Compatibility (EMC 2013), the Best Paper Award at the 2014 IACR International Conference on Cryptographic Hardware and Embedded Systems (CHES 2014), the JSPS Prize in 2018, and German Innovation Award in 2018. He served as a Program Co-Chair of 2017 IACR International Conference on Cryptographic Hardware and Embedded Systems (CHES 2017).

Keynote 2: Recent Advances in Visual Sensor Systems

Dr. Ivan Lee
University of South Australia
27 November, Room 1, 9:00-10:00

Abstract: The rapid development in smart sensor technologies has major impact across most industries, with rich information collected to assist information management and decision making. Among these, visual sensors acquire rich media data from natural and built environments, which plays crucial role in smart Internet of Things. While visual sensors promise improved services in manufacturing, health, surveillance, monitoring, and vehicular industries, techniques in acquisition, processing, and analysis remain on-going challenges. This keynote address will cover the evolution of visual sensor development in the recent past, and showcase various applications facilitated by visual sensors. Present challenges of visual sensor applications will be presented, and future research directions will be discussed.

Bibliography: Ivan Lee received the B.Eng., M.Com., MER, and Ph.D. degrees from The University of Sydney. He was a software development engineer at Cisco Systems, a software engineer at Remotek Corporation, and an Assistant Professor at Ryerson University. Since 2008, he has been a Senior Lecturer with the University of South Australia. He has served as the Program Co-Chair of the 2008 ACM International Conference on Image and Video Retrieval (CIVR), the General Chair of 2013 Australasian Computer Science Week (ACSW), and the General Co-Chair of 2015 International Conference on Intelligent Information Hiding and Multimedia Signal Processing (IIH-MSP). He was a recipient of the Lockheed Martin Best Paper Award of 2015 SPIE Defense + Security, Automatic Target Recognition XXV, and the Best Paper Award of 2007 Pacific-Rim Conference on Multimedia. His research findings have been disseminated in over 100 peer-reviewed publications, including IEEE Transactions on Image Processing, IEEE Transactions on Multimedia, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Emerging Topics in Computing, IEEE Transactions on Industrial Informatics, and Advanced Functional Materials. His research interests include smart sensors, multimedia systems, and scholarly data analytics.

Technical Programs

MOA1A: Recent Advances in Information Hiding and Signal Processing for Audio and Speech Signals
26 November, 11:00-12:20; Room 1
Session Chair: Kotaro Sonoda (Nagasaki University)

MOA1A-1 An Interrogation Speech Manipulation Detection Method using Speech Fingerprinting and Watermarking
Shinya Takahashi and Kazuhiro Kondo

MOA1A-2 Digital Audio Watermarking Method Based on Singular Spectrum Analysis with Automatic Parameter Estimation Using a Convolutional Neural Network
Kasorn Galajit, Jessada Karnjana, Aakinee Aimmanee and Masahi Unoki

MOA1A-3 Muting Machine Speech Using Audio Watermarking
Akinori Ito

MOA1A-4 Leveraging a Small Corpus by Different Frame Shifts for Training of a Speech Recognizer
Akinori Ito

MOA1B: Emerging Techniques and Its Applications in Computer Science 1
26 November, 11:00-12:20; Room 2
Session Chair: Tsu-Yang Wu (Fujian University of Technology)

MOA1B-1 A Hybrid NSGA-II for Matching Biomedical Ontology
Xingsi Xue, Jie Chen, Junfeng Chen, Dongxu Chen

MOA1B-2 Multi-attributes Graph Algorithm for Association Rules Mining over Energy Internet
Ling Wang, Fu Tao Ma, Tie Hua Zhou, Xue Gao

MOA1B-3 Real-time Electricity Pricing Trend Forecasting based on Multi-density Clustering and Sequence Pattern Mining
Tie Hua Zhou, Cong Hui Sun, Ling Wang, Gong Liang Hu

MOA1B-4 TDT_CC: A Hot Topic Detection and Tracking Algorithm based on Chain of Causes
Zhen Hong Liu, Gong Liang Hu, Tie Hua Zhou, Ling Wang

MOP1A: Advances in speech and language processing
26 November, 13:20-15:20; Room 1
Session Chair: Akinori Ito (Tohoku University)

MOP1A-1 Evaluation of English Speech Recognition for Japanese Learners Using DNN-based Acoustic Models
Jiang Fu, Yuya Chiba, Takashi Nose and Akinori Ito

MOP1A-2 A Study on a Spoken Dialogue System with Cooperative Emotional Speech Synthesis Using Acoustic and Linguistic Information
Mai Yamanaka, Yuya Chiba, Takashi Nose, and Akinori Ito

MOP1A-3 Comparison of Speech Recognition Performance between Kaldi and Google Cloud Speech API
Takashi Kimura, Takashi Nose, Shinji Hirooka, Yuya Chiba, and Akinori Ito

MOP1A-4 Segmental pitch control using speech input based on differential contexts and features for customizable neural speech synthesis
Shinya Hanabusa, Takashi Nose, and Akinori Ito

MOP1A-5 Two-Stage Sequence-to-Sequence Neural Voice Conversion with Low-to-High Definition Spectrogram Mapping
Sou Miyamoto, Takashi Nose, Kazuyuki Hiroshiba, Yuri Odagiri, and Akinori Ito

MOP1A-6 Improvement of Accent Sandhi Rules Based on Japanese Accent Dictionaries
Hiroto Aoyama, Takashi Nose, Yuya Chiba, Akinori Ito

MOP1B: Emerging Techniques and Its Applications in Computer Science 2
26 November, 13:20-15:20; Room 2
Session Chair: Shaozhang Niu (Beijing University of Posts and Telecommunications)

MOP1B-1 A New Approximation Algorithm for the d-dimensional Knapsack Problem based on Hopfeld Networks
Hsin-Lung Wu, Jui-Sheng Chang, Jen-Chun Chang

MOP1B-2 A Method of Cancellation Interference In CCFD System
Zengyou Sun, Yujie Zhao

MOP1B-3 Power Optimization Method of Magnetic Coupling Resonant Wireless Energy Transmission System
Jianpo Li, Yang Lu, Songjun Pan, Ziqi Dong, Baochun Mu, Fuxin Liu, Cong Zheng

MOP1B-4 PSO-AFSA Global Maximum Power Point Tracking Algorithm with Adaptive Evolutionary Strategy for PV System
Jianpo Li, Pengwei Dong, Cong Zheng, Fuxin Liu, Songjun Pan, Baochun Mu, Ziqi Dong

MOP1B-5 The Design of RFID Localization System for Library Books
Jianpo Li, Jun Wang, Fuxin Liu, Songjun Pan, Cong Zheng, Baochun Mu, Ziqi Dong

MOP1B-6 The Design and Implementation of Automatic Detection and Control Equipment with Unattended Truck Scales
Yun Wu, Xin Hu, XiaoDong Wang

MOP2A: Deep Learning for Information Hiding
26 November, 15:50-17:50; Room 1
Session Chair: Ru Zhang (Beijing University of Posts and Telecommunications)

MOP2A-1 Melody Completion Based on Convolutional Neural Networks and Generative Adversarial Learning
Kosuke Nakamura, Takashi Nose, Yuya Chiba, and Akinori Ito

MOP2A-2 Data Collection and Analysis for Automatically Generating Record of Human Behaviors by Environmental Sound Recognition
Takahiro Furuya, Yuya Chiba, Takashi Nose and Akinori Ito

MOP2A-3 DNN-Based Talking Movie Generation with Face Direction Consideration
Toru Ishikawa, Takashi Nose, and Akinori Ito

MOP2A-4 An Image Steganography Algorithm Based on Pixel Block Difference and Variable Modulus Function
Yu Yang, Ru Zhang, Jianyi Liu,Yuhan Wang and Fuhong Huang

MOP2A-5 Attack Pattern Mining Algorithm Based on Fuzzy Clustering and Sequence Pattern from Security Log
Jianyi Liu, Keyi Li, Yang Li, Ru Zhang and Xi Duan

MOP2A-6 Calculating the truck's box volume with a single image under the circle projection and vanishing points constraint
Wei Sun, Wei Lu, Chun-yu Zhao, Bao-long Guo, Da-jian Li

MOP2B: Emerging Techniques and Its Applications in Computer Science 3
26 November, 15:50-17:50; Room 2
Session Chair: Ming-Tai Wu (National Chung Hsing University)

MOP2B-1 An Interactive Appliances' Intelligent Control Method Based on Time-sharing Electricity Price
Yun Wu, Qiang Wang, Jian Wang

MOP2B-2 Modification Algorithm to Node Localization Error for Wireless Sensor Networks
Jianpo Li, Na Li, Cong Zheng, Fuxin Liu, Songjun Pan, Baochun Mu, Ziqi Dong

MOP2B-3 A Real-time Missing Data Recovery Method Using Recurrent Neural Network for Multiple Transmissions
Bor-Shing Lin, Yu-Syuan Lin, I-Jung Lee, Bor-Shyh Lin

MOP2B-4 The extraction and application of the Color Texture Feature Based on Quaternion Gabor
Bo Meng, Xiaolin Wang, Xuejun Liu, Linlin Xia, Guannan Deng, Shengxi Jiao

MOP2B-5 Analysis and Detection of Android App Privilege Escalation Vulnerability Based on Machine Learning
Xin Jiang, Wen Zhang, Shaozhang Niu, Yiming Xue

MOP2B-6 A Watermarking Method for Printed QR Code based on Module Expansion
Cai-Jie Weng, Jeng-Shyang Pan, Shi-Jian Liu, Mei-Jin Wang

TUA1A: Health Informatics and Intelligent Data Hiding
27 November, 10:30-12:10; Room 1
Session Chair: Wen-Fong Wang (National Yunlin University of Science and Technology)

TUA1A-1 An Improved High-Capacity ECG Steganography with Smart Offset Coefficients
Ching-Yu Yang and Wen-Fong Wang

TUA1A-2 Preview-versioned Essential Secret Image Sharing
Shang-Kuan Chen and Rei-Heng Cheng

TUA1A-3 Visual Cryptography with QR-code transparencies
Shang-Kuan Chen and Yen-Wu Ti

TUA1A-4 Solving multiple charging vehicles scheduling problem for wireless rechargeable sensor networks using cuckoo search approach
Rei-Heng Cheng and Shang-Kuan Chen

TUA1A-5 A State Codebook Generation Algorithm of Side Match Vector Quantization
Yang Wang and Zhibin Pan

TUA1B: Emerging Techniques and Its Applications in Computer Science 4
27 November, 10:30-12:10; Room 2
Session Chair: Hsin-Lung Wu (National Taipei University)

TUA1B-1 Research on Optimal Combination of Secondary Hybrid Encryption Algorithm Based on K-means Clustering Algorithm
Yun Wu, MengKe Wu, HaoJie Shu

TUA1B-2 Construct Left Ventricular Hypertrophy Prediction Model based on Random Forest
Ming-Tai Wu, Meng-Hsiun Tasi, Sheng-Han Xiao, Tsu-Yang Wu

TUA1B-3 The Bayesian Causal Inference in Multisensory Information Processing: a Narrative Review
Yang Xi, Ning Gao, Mengchao Zhang, Lin Liu, Qi Li

TUA1B-4 The Neural Mechanism of Audiovisual Integration Modulated by Attention: a DCM Study
Yang Xi, Mengchao Zhang, Ning Gao, Yue Li, Lin Liu, Qi Li

TUA1B-5 On the security of a three factor remote user authentication scheme using fuzzy extractor
Chien-Ming Chen, Yanyu Huang, Xiaoting Deng, Tsu-Yang Wu

TUP1A: Cross-Disciplinary Approaches and Applications 1
27 November, 13:10-15:10; Room 1
Session Chair: Chin-Feng Lee (Chaoyang University of Technology)

TUP1A-1 A Novel Tamper Detection and Image Recovery Technique for Color Image Demosaicking
Yu-Chen Hu, Pei-Jung Wu, Chia-Mei Chen, and Yi-Hung Liu

TUP1A-2 Improving Latency and Reliability for Vehicle System under Fog Computing Networks
Mao-Lun Chiang, Yu-an Lin, Hui-Ching Hsieh and Weng-Chung Tsai

TUP1A-3 Nominate Connected Dominating Set Algorithm in Mobile Ad Hoc Network
Mao-Lun Chiang, Ze-Yu Chen, Hui-Ching Hsieh and Tsui-Ping Chang

TUP1A-4 The Keywords of Affecting Performance for Live Streaming
Long-Sheng Chen and Yi-Ting Pan

TUP1A-5 Mobile Coupons Using Blockchain Technology
Sue-Chen Hsueh and Jia-He Zeng

TUP1A-6 Dual Image Reversible Data Hiding Based on Modified LSB Matching Method
Hsien-Wen Tseng, Hui-Xin Lu and Hui-Shih Leng

TUP1B: Advances in Machine Learning Technology for Industrial Applications 1
27 November, 13:10-15:10; Room 2
Session Chair: Ching-Lung Chang (National Yunlin University of Science and Technology)

TUP1B-1 Security Analysis of a Public Key Authenticated Encryption with Keyword Search Scheme
Tsu-Yang Wu, Chien-Ming Chen, King-Hang Wang, Jimmy Ming-Tai Wu, Jeng-Shyang Pan

TUP1B-2 The research about Topic Extraction Method Based on the DTS-ILDA Model
Xiaoli Guo, Li Feng, Yuhan Sun, Ping Guo

TUP1B-3 The Study of Power Server operations Information Visualization Key Technologies
Xiaoli Guo, Ping Guo, Li Feng, Wei Yue

TUP1B-4 Heart Rate Detection Based on Facial Feature Points Tracking
Chuan-Yu Chang and Hsiang-Chi Liu

TUP1B-5 3D MODELING FOR UPPER OF SHOE BASED ON BILATERAL TRIANGULATION
Hsien-Huang Wu, Ying-Dong Lian, Ya-Yung Huang

TUP1B-6 A New Application of Hyperspectral Techniques in Drug Classification
Shih-Yu Chen, Yen-Chung Chen, and Chou-Tien Lien

TUP2A: Cross-Disciplinary Approaches and Applications 2
27 November, 15:40-17:40; Room 1
Session Chair: Yu-Chen Hu (Providence University)

TUP2A-1 A Survey of Semi-Fragile Watermarking Authentication
Chin-Feng Lee, Jau-Ji Shen, Fang-Wei Hsu

TUP2A-2 A High Payload Edge Detection-Based Image Steganography Robust to RS-Attack by Using LSB Substitution and Pixel Value Differencing
Chin-Feng Lee, Jau-Ji Shen, Ting-Yi Ou-Yang

TUP2A-3 High-Capacity Reversible Data Hiding Based on Star-Shaped PVO Method
Chin-Feng Lee, Jau-Ji Shen, Yu-Chi Kao

TUP2A-4 New Anatomy of Consensus in a Multiple Damage Communication VANET
Shu-Ching Wang, Kuo-Qin Yan and Wei-Shu Xiong

TUP2A-5 Customer Management and Marketing Strategy Development in the Internet of Things
Kuo-Qin Yan, Shu-Ching Wang, Wei-Shu Xiong, Ke-Yin Lu and Yun-Ju Cha

TUP2A-6 Privacy-Preserving Reversible Watermarking for Data Extration Prevention Through Lexico-graphic Permutations
Ching-Chun Chang and Chang-Tsun Li

TUP2B: Advances in Machine Learning Technology for Industrial Applications 2
27 November, 15:40-17:40; Room 2
Session Chair: Chuan-Yu Chang (National Yunlin University of Science and Technology)

TUP2B-1 Evaluation of DoS Attacks on Vehicle CAN Bus System
Shi-Huang Chen and Chun-Hung Richard Lin

TUP2B-2 Deep Learning-based Identification of Steel Products
Li-Wei Kang, You-Ting Chen, Wei-Chen Jhong and Chao-Yung Hsu

TUP2B-3 Reinforcement Learning-based Two-Wheel Robot Control
Ching-Lung Chang

TUP2B-4 A localization approach based on Fixed 3D Objects for Autonomous Robots
Chien-Chou Lin

TUP2B-5 Clockwise and counter-clockwise torsion in different operational angles on transverse plane
Dengchuan Cai, Jhongpei Wu and Chuan-Yu Chang

TUP2B-6 Micro Physiological Vibration Detection for Human Heartbeats
Wen-Fong Wang, Ying-Peng Huang, Chuan-Yu Chang and Ching-Yu Yang

WEA1A: Multimedia System and Intelligent Computing 1
28 November, 9:00-10:40; Room 1
Session Chair: Jyh-Horng Wen (Tunghai University)

WEA1A-1 Denoising of ECG Signal with Power Line and EMG Interference based on Ensemble Empirical Mode Decomposition
Shing-Hong Liu, Li-Te Hsu, Cheng Hsiung Hsieh, Yung-Fa Huang

WEA1A-2 Using the Photoplethysmography Technique to Improve the Accuracy of LVET Measurement in the ICG Technique
Shing-Hong Liu, Zheng-Yu Zhu, Shao-Heng Lai. Tai-Shen Huang

WEA1A-3 Network Anomaly Detection Based on Artificial Intelligence
Chia-Mei Chen, Wen-Ling Lo, Gu-Hsin Lai, Yu-Chen Hu

WEA1A-4 Traffic Flow Correlation Analysis of K Intersections Based on Deep Learning
Hung-Chi Chu, Chi-Kun Wang, and Yi-Xiang Liao

WEA1A-5 Detecting Attention and Meditation EEG Utilized Deep Learning
Chung-Yen Liao, Rung-Ching Chen, Qiao-En Liu

WEA1B: Emerging Trends in Multimedia Systems and Applications
28 November, 9:00-10:40; Room 2
Session Chair: Ivan Lee (University of South Australia)

WEA1B-1 The Properties of Order and Failure Estimation on Redundancy System
Lin Xu, Chao-Fan Xie, Lu-Xiong Xu, Fuquan Zhang

WEA1B-2 Hepatic Texture Synthesis Method Based on the Accelerated CUDA
Lin Xu, Chao-Fan Xie, Lu-Xiong Xu, Na Wang

WEA1B-3 A P2P Multimedia Service System based on Mesh Chords
Zhiming Cai, Xuehong Huang

WEA1B-4 Resolution Reduction for Two-Phase Test Sample Representation in Face Recognition
Ning Wu, Jinzhan Wei

WEA1B-5 Path Finding for Road Accessibility in Maze using BLOB Extraction
Jinzhan Wei, Ning Wu

WEA2A: Multimedia System and Intelligent Computing 2
28 November, 11:10-12:50; Room 1
Session Chair: Yung-Fa Huang (Chaoyang University of Technology)

WEA2A-1 Improving the Implementation of Sensor Nodes for Illegal Logging Detection
Jen-Ting Chen, Chuan-Bi Lin, Jiun-Jian Liaw, Yu-Yan Chen

WEA2A-2 A Study on CNC Machine Training Based on Virtual Reality Technology
Tzu-Chuen Lu, Rong-Chang Chen, Guang-En Hsuen

WEA2A-3 Forecasting for the Total Electricity Consumption of Taiwan by Fuzzy Time Series
Jing-Rong Chang, Zhong-Qi Liu, Pei-Yu Yu

WEA2A-4 Performance Analysis of Grouping Strategy in Relay-based Cooperative Networks
Jheng-Siam Li and Jyh-Horng WEN

WEA2A-5 The Development of Display Interface for Automatic Identification System and Digital Selective Calling System
Chien Erh Weng, Zhu-Yun Zheng, Lie Yang

WEA2B: Internet of Things: Technologies and Applications
28 November, 11:10-13:10; Room 2
Session Chair: Hui-Kai Su (National Formosa University)

WEA2B-1 Intelligent Infant Monitoring System Involving a Wi-Fi Wireless Sensor Network
Chi-Chang Lu, Chung-Hsien Wu, Hui-Kai Su

WEA2B-2 Long Lifetime Data Aggregation Using Geographic Division in Wireless Sensor Networks
Chia-Hsin Cheng, Hui-Kai Su, Yi-Shiang Chen, Tao-Ping Wang, Feng-Cheng Wu and Yu-An Chen

WEA2B-3 Distortion function for Steganography in Texture Synthesized Images
Lina Shi, Zichi Wang, Zhenxing Qian and Xinpeng Zhang

WEA2B-4 A Design Exploration of Wearable Companion of Smartphone
Wen Qi

WEA2B-5 Research and implementation of fuzzy control method of UAV formation with ad hoc network
Zhen-hao Zhang, Wei Sun, Wei Lu, Lei Bian

WEA2B-6 Design and Implementation of a Host-based Intrusion Detection System for Linux-based Web
Server
Cheng-Chung Kuo, Shu-Han Yao, Chia-Ling Hou and Chu-Sing Yang

Abstracts

MOA1A-1: An Interrogation Speech Manipulation Detection Method using Speech Fingerprinting and Watermarking

Shinya Takahashi and Kazuhiro Kondo

We proposed a manipulation detection method for interrogation speech. We used a robust fingerprinting method optimized for speech since our intended target is interrogation speech recorded during a police investigation. The fingerprint uses line spectral pairs (LSP) to measure the spectral envelope of the speech, and is coarsely quantized so that the fingerprint will not be altered by small degradation in the signal, but will be altered enough by malicious modifications to the speech content. This fingerprint is embedded in the speech signal using conventional spreadspectrum watermarks. To detect manipulation, the watermarked fingerprint is detected, and compared to the fingerprint extracted from the speech itself. If the fingerprints match within the predetermined tolerance, it can be authenticated to be unaltered. Otherwise, manipulation should be suspected. We conducted manipulation detection on a frame by frame basis, and confirmed that we can correctly detect manipulation with noisy and reverberant speech in almost all of the substituted frames.

MOA1A-2: Digital Audio Watermarking Method Based on Singular Spectrum Analysis with Automatic Parameter Estimation Using a Convolutional Neural Network

Kasorn Galajit, Jessada Karnjana, Aakinee Aimmanee and Masahi Unoki

This paper proposes an audio watermarking method based on the singular-spectrum analysis (SSA) incorporating with a convolutional neural network (CNN) for parameter estimation. A watermark is embedded into an audio signal by modifying some part of its singular spectrum according to an embedding rule. Such a modified part affects both the robustness of the scheme and sound quality of watermarked signals, and it should be determined appropriately in order to balance the robustness and sound quality. In our previous work, we used a method based on a differential evolution (DE) algorithm to estimate the suitable part. However, it is a time-consuming approach. Therefore, in this work, we replace it with a CNN approach. A dataset used to train the CNN is constructed based on the DE. Experimental results show that the computational time is considerably reduced by 96,923 times. The average bit-error rate is 0.07 when there is no attack, and the sound quality of watermarked signals satisfies three objective evaluation metrics. Also, the proposed scheme could blindly extract the watermark due to the time efficiency of the CNN-based method.

MOA1A-3: Muting Machine Speech Using Audio Watermarking

Akinori Ito

Spoken dialog systems have become popular and are used in a home environment, such as smart speakers. A problem will occur when two or more smart speakers are in the same environment, in which a dialog system misdetects the other dialog systems voice as a users voice. In this paper, a method to mute synthesized speech is proposed to prevent a speech recognizer from recognizing speech uttered by a machine. The audio watermark technique is used to indicate that a machine utters the speech, and the speech recognizer attenuates the observed speech if it contains the watermark. The watermark is embedded in high frequency so that humans cannot perceive the watermark and the watermark is robustly extracted. From the experimental result, we found that the proposed method robustly determine the existence of the watermark when the SNR is no less than 0 dB.

MOA1A-4: Leveraging a Small Corpus by Different Frame Shifts for Training of a Speech Recognizer

Akinori Ito

During the feature extraction process for speech recognition, a window function is first applied to the input waveform to extract temporally-limited spectrum. By shifting the window function with a short time period, we can analyze the temporal change of speech spectrum. This time period is called "the frame shift," which is usually 5 to 10 ms. In this paper, frame shift is re-considered from two aspects. The first one is the appropriateness of 10 ms as the frame shift. The frame-based process is based on the assumption that temporal change of speech spectrum is slow enough compared with the frame shift, which does not hold for kinds of consonants such as plosives. Thus, this paper experimentally shows that feature value fluctuates much according to the first position of the frame. Then a training method is proposed that uses temporally shifted samples as independent samples to compensate for the fluctuation of feature caused by the difference of the beginning position of a frame. The second aspect is that the frame shift could be longer if the fluctuation can be compensated. To prove this, an experiment was conducted to change frame shift from 10 to 60 ms, and it was found that the result of 40 ms frame shift outperformed the result of 10 ms frame shift, and comparable recognition performance with 10 ms frame shift result was obtained with 50 ms frame shift.

MOA1B-1: A Hybrid NSGA-II for Matching Biomedical Ontology
Xingsi Xue, Jie Chen, Junfeng Chen, Dongxu Chen

Over the recent years, ontologies are widely used in the biomedical domains. However, biomedical ontology heterogeneity problem hamper the cooperation between intelligent applications based on biomedical ontologies. It is crucial to establish correspondences between the heterogeneous biomedical concepts in different ontologies, which is so-called biomedical ontology matching. Approaches based on MultiObjective Evolutionary Algorithm (MOEA), such as NSGA-II, are emerging as a new methodology to solve the ontology matching problem. In this paper, to further improve the quality of biomedical ontology alignments, a hybrid NSGA-II is proposed, which modifies the knee solutions in the Pareto front by using a local search method. Experiment utilizes two biomedical ontology matching tracks provided by Ontology Alignment Evaluation Initiative (OAEI 2017). The experimental results show that our approach outperforms the participants of OAEI 2017 and NSGA-II based ontology matching technique.

MOA1B-2: Multi-attributes Graph Algorithm for Association Rules Mining over Energy Internet
Ling Wang, Fu Tao Ma, Tie Hua Zhou, Xue Gao

In recent years, with the development of the energy internet.Developing energy internet system is a necessary requirement for building resource-saving and environment-friendly society. Due to the consumption of the load is affected by many factors, each factor is an attribute. Our main contribution is that as the property changes in the weight of all influencing factors in the different time intervals, and calculates the global attribute nodes based on the graph updating. Furthermore, for analysis and predicts the trend of user side power consumption. By this way, our objective is through the definition of various attributes, discovery groups of potential distribution formed by dense power graphs that are homogeneous with respect to the attribute correlation of users. To this aim, we present a new kind of pattern algorithm called Mapm algorithm. It's a multi-attributes correlated pattern mining algorithm, based on the correlation operation of multiple attributes, through the results of mining to find similar users, so as to achieve the forecast purpose of real-time power consumption.

MOA1B-3: Real-time Electricity Pricing Trend Forecasting based on Multi-density Clustering and Sequence Pattern Mining
Tie Hua Zhou, Cong Hui Sun, Ling Wang, Gong Liang Hu

The implementation of real-time electricity price has become an essential point in the electricity market reform. It reflects the balance between the real-time market price and the electricity price. However, due to the nonlinear, non-stationary, time variant and other uncertainties factors in power market, prediction accuracy is difficult to guarantee. Therefore, we proposed a Multi-density

Clustering (MD Clustering) algorithm use different radius to classify the electricity price data,and automatically generated multi-levels clusters by different price ranges. Then, we forecast the trend of electrity price based on the association analysis and pattern recognition of different level catagories. The experimental results show that our MD clustering algorithm has fast performance and high accuracy in dealing with the data of density attributes nonuniformity condition, and ensure the accuracy of real-time electricity price forecasting.

MOA1B-4: TDT_CC: A Hot Topic Detection and Tracking Algorithm based on Chain of Causes
Zhen Hong Liu, Gong Liang Hu, Tie Hua Zhou, Ling Wang

With the development and application of Web3.0, it has become a common social phenomenon that users discuss hot topics on social networks, making them to aggregate into user groups based on the topics, rapidly. The hot topic detection and tracking is helpful for social public opinion supervision and guidance, in addition, it contribute to the user's behavior mining and analysis. However, users' interest in some topics often changes as new event occurs, causing the center of hot topics to change over time. For tracking the heat of topic in real-time, we proposed an effective algorithm to detect and track hot topic based on chain of causes (TDT_CC). Firstly, we treat the events as attributes of topic and add them to the structure of the social networks. Secondly, the subgraphs that induced by specific attributes are mined based on the correlation of event-heat-changing attributes and attribute-extended social network structure.

MOP1A-1: Evaluation of English Speech Recognition for Japanese Learners Using DNN-based Acoustic Models
Jiang Fu, Yuya Chiba, Takashi Nose and Akinori Ito

Regarding the assistance of computer-assisted language learning (CALL) systems to make foreign language learning easier, it is necessary to recognize the utterances of the learner with high accuracy. The quality of CALL systems mainly depends on the accuracy of automatic speech recognition (ASR). However, since the pronunciation of non-native speakers is greatly different from that of native speakers, existing ASR system cannot well recognize speech accurately. To solve this problem, this research projects an acoustic model based on deep neural networks (DNN), which is trained by using ERJ (English Read by Japanese) database collected from 202 Japanese learners. Compared with traditional ASR systems, this new system significantly promotes the speech recognition accuracy.

MOP1A-2: A Study on a Spoken Dialogue System with Cooperative Emotional Speech Synthesis Using Acoustic and Linguistic Information
Mai Yamanaka, Yuya Chiba, Takashi Nose, and Akinori Ito

This study examines an emotion labeling method for a system utterance of a non-task-oriented spoken dialogue system. The conventional study proposed the cooperative emotion labeling, which generates an emotional speech with an emotion label estimated from user and system utterances. However, this method had a problem that the system cannot decide the emotion label when the emotion is not estimated from the linguistic information. Therefore, we propose a method that uses both the acoustic and the linguistic information for the emotion recognition. In this paper, we show the performance of the emotion recognition when using the acoustic features first. Then, a dialogue experiment based on scenarios is conducted to verify the effectiveness of the proposed emotion labeling method. 1

MOP1A-3: Comparison of Speech Recognition Performance between Kaldi and Google Cloud Speech API
Takashi Kimura, Takashi Nose, Shinji Hirooka, Yuya Chiba, and Akinori Ito

In recent years, many systems having a speech interface have grown. The speech interface includes spoken dialogue function and high performance of a spoken dialogue system has been required. The spoken dialogue system consists of a speech recognition module. In this study, we focus on the speech recognition module of the spoken dialogue system and aim for improving the spoken dialogue system by enhancing the performance of the speech recognition system. Among several speech recognition systems, Kaldi is a widely used speech recognition system in many kinds of researches. On the other hand, several speech recognition services that are Web API is also provided, such as IBM Watson Speech to Text, Microsoft Bing Speech API, and Google Cloud Speech API, which is known that it has high performance. This paper compares speech recognition performance between Kaldi and Google Cloud Speech API in WER and RTF and confirms the recognition performance of each recognition system.

MOP1A-4: Segmental pitch control using speech input based on differential contexts and features for customizable neural speech synthesis
Shinya Hanabusa, Takashi Nose, and Akinori Ito

This paper proposes a technique for controlling the pitch of synthetic speech at a segmental level using user input speech within a framework of speech synthesis based on deep neural networks (DNNs). In a previous study, we proposed tailor-made speech synthesis, the speech synthesis technique which enables users to control the synthetic speech naturally and intuitively. We introduced differential fundamental frequency (F0) contexts into speaker model training of speech synthesis based on DNNs. The differential F0 context represents relative log F0 at the segmental level of training data. In this study, we use the user speech to determine the F0 contexts for synthetic speech. This approach allows users to modify and control the segmental pitch more flexibly, which will enhance the performance of the tailor-made speech synthesis.

MOP1A-5: Two-Stage Sequence-to-Sequence Neural Voice Conversion with Low-to-High Definition Spectrogram Mapping
Sou Miyamoto, Takashi Nose, Kazuyuki Hiroshiba, Yuri Odagiri, and Akinori Ito

In this study, we propose a voice conversion technique with two-stage conversion, which is realized by using two models consisting of U-Net and pix2pix. Using U-Net, we tried to reproduce intonation of a target speaker by performing low-dimensional feature conversion considering the time direction. We introduced pix2pix for the task of spectrogram enhancement. The pix2pix is trained to map from low definition spectrogram to high definition spectrogram (low-to-high spectrogram mapping). Low definition spectrogram is reconstructed from low dimensional mel-cepstrum converted by U-Net and high definition spectrogram is extracted from natural speech. In objective evaluations, we showed that the proposed method was effective in improvement of melcepstral distance (MCD) and Log F0 RMSE. Subjective evaluations revealed that the use of the proposed method had a certain effect in improving speech individuality while maintaining the same level of naturalness as the conventional method.

MOP1A-6: Improvement of Accent Sandhi Rules Based on Japanese Accent Dictionaries
Hiroto Aoyama, Takashi Nose, Yuya Chiba, Akinori Ito

In order to synthesize more natural speech with Japanese text-tospeech systems, we improve accent sandhi rules. The conventional Japanese accent sandhi rules lack rules related to numerals and counter words in conventional rules. In this paper, we comprehensively improved the accent sandhi rules as well as those related to numerals and counter words, concerning accent rules related to word combinations described in the Japanese accent dictionaries. Then, accent estimation experiments were conducted using the conventional and improved rules to evaluate the accuracy of the estimation by the two types of rules. The effectiveness and problems of the accent sandhi rules themselves and improved rules were discussed by analyzing the experimental results.

MOP1B-1: A New Approximation Algorithm for the d-dimensional Knapsack Problem based on Hopfeld Networks

Hsin-Lung Wu, Jui-Sheng Chang, Jen-Chun Chang

In this paper, we study the d-dimensional knapsack problem (d-KP). The problem d-KP is a generalized version of the well-known knapsack problem (1-KP) which is known to be an NP-complete problem. It is also known that there is no fully polynomial-time approximation scheme for d-KP for d ¿ 1 unless P = N P . In this work, we design an approximation algorithm for d-KP based on the Hopfield networks. Experimental results show that our proposed algorithm outperforms a well-known greedy algorithm in many cases.

MOP1B-2: A Method of Cancellation Interference In CCFD System

Zengyou Sun, Yujie Zhao

Co-frequency Co-time Full Duplex(CCFD) is a key concept brought up in 5G,of which the key technology is self-interference (SI) cancellation. Among all the cancellation technology ,the digital cancellation technology has the advantage of being flexible and efficient, and further improving its performance is an important way to reduce the cost, power consumption and complexity of full-duplex nodes. In this paper, an adaptive filtering scheme based on channel estimation is proposed, and the two important processes of SI channel estimation and adaptive filtering are analyzed. Finally, the performance of the scheme is verfied by MATLAB simulation.

MOP1B-3: Power Optimization Method of Magnetic Coupling Resonant Wireless Energy Transmission System

Jianpo Li, Yang Lu, Songjun Pan, Ziqi Dong, Baochun Mu, Fuxin Liu, Cong Zheng

Magnetic coupled resonant wireless energy transmission technology is a way of wireless energy transmission. In the field of magnetic coupled resonant wireless energy transmission system, the distance between the transmitting coil and the receiving coil is too large and the position is fixed. The system is in the state of under coupling, which causes the system output power to be too small. The case of adding the relay coil between the transmitting coil and the receiving coil is proposed to improve the output power. Considering that the

MOP1B-4: PSO-AFSA Global Maximum Power Point Tracking Algorithm with Adaptive Evolutionary Strategy for PV System

Jianpo Li, Pengwei Dong, Cong Zheng, Fuxin Liu, Songjun Pan, Baochun Mu, Ziqi Dong

The P-U curve of the PV (photovoltaic) system has multi-peak characteristics under non-uniform irradiance conditions (NUIC). The conventional MPPT algorithm can only track the local maximum power points, therefore, PV system fails to work at the global optimum, causing serious energy loss. How to track its global maximum power point is of great significance for the PV system to maintain an efficient output state. PSO-AFSA (Particle Swarm Optimization Artificial Fish Swarm Algorithm) is a global maximum power point tracking (GMPPT) algorithm with strong global search capability, but the convergence speed and accuracy of the algorithm are limited. To solve the mentioned problems, a modified AESPSO-AFSA GMPPT algorithm is proposed in this paper by introducing the evolution strategy into PSO-AFSA algorithm. Simulation results show that under NUIC, compared with the conventional P&O and PSO-AFSA algorithm, the proposed algorithm has well performance on getting out of the local optimal solution and improving the global optimal solution of the individual neighborhood, the convergence speed and convergence accuracy are also increased.

MOP1B-5: The Design of RFID Localization System for Library Books

Jianpo Li, Jun Wang, Fuxin Liu, Songjun Pan, Cong Zheng, Baochun Mu, Ziqi Dong

In order to deal with the difficulty of finding misplaced books caused by disordered borrowing and enhance borrowing convenience, a Low-power Localization System for Wireless Sensor Network (WSNs) based on CC2530 was designed and applied in practice. With the RFID technology, the proposed system succeed in localizing library books and guiding readers to find the their required books with high efficiency, which greatly modifies the process of management for librarians.

MOP1B-6: The Design and Implementation of Automatic Detection and Control Equipment with Unattended Truck Scales

Yun Wu, Xin Hu, XiaoDong Wang

The electronic truck scale is one of indispensable equipment in the daily management of the industrial and mining enterprises, and the traditional truck scale has to access to a large number of peripheral equipment and working under extreme conditions when doing weighing .This paper designed the unattended truck automatic detection and control of the equipment which let staff of truck scale in remote peripherals to an unified management and detection as to timely warn of problems of peripheral equipment. And it's easy to maintain hence improve the management level of enterprises and production efficiency.

MOP2A-1: Melody Completion Based on Convolutional Neural Networks and Generative Adversarial Learning

Kosuke Nakamura, Takashi Nose, Yuya Chiba, and Akinori Ito

In this paper, we deal with melody completion, a technique which smoothly completes melodies that are partially masked. Melody completion can be used to help people compose or arrange pieces of music in several ways, such as editing existing melodies or connecting two other melodies. In recent years, various methods have been proposed for realizing high-quality completion via neural networks. Therefore, in this research, we examine a method of melody completion based on an image completion network. We represent melodies of a certain length as images and train a completion network to complete those images. The completion network consists of convolution layers and is trained in the framework of generative adversarial networks. We also consider chord progression from musical pieces as conditions.

MOP2A-2: Data Collection and Analysis for Automatically Generating Record of Human Behaviors by Environmental Sound Recognition

Takahiro Furuya, Yuya Chiba, Takashi Nose and Akinori Ito

Nowadays, the "life-log," recording our daily activities using a camera, microphone or other sensors and retrieve those recorded data, is becoming more and more realistic. One of the applications that utilize the lifelog data is the automatic generation of activity summary of the user. The present work focuses on using sound data to make the activity summary. There have been several works that classified the recorded sound based on the user's activity. The focus of those studies was how to classify the collected data into a pre-defined set of activity classes. However, there have been no considerations what kind of activity classes were appropriate for this purpose. Moreover, we need a basic investigation for optimizing parameters of sound recognition such as window size for feature calculation. Therefore, we first investigated the optimum parameters for feature extraction, and then analyzed the acoustic similarities of sound features observed by various activities. We exploited twenty-two hours of environmental sound in a test subject's ordinal life as the training and test data. Using the data, we analyzed the acoustic similarities of the activity sound using hierarchical clustering. As a consequence, we observed that target classes could be classified into three groups ("speaking," "silent" and "noisy"). Misrecognitions between those groups were rare, and we observed a large number of misrecognitions within the "speaking" group.

MOP2A-3: DNN-Based Talking Movie Generation with Face Direction Consideration

Toru Ishikawa, Takashi Nose, and Akinori Ito

In this paper, we propose a method to generate a talking head animation considering the direction of the face. The proposed method parametrizes a facial image using the active appearance model (AAM) and models the parameters of the AAM using a feedforward deep neural network. Since the AAM is a two-dimensional face model, conventional methods that use the AAM assumes only the frontal face. Thus, when combining the generated face and other parts such as a head and a body, the direction of the face and the head was often inconsistent. The proposed method models the shape parameters of the AAM using the principal component analysis (PCA) so that the direction and movement of individual facial parts are modeled separately; thus we substitute the face direction of the generated animation with that of the head part so that the direction of the face and the head coincides. We conducted an experiment to demonstrate that the proposed method can generate face animation with proper face direction.

MOP2A-4: An Image Steganography Algorithm Based on Pixel Block Difference and Variable Modulus Function

According to pixels out of bounds and the serious distortion caused by too much pixel value modification in traditional PVD steganography, This paper proposes a steganography algorithm based on pixel block difference and variable modulus function(PVBD).The algorithm uses the modular function of dynamic parameters to optimize the amplitude of the pixel value modification, and at the same time the related parameters of the mode function are dynamically variable, which increases the security of the algorithm on the basis of the diversity of the embedded modes. Experiments show that the algorithm this paper proposed has better performance in the embedded capacity and digital image quality as well as other properties than the existing PVD algorithm.

MOP2A-5: Attack Pattern Mining Algorithm Based on Fuzzy Clustering and Sequence Pattern from Security Log

This paper proposed an attack pattern mining algorithm based on improved fuzzy clustering and sequence pattern mining. The method combines the advantage of fuzzy clustering to describe the similarity between security logs and the advantage of sequence pattern to describe the logical relationship in attacking steps. The experimental results show that the algorithm can effectively mine the attack pattern, improve the accuracy and generate more effective attack pattern.

MOP2A-6: Calculating the truck's box volume with a single image under the circle projection and vanishing points constraint
Wei Sun, Wei Lu, Chun-yu Zhao, Bao-long Guo, Da-jian Li

To concise the truck's box volume measuring system, some techniques such as calculation of camera intrinsic parameters, estimation of truck's position and orientation, and calculation the vertex coordinates on the truck's box are discussed in details. A novel method based on one single image is proposed under the constraint information of orthogonal vanishing points and circle projection priori. Firstly, three orthogonal vanishing points are detected, the intrinsic parameters of the camera are calculated based on the vanishing points. Secondly, the world coordinate system is established at the center of one of the truck's wheels.the truck's position and orientation related to the camera's plane and the external facade equation of truck's box can be figured out with the camera's intrinsic parameters and the prior of wheel's single circular projection. Finally, the vertex coordinates of the truck's box are calculated based on the external facade equation and matrix equation of projection algorithm. Then the volume of truck's box can be calculated. Experimental results show that the error of the truck's box volume is within 5%. The proposed approach is more effective and lower cost than other state of art methods, it is a competitive approach for real-time measurement of truck's box volume.

MOP2B-1: An Interactive Appliances' Intelligent Control Method Based on Time-sharing Electricity Price
Yun Wu, Qiang Wang, Jian Wang

This paper provides an interactive appliances intelligent control method with time-sharing electricity price. In order to reduce home users power expenditure and cut peak expenditure scientifically guide. The paper analyzes intelligent power two-way interaction, the time-sharing electricity response, utility bills, users of electricity usage and comfort. From those four angles to summarize electrical appliances running-control characteristics. According to timesharing price information and the real-time running status information of home appliance electrical home appliances control index calculation, determine the dynamic control of home appliance priority, on the basis of meet user normal life, significantly lower the cost electricity.

MOP2B-2: Modification Algorithm to Node Localization Error for Wireless Sensor Networks
Jianpo Li, Na Li, Cong Zheng, Fuxin Liu, Songjun Pan, Baochun Mu, Ziqi Dong

RSSI-based localization technology is widely concerned for WSN node localization. However, this kind of methods has relatively larger localization error, and its localization rate is low. In order to enhance the localization accuracy, the localization error is declined by considering the construction of signal transmission model as well as the ranging process, and a modified weighted centroid localization algorithm is proposed in this paper. The simulation results show that the proposed approach can effectively reduce the three-dimensional node localization error.

MOP2B-3: A Real-time Missing Data Recovery Method Using Recurrent Neural Network for Multiple Transmissions
Bor-Shing Lin, Yu-Syuan Lin, I-Jung Lee, Bor-Shyh Lin

Data loss and recovery is a critical issue in data transmission. Traditional data recovery methods are impractical for use in real-time systems that require multiple transmissions. To solve this problem, this study proposed a recovery method based on a recurrent neural network, which is then used to build a pre-diction model. When a data gap occurs, the missing data can be recovered immediately using the predicted value. This method distributes the calculation and can immediately recover the data gap. Through a series of experiments, this study optimized different parameters in the neural network, thus optimizing the prediction model.

MOP2B-4: The extraction and application of the Color Texture Feature Based on Quaternion Gabor
Bo Meng, Xiaolin Wang, Xuejun Liu, Linlin Xia, Guannan Deng, Shengxi Jiao

The Gabor is a standard means to extract texture feature of image, besides it was used to image classification and image segmentation far and wide. But, traditional methods that extracting texture feature always ignoring the color information and losing dependency between one channel and others. That makes it difficult to remain the raw information of image. To address above problems, this paper proposed a quaternion Gabor method to extract color texture feature. Firstly, according to the traditional Gabor filter and quaternion Euler's formula, the quaternion Gabor filter was determined. Then, the multi-scale, multi-direction color texture image was obtained by quaternion Gabor convolution algorithm. Finally, the Tamura feature was extracted from the feature image to test the proposed method. Experimental results show that the proposed method can retain coarseness, contrast and directionality to a great extent, the feature image if better than traditional Gabor feature image and LBP feature image in retaining the Tamura texture feature. Besides, the quaternion Gabor can also use in image enhancement. The second experiment shows the application on

MOP2B-5: Analysis and Detection of Android App Privilege Escalation Vulnerability Based on Machine Learning

Xin Jiang, Wen Zhang, Shaozhang Niu, Yiming Xue

Android is currently playing an important role in smartphone operating systems. However, there are potential risks hidden in Android applications. One of them is application vulnerability, which can put users' information in danger. In this paper, we investigate the machine learning techniques in identify one of the most common application vulnerabilities–privilege escalation vulnerability (referred as PE vulnerability). We propose a machine learning system for detecting PE vulnerability. Our method is component-based detection, which means a more granular method. In this way, we can not only identify App with problems, but also locate component with loopholes. We first analyze the principle of PE vulnerability's formation process, and then propose an EMPC model according to key elements in the process. The model is used to select features in the following steps. Second, we apply machine learning techniques to build a classification model to classify samples. Seven classification algorithms are applied. The experiment results show that our method is feasible in detecting PE vulnerability in component-degree.

MOP2B-6: A Watermarking Method for Printed QR Code based on Module Expansion
Cai-Jie Weng, Jeng-Shyang Pan, Shi-Jian Liu, Mei-Jin Wang

With the development of the Internet and smart terminals, Quick Response (QR) code and its related applications become increasingly popular. Though there are plenty of advantages for the usage of QR code, but its security issue is always a problem that can not be overlooked. Aiming for embedding message into QR code, a Module Expansion (ME) based method is proposed in this paper. The core idea of ME is to expand a module to its neighbor if these two modules are in different colors. Experimental results show that (1) our capacity for embedding is about half of that for encoding of the same QR code, which is much higher comparing to the state-of-the-art methods, (2) for the QR codes of versions under 20, the average time cost for embedding and extraction is around 51 ms and 59 ms respectively, (3) the success ratio of message extraction under noise attack and print-and-scan process are both higher than 80%. The proposed method can be used in QR code applications such as the anti-counterfeiting for encoded message of a printed QR code, and others for which message sharing is needed.

TUA1A-1: An Improved High-Capacity ECG Steganography with Smart Offset Coefficients
Ching-Yu Yang and Wen-Fong Wang

In this article, we use the absolute-value-decision policy and effectively promote the SNR performance of the Yang and Wang's scheme [9]. Besides, there is no need of using extra overhead for the intended receiver. Furthermore, the hidden message can be designed on-demand with various size. Experimental results indicated that the average SNR of the proposed method is larger than that of the Yang and Wang's scheme about 3.54 dB. The proposed method is also robust against the attacks such as inversion, translation, truncation, and Gaussian noise-addition attacks. Our method is suitable for real-time applications as well.

TUA1A-2: Preview-versioned Essential Secret Image Sharing
Shang-Kuan Chen and Rei-Heng Cheng

In a (t, s, k, n)-essential secret image sharing ESIS scheme, a secret image is shared into two kinds of shadows including s essential shadows and (ns) nonessential shadows. When receiving at least k shadows containing at least t essential shadows, the secret image can be lossless revealed. In this paper, a previewversioned style essential secret image sharing is proposed. When receiving at least t essential shadows, a previewed version of secret image can be revealed. It is reasonable that at least t essential shadows are entitled to see the rough version of secret image, when the total shadows are less than k.

TUA1A-3: Visual Cryptography with QR-code transparencies
Shang-Kuan Chen and Yen-Wu Ti

In conventional Visual Cryptography, the generated transparency is either meaningless or meaningful. However, even if the generated transparencies are meaningful, they are just with rough look of a meaningful picture. In this paper, the encoded transparencies are also QR-codes that can be decoded by common QR-code scanner that can be obtained in mobile phone. Therefore, people can get more information of this transparencies by scanning the QR-code transparencies. Keywords. Visual Cryptography, QR-code. 1.

TUA1A-4: Solving multiple charging vehicles scheduling problem for wireless rechargeable sensor networks using cuckoo search approach
Rei-Heng Cheng and Shang-Kuan Chen

Wireless rechargeable sensor networks (WRSNs) get the focus of attention recently due to the rapid progress in wireless charging technology. Since the loading of each sensor is different, sensors request for charging in different frequencies. Also, sensors may deplete their energy quickly and need to be charged urgently under some circumstances. Therefore, a good charging route should not only minimize the moving distance of the charging device to save its energy but also charge all the sensors in time to keep the entire network working properly. In this paper, a cuckoo search approach is proposed to solve this complex problem. Based on the K-center concept, all the recharging tasks are divided into groups according to the location of sensors waiting to be charged. Preliminary simulation results show that the pre-grouping strategy can further improve the performance of the proposed cuckoo search approach.

TUA1A-5: A State Codebook Generation Algorithm of Side Match Vector Quantization
Yang Wang and Zhibin Pan

Side match vector quantization (SMVQ) algorithm is an effective low bit rate image compression algorithm which is very useful for data hiding techniques. By replacing the main codebook used in conventional vector quantization (VQ) with a high-quality state codebook (SC) which consists of less codewords, SMVQ algorithm can achieve both much lower bit rate than VQ and acceptable visual quality. However, the generation of the SC is of high complexity that makes the applications of SMVQ limited. To overcome this bottleneck, inequality-based fast search algorithm is used in this paper. Experimental results show that by utilizing the mean feature and the variance feature of a vector, a majority of non-closest codewords in the main codebook can be rejected and the generation of SC can be efficiently speeded up. In addition, the SC generated by using our proposed algorithm is exactly the same as the SC generated by conventional SMVQ.

TUA1B-1: Research on Optimal Combination of Secondary Hybrid Encryption Algorithm Based on K-means Clustering Algorithm
Yun Wu, MengKe Wu, HaoJie Shu

As the cloud has grown rapidly, people have been more concerned about their data security. In order to overcome the problem of difficulty in the algorithm combination selection in the secondary hybrid encryption algorithm of cloud storage, the common six symmetric encryption algorithms and two asymmetric encryption algorithms are combined in this paper, we measure the value of encryption algorithms in three ways: the speed of encryption, the level of security, and the sensitivity to plaintext. Finally, the algorithm combination of 3DES algorithm and RSA algorithm was selected by K-means clustering algorithm, which improved the encryption speed on the basis of guaranteeing security.

TUA1B-2: Construct Left Ventricular Hypertrophy Prediction Model based on Random Forest

Ming-Tai Wu, Meng-Hsiun Tasi, Sheng-Han Xiao, Tsu-Yang Wu

Heart disease ranks second in Taiwan's top ten cause of death in 2016 and the number of deaths in heart disease increases by about 700 people each year. Left ventricular hypertrophy (LVH) has a significant impact on increasing the morbidity of coronary disease and stroke. Therefore, how to improve the accuracy of heart disease diagnosis is urgent. This study suggests a better method that used K-Nearest Neighbor (KNN) to impute missing values of ECG data and Z-score to standardize ECG data for the requirement of the random forest. This study combined the random forest and ECG data to develop an ECG left ventricular hypertrophy classifier. The experimental results show that the accuracy of the prediction model is 66.1%, the sensitivity is 58%, and the specificity is 70.9%.

TUA1B-3: The Bayesian Causal Inference in Multisensory Information Processing: a Narrative Review
Yang Xi, Ning Gao, Mengchao Zhang, Lin Liu, Qi Li

When processing the simultaneous multisensory information, the brain must first infer whether the information comes from the same object, which is a prerequisite for multisensory information processing. The Bayesian causal inference can effectively simulate the inference process in the brain and predict the results. This paper reviews the research of multisensory information processing based on Bayesian causal inference, introduces the Bayesian causal inference theory in multisensory information processing, explains the multisensory information processing based on this theory in detail, analyzed the factors influencing the causal inference and the future research direction, in order to enhance the new understanding of the brain-like model for multisensory information processing, and to provide reference for the research of multisensory information processing in future. Key words: Multisensory integration, Causal inference, Bayesian Causal Inference. 1

TUA1B-4: The Neural Mechanism of Audiovisual Integration Modulated by Attention: a DCM Study
Yang Xi, Mengchao Zhang, Ning Gao, Yue Li, Lin Liu, Qi Li

Attention plays an important role in audiovisual integration. To further explore the neural mechanism of audiovisual integration when the participants attended and unattended the stimulus, we designed a visual and auditory discrimination task that included 'A stimuli', 'V stimuli' and 'AV stimuli' presented on the right or left side of screen randomly. We adopt DCM method to model audiovisual integration in attended and unattended condition to investigate the neural mechanism of audiovisual interaction in these two conditions. The results showed that the audiovisual interaction in attention-condition was stronger than that in inattention-condition, which reflected the influence of attention on multisensory integration.

TUA1B-5: On the security of a three factor remote user authentication scheme using fuzzy extractor
Chien-Ming Chen, Yanyu Huang, Xiaoting Deng, Tsu-Yang Wu

A secure authenticated key exchange protocol is an important key to establish a secure wireless communication. Various research have been conducted to study the efficiency and security of these authenticated key exchange protocol. A recent work by Giri et al. proposed a three factor remote user authentication scheme using Fuzzy Extractor for single server environment However we found that their protocol is still vulnerable against an online password guessing attack. We also found that their protocol does not provide the perfect forward secrecy. To solve such problems, we propose a simple but effective improvement. 1

TUP1A-1: A Novel Tamper Detection and Image Recovery Technique for Color Image Demosaicking
Yu-Chen Hu, Pei-Jung Wu, Chia-Mei Chen, and Yi-Hung Liu

In this paper, we designed an image integrity protection technique for color image demosaicking. In the proposed technique, the authentication codes are generated based on the random values induced by the random number seed. The recovery codes are generated by compressing the demosaicked image using the block truncation coding technique. The authentication codes and the recovery codes are then embedded into the host image to provide the image integrity protection. The experimental results show that the tampered areas of a modified image can be clearly detected. In addition, the tampered areas in the modified image can be roughly recovered if needed.

TUP1A-2: Improving Latency and Reliability for Vehicle System under Fog Computing Networks
Mao-Lun Chiang, Yu-an Lin, Hui-Ching Hsieh and Weng-Chung Tsai

In order to increase the level of convenience, people drive the car instead of walking. This case made the city's traffic flow larger than before, and the probability of traffic accidents increase as the same time. Because of the improving in the number of traffic accidents and the dissatisfaction of road users in the vehicle network. To improve this phenomenon, the Vehicular Ad Hoc Networks (VANET) technology has been proposed. The main concept of VANET is to build an on-board sensor network, and then exchange information among the vehicles for obtaining the traffic information. In the process of information transmission, the storage and processing requirement will increase relatively. Furthermore, the latency for transmitting data between the terminal device and the data center is still an important problem that needs to be improved. In a real situation, the sensing devices under the VANET may be faulty, and these faulty devices may disturb the correctness and consistence of the overall VANET system. In order to reduce the latency and to achieve the correctness and consistency for the vehicular network system, an agreement based method for ensuring the correctness and consistency of the vehicular information system under the fog computing network has been proposed in this paper. Under the proposed three layers architecture of fog computing network, users can get the real-time traffic information of the local area with low latency and get the related information about the remote traffic condition in advanced.

TUP1A-3: Nominate Connected Dominating Set Algorithm in Mobile Ad Hoc Network
Mao-Lun Chiang, Ze-Yu Chen, Hui-Ching Hsieh and Tsui-Ping Chang

The Mobile Ad-hoc NETwork (MANET) is a dynamic network topology, which is mainly achieved by mobile nodes through peer-to-peer communication or packet forwarding. However, an efficient routing algorithm between nodes is necessary to be proposed due to lack of physical backbone. As a result, a popular method which is called Connected Dominating Set (CDS) is proposed to be a virtual backbone of a MANET. The main concept of CDS is to reduce the search space for the route to the mobile node in the set. Subsequently, the CDS can be invoked to as the virtual backbone of MANET to reduce the cost of routing information and enhance the scalability of the network. However, the most algorithms cannot find the minimum CDS in a MANET. Therefore, the concept of nominate is used to our proposed algorithm to construct the minimum CDS in this paper.

TUP1A-4: The Keywords of Affecting Performance for Live Streaming
Long-Sheng Chen and Yi-Ting Pan

Watching other people playing games on live streaming platforms have become more popular. In published literature, most of researches on live streaming focused on predicting the number of viewers in the live streaming period, explaining the high peak of the audience in a game, and finding out popular live streamers, and discussing usage behaviors such as exploring the gift giving. However, from available literature, relatively few works focus on discussing the text chats/comments which can affect other users' watching behaviors. Therefore, this study aims to find important terms that affect viewing of live streaming. We used live game streaming as our study target. Using the comments of the audience in the chat room of the Twitch live streaming platform as experimental samples. Text mining and feature selection methods, including Least Absolute Shrinkage and Selection Operator (LASSO), Support Vector Machine-Recursive Feature (SVM-RFE) and chi-square test (χ^2 test), to find important terms that affect viewing of live streaming.

TUP1A-5: Mobile Coupons Using Blockchain Technology
Sue-Chen Hsueh and Jia-He Zeng

Blockchain is a kind of non-tampered global database which provides digital booklets recording financial transactions and valuables such as birth certificates, asset ownerships, education diplomas, medical procedures, ballots and so on. Among the financial activities, coupons have longtime been used for marketing in business and mobile coupons are replacing paper ones due to the popularity of mobile devices gradually. The strong interactions between people and the use of mobile coupons have together inspired Peer to Peer (P2P) sharing and raised the usage of coupons with peer trusts. Adding bonus feedback mechanisms to mobile coupons may effectively prompt transfers of unused coupons to potential users. The valuable information including contents and feedback bonus in mobile coupons need to be protected against security threats like forgery or tampering. The limitations of storage space, computing power, and transmission bandwidth in mobile devices generally constrain strong protection mechanisms as used in desktop computers. Therefore, in this study, the technique of Hash Chain is combined with the blockchain technology to verify forgery coupons and to enable both storage and transmission of low-computation requirements. Our scheme exemplifies P2P sharing spirit with the nature of highly distribution in blockchain. Verifications are handed by the distributed miners in the P2P environment, which reduces the opportunity of conspiracy among evil-doers. In addition, eavesdroppers have no way to steal valuable information due to the anonymous nature of blockchains so that transmissions are entirely secured in the proposed scheme.

TUP1A-6: Dual Image Reversible Data Hiding Based on Modified LSB Matching Method
Hsien-Wen Tseng, Hui-Xin Lu and Hui-Shih Leng

Lu et al. proposed a dual imaging-based reversible hiding technique using LSB matching in 2015, two pixels as a group and LSB matching method is used to embed the secret message bits into two images. In order to recover the original image, seven rules are applied to modify the cover pixels. However, the method resulted in changes to pixel values increasingly and the stego image quality is affected. Therefore, in order to reduce image distortion, the proposed method uses a modified LSB matching method to embed secret message bits into dual image. The embedding only increases/decreases the cover image pixel values either by one or leaves them unmodified. Additionally the original image can be recovered from dual image. The experimental results show that the proposed method has better image quality than that of Lu et al.'s. The image hiding capacity is also a little higher than that of Lu et al.'s.

TUP1B-1: Security Analysis of a Public Key Authenticated Encryption with Keyword Search Scheme
Tsu-Yang Wu, Chien-Ming Chen, King-Hang Wang, Jimmy Ming-Tai Wu, Jeng-Shyang Pan

In order to solve the security problem that off-line guessing attacks existed in PEKS or dPEKS scheme, Huang and Li introduced a new security model called PAEKS. In this paper, we show that their scheme didn't provide "ciphertext indistinguishability" based on some assumptions.

TUP1B-2: The research about Topic Extraction Method Based on the DTS-ILDA Model
Xiaoli Guo, Li Feng, Yuhan Sun, Ping Guo

Because the existing LDA model is difficult to determine the number of topics and the key point of time,it is difficult to explain the topic result accurately.In this paper,the DTS-ILDA model is proposed,which fused an improved clustering algorithm into the DTM model,and label information is used for supervised learning on each subset.The size of the sliding window varies according to the topic distribution characteristics in this model. Text segmentation can be achieved more reasonable.The number of topics is also variable and easy to understand.The experiment shows that this method can effectively find the time points of important changes in the topic content,and prevent insignificance topics.It can reduce the related interference of the wrong topics and dig out the exact deep relationship at the same time.

TUP1B-3: The Study of Power Server operations Information Visualization Key Technologies
Xiaoli Guo, Ping Guo, Li Feng, Wei Yue

To solve the problems of visualization for power information, such as single manifestations, low-efficient and not visual, a general three-dimensional power server operations information visualization model was presented in this paper. First, the construction method of server related device models was given. Then, the power server operations information visual scene building method was proposed. This included rapid scene organization strategy, and exploration on the storage and re-use mechanism of three-dimensional visualization scene. Moreover, collision detection using swarm intelligence and bionic computing to solve its existing problems. Finally, The feasibility and practicality of the method was verified by a developed intelligent power virtual imulation platform based on JME (JMonkeyEngine).

TUP1B-4: Heart Rate Detection Based on Facial Feature Points Tracking
Chuan-Yu Chang and Hsiang-Chi Liu

In recent years, with the improvement of photographic equipment and computer's computational efficiency, there are many non-contact heartbeat detection technologies based on image had been proposed. However, their performances are suffering from the influences under complex environment such as illumination changes, non-frontal face, and so on. In this paper proposed a non-contact heart rate detection through pulse. It using regression tree to located the feature points of facial, and tracked its trajectory. Then, separate blind source by use FastICA, select the appropriate channel for frequency domain analysis, and calculate heart rate. Experimental results showed that the error of the proposed method is about 4 beats/min.

TUP1B-5: 3D MODELING FOR UPPER OF SHOE BASED ON BILATERAL TRIANGULATION
Hsien-Huang Wu, Ying-Dong Lian, Ya-Yung Huang

With the trend of global industrial 4.0, all traditional manufacturing industries have begun to move toward smart automation; therefore, the laborintensive traditional footwear industry with decades of history has begun to be affected. However, soft property of shoes and the complicated shoe-making process has hindered significant improvement in the automation of the footwear industry. This article introduced the use of three-dimensional scanning by line laser to obtain the shoe body information. This information is used to construct the 2.5D model of each upper of shoe in the process of shoemaking. The system can meet the accuracy and speed requirements of the current shoe industry, and is expected to replace the gluing procedure which requires great manpower demand in the shoemaking process.

TUP1B-6: A New Application of Hyperspectral Techniques in Drug Classification
Shih-Yu Chen, Yen-Chung Chen, and Chou-Tien Lien

Different from the traditional RGB images, the hyperspectral sensors provide near-infrared signal which is gradually being applied in many fields. In the early days, hyperspectral signals were more commonly used for military purposes, but with the increase in optical spectroscopic technology, hyperspectral instruments were gradually applied to the general public, including medical images, food and agriculture. In the medical field, the hyperspectral signal can be used for public identification of unknown drugs, and after the detection of hyperspectral instruments and algorithms, the medication information is provided to the users. The experimental results show that our proposed method is effective to the drug classification using hyperspectral sensors.

TUP2A-1: A Survey of Semi-Fragile Watermarking Authentication
Chin-Feng Lee, Jau-Ji Shen, Fang-Wei Hsu

In order to improve security and detection of tampered area, in the meantime be able to resist common image processing operation such as: JPEG, Gaussian Filter or other compression techniques, semi-fragile watermarking technology are considered to be the solution. This paper investigate four different kinds of semi-fragile watermarking method based upon discrete wavelet transformation (DWT), discrete cosine transformation (DCT) and vector quantization (VQ) in image authentication. Four methods will be analyzed in different aspects, including the characteristic of methods, comparison of image quality and false detection rate.

TUP2A-2: A High Payload Edge Detection-Based Image Steganography Robust to RS-Attack by Using LSB Substitution and Pixel Value Differencing
Chin-Feng Lee, Jau-Ji Shen, Ting-Yi Ou-Yang

Among current information hiding methods, the least significant bits (LSBs) substitution is the most common. By modifying the least significant bit that has no effect on the image, secret information can be hidden in image media and cannot be perceived by the human visual system, making information transmission via the Internet more secure. Not all blocks in the image have the ability to carry secret messages of the same length and high confidence. Also, success can be achieved by hiding more secret information in complex areas of the image. This research proposes a hybrid steganographic method by using LSB substitution and pixel-value differencing (PVD) to increase the embedding capacity for the digital image. Moreover, the proposed method can effectively resist an RS detection attack and effectively improve the security of transmitting secret messages.

TUP2A-3: High-Capacity Reversible Data Hiding Based on Star-Shaped PVO Method
Chin-Feng Lee, Jau-Ji Shen, Yu-Chi Kao

In recent years, many reversible data hiding (RDH) methods have been proposed. Among them, the method of pixel value ordering (PVO) can generate high-fidelity camouflage images with good embedding capacity. The original PVO method used the block-by-block approach to generate prediction error, where only two pixels can be predicted per block. In this paper, we proposed the "star-shaped" PVO method. Furthermore, to achieve the effect of increasing the embedding capacity, we can maximize all the pixel values in the 3×3 block to embed secret data and take advantage of the correlation between adjacent pixels in the natural image. The advantage of this method is that a moderate image quality can be maintained even when multi-layer embedding is performed. Results indicate that the cumulative quantity in smooth images can reach up to 110000 bits and that the embedding capacity of complexity images is also superior to previous PVO series methods. Therefore, any kind of image is suitable for this method.

TUP2A-4: New Anatomy of Consensus in a Multiple Damage Communication VANET
Shu-Ching Wang, Kuo-Qin Yan and Wei-Shu Xiong

Vehicular Ad Hoc Networks (VANET) is a technology that has been recently emerged, and brings a lot of interests. VANET can be used to improve road safety, reduce road traffic, serve interests of its users, and provide emergency services. Therefore, it is important that VANETs are applied with reliable communication. However, the problem of reaching consensus in the distributed system is one of the most important issues in designing a reliable communication network. Reaching consensus on a same value in a distributed system is required; even if certain components in the distributed system fail, the protocol is necessary so that system can still operate correctly. In this study, the consensus problem is revisited with the assumption of transmission medium failure with dormant and malicious faults in the VANET. The proposed protocol allows all fault-free nodes to reach reliable consensus with minimal rounds of message exchanges, and tolerates the maximal number of allowable components in the VANET.

TUP2A-5: Customer Management and Marketing Strategy Development in the Internet of Things

Kuo-Qin Yan, Shu-Ching Wang, Wei-Shu Xiong, Ke-Yin Lu and Yun-Ju Cha

In the complex environment of Internet of Things (IoT), the amount of information available is enormous and the number of users also increases at a blistering pace. With a huge number of users, the marketing strategies in the IoT become extremely important and must be altered accordingly in response to changes in the environment. In this study, a "Three-Phase customer Demand Mining mechanism (3PDM)" is proposed. In the first phase, the customer value of the enterprise is analyzed. In the second phase, the clustering of different customer value is made. In the third phase, the correlation between the bought products and the high-frequent item sets can be found. Finally, the product recommendations for different customer clusters can be provided.

TUP2A-6: Privacy-Preserving Reversible Watermarking for Data Extration Prevention Through Lexicographic Permutations
Ching-Chun Chang and Chang-Tsun Li

Privacy-preserving reversible watermarking, as a subfield of secure signal processing, has received a growing research attention in the recent years due to privacy concerns in cloud computing. In this paper, we propose a novel reversible watermarking scheme for data exfiltration prevention. This scheme enables the cloud to embed labels that indicate the degree of confidentiality into the encrypted documents in such a way that the network administrator can monitor the document exfiltration through detecting the labels in the encrypted domain without compromising data privacy. An efficient watermarking algorithm is devised primarily based upon the concept of lexicographic permutations. In addition to this, a content-adaptive signal estimation mechanism is constructed for assisting host media recovery. Experimental results show that the proposed scheme outperforms the state-of-the-art with regards to watermarking capacity, fidelity, and recoverability.

TUP2B-1: Evaluation of DoS Attacks on Vehicle CAN Bus System
Shi-Huang Chen and Chun-Hung Richard Lin

The controller area network (CAN) has been widely used in the modern automotives for interconnecting electrical components such as air bag system, anti-lock braking system (ABS), electronic dashboard, fuel injection system, and etc. In order to make sure the urgent message, e.g., ABS, could be processed in the shortest time, CAN bus protocol establishes the priority of the message, and allows certain messages can take priority over others. It goes without saying that this design is quite desirable for vehicular applications; however, it also provides vulnerability for Denial-of-Service (DoS) attacks. It is possible for malicious adversaries to cause major damage by exploiting flaws in the CAN protocol design or implementation. Some of these attacks can lead to catastrophic consequences for both the vehicle and the driver. This paper proposed a study on the impact of such priority based DoS attacks. Experimental results shown that a significant impact on the CAN bus efficiency of prioritybased DoS attacks. In addition, a single attacker could block an entire CAN network just using fake CAN message with continuous injection.

TUP2B-2: Deep Learning-based Identification of Steel Products
Li-Wei Kang, You-Ting Chen, Wei-Chen Jhong and Chao-Yung Hsu

To achieve smart manufacturing in Industry 4.0 for steel industry (or Steel 4.0), this paper proposes a smart steel manufacturing framework, where a deep learning-based automatic identification tracking method for steel products is developed. Automatically online tracking and identifying steel products on a production line is essential for smart manufacturing management since those products might be frequently moved and processed everywhere on the product flow. Existing approaches usually rely upon marking or embedding a series of identification codes on the steel surfaces. However, steel-making is usually processed under a very high temperature environment, making it difficult to well embed the identification codes with acceptable quality for further automatically online recognizing them. To tackle this problem, this paper presents a visionbased automatic identification tracking

method without needing to embed any identification codes onto the steel product surfaces. The key idea is to utilize the essential identity of a steel product without extrinsic information embedded, achieved by automatically and deeply learning visual features from the steel image. The presented preliminary results have verified the efficiency of the proposed method.

TUP2B-3: Reinforcement Learning-based Two-Wheel Robot Control
Ching-Lung Chang

In this paper, reinforcement learning (RL) with PID control is used to design the balance and self-control system to verify the feasibility of RL technology in this field. We can use straight line command and turn command via WiFi interface to control the robot. Thus the robot acts according to the received command. The system is divided into three parts: sensing module, learning control module and motor drive module. A Q-Learning algorithm is implemented by learning control module using ARM A8 embedded platform. The sensing module contains an accelerometer (ADXL345) and a gyroscope (L3G4200D) that senses the current tilt angle and angular velocity of robot. Rely on the Qlearning algorithm which based on the input data from sensing module, an optimal response control is derived in motor driving control. The realization results shown that the two-wheel robot can back to balance within 2ms once it goes to unbalance state.

TUP2B-4: A localization approach based on Fixed 3D Objects for Autonomous Robots
Chien-Chou Lin

In this paper, an object-based localization for mobile robot in real-time environments is proposed. The proposed system consists of a mobile platform and LiDAR. The proposed localization algorithm has 4 steps: (1) scanning the point cloud of the environment by the LiDAR mounted on a robot, (2) ground point removal and object segmentation, (3) recognizing objects with Point Feature Histogram (PFH) features, (4) computing the current position and pose by using the geometry relation between the 3D objects. Comparing with SLAMbased systems, the proposed method is more precise and efficient since the map and mapping are not necessary.

TUP2B-5: Clockwise and counter-clockwise torsion in different operational angles on transverse plane
Dengchuan Cai, Jhongpei Wu and Chuan-Yu Chang

Working surface are usually set in the transverse plane. Most of hand tools are used in the working surface. The hand tools design affects the convenience and safety of human use. The wrenches are one of the most frequently used hand tools. To provide reference for the hand tools design, this study surveyed the two torque in five operational angles in transverse plane when use wrenches. Eighty volunteer adults (half male and half female) were recruited as subjects. The maximum torques of dominant hand were measured. Palm facing to ground is defined as 0 degree. Hand in supine positions are defined as positive angle and in prone positions are defined as negative angle. The five angles are: 0, 15, 22.5, 30, and 45 degrees. The two torque are: clockwise and counter clockwise in horizontal plane. A digital torque wrench was used as the measurement apparatus. The results shown that the torque of counter-clockwise is greater than of clockwise in the horizontal plane. The torques forces in positive angles were greater than that in the negative angles. The torque forces of male is greater than that of female. The results of the study can be reference for research and other hand tools design.

TUP2B-6: Micro Physiological Vibration Detection for Human Heartbeats
Wen-Fong Wang, Ying-Peng Huang, Chuan-Yu Chang and Ching-Yu Yang

The purpose of this investigation is to verify the accuracy and stability of a novel detection scheme based on pulsation microvibration signals. Different from traditional heart rate measurement, this scheme has the advantage of convenience in comparison with the pulsations determined by EKG and

PPG. Actually, the heartbeat pulsation measurement based on EKG is usually served as the ground true. However, the pulsation measurement based on PPG was popularly fulfilled on many wearable devices such as rings or watches. To assure the measuring effectiveness of heartbeat pulsations, the scheme is compared to the pulsation measurement based on EKG and PPG. After several experiments and signal processing steps, the statistics of correlation coefficients based on the Pearson correlation coefficient were obtained, and the correlation coefficients among the signals due to EKG, PPG, and micro-vibration are as high as 0.98. Since modern smart phones have the same inertial sensors, which are used in this investigation to detect the micro-vibration signals from heartbeats, it is very promising to realize an APP of smart phones to detect heartbeats more conveniently.

WEA1A-1: Denoising of ECG Signal with Power Line and EMG Interference based on Ensemble Empirical Mode Decomposition
Shing-Hong Liu, Li-Te Hsu, Cheng Hsiung Hsieh, Yung-Fa Huang

In this paper, the mode decomposition (EMD) and ensemble empirical mode decomposition (EEMD) were used are used to perform a noise cancellation process on electrocardiogram (ECG) signal coupling the power line (PLn) and electromyogram (EMG) interference. The ECG signal with noise was decomposed by the EMD or EEMD method. A series of intrinsic mode functions (IMF) were decomposed out. This was followed by the grey noise estimation method, which is used to perform noise estimation on the high-order IMF component. Then, determine whether the signal-to-noise ratio (SNR) of each IMF component was lower than the threshold values defined. These IMF components with lower SNR were removed, following which the ECG signal with the denosing process was obtained through reconstruction process. The performance evaluation on the noise cancellation method proposed was to use the ECG signals in the MIT-BIH cardiac arrhythmia database by adding the PLn and EMG noise to perform the processing. The results indicate that the EEMD method doing the noise cancellation had a better performance than EMD method.

WEA1A-2: Using the Photoplethysmography Technique to Improve the Accuracy of LVET Measurement in the ICG Technique
Shing-Hong Liu, Zheng-Yu Zhu, Shao-Heng Lai. Tai-Shen Huang

The stroke volume is an important cardiac blood flow hydraulic parameter that can be used to assess whether the pump function of the heart is normal. Non-invasive stroke volume measurement is currently performed using impedance cardio plethysmography (ICG). The ICG method is used to detect the amount of changes in the volume of thoracic cavity generated by the heartbeat and to estimate the stroke volume. Left ventricular ejection time (LVET) is an important parameter in stroke volume measurement with ICG technology. However, the ICG signal is susceptible to artificial noise interference, which leads to inaccurate LVET and miscalculation of stroke volume. In order to solve this problem, this paper uses the photoplethysmography (PPG) sensor to measure LVET, and assesses whether the LVET measured by the PPG sensor is more accurate than the LVET measured by the ICG. The results show that using the PPG sensor can indeed improve the accuracy of the LVET measurement, and that the closer the PPG sensor is placed to the heart, the more stable and accurate the measured LVET will be.

WEA1A-3: Network Anomaly Detection Based on Artificial Intelligence
Chia-Mei Chen, Wen-Ling Lo, Gu-Hsin Lai, Yu-Chen Hu

The cyber kill chain consists of the following stages: reconnaissance, weaponization, delivery, exploitation, installation, command and control (C2), actions on objectives. Based on the kill chain framework, identifying botnets is critical for defensing cyber attacks. Bot masters control the botnet through command and control servers; they often adopt the most commonly used communication channel such as through web connection in order to blend in malicious communication messages into massive normal traffic for detection evasion purpose. By analyzing malicious and normal traffic, this study discovered the network anomalous patterns. Botnet connections exhibit some similarity

behaviors which are not possessed by normal traffic. This study develops an anomaly score function to represent the anomalies and proposes a network anomaly detection method based on ant colony optimization algorithm and clustering algorithm. The experimental results show that the proposed anomaly detection method identifies botnets efficiently.

WEA1A-4: Traffic Flow Correlation Analysis of K Intersections Based on Deep Learning
Hung-Chi Chu, Chi-Kun Wang, and Yi-Xiang Liao

An Intelligent transportation system is one of the indispensable systems of smart cities. The most important goal of an intelligent transportation system is to effectively reduce traffic congestion. This paper presents an analysis of traffic congestion based on traffic flows. According to the result of this analysis, the intersection correlation in a specific area can be deduced. This analysis method more effectively than the traditional method finds the relationship between the intersections according to traffic information, so through deep neural network classify intersection congestion levels, the accuracy rate is higher than 96.7%.

WEA1A-5: Detecting Attention and Meditation EEG Utilized Deep Learning
Chung-Yen Liao, Rung-Ching Chen, Qiano-En Liu

Brainwave reflects the change in electrical potential resulting from the conjunction between the thousands of brain neurons. A neuron can receive signals from other neurons and starts off cyclic discharge reaction when sufficient energy is8 accumulated. That is also the reason why people persistently emit brainwaves. According to experts from Laboratory of Brain Recognition and Behavior, Michigan University, long-term multitask operation results in the lack of efficiency and in filtering out irrelevant signals leads to the distraction of paying attention of the irrelevant message rather than work-related information. As a result, one would have problems in the transition from one job to another. However, for some people rely on their brain to deal with many things and it may lead to fatigue. Therefore, we did this experiment and tried to figure out the most efficient way to soothe the spiritual pressure and calm the mind down. We utilize deep learning as learning method to predict users stress feeling through listening to the music. Through above research, by listening to music or create the atmosphere of a music background also with an artistic performance could provide not only psychological treatment effect but also improve the ability of the person to focus.

WEA1B-1: The Properties of Order and Failure Estimation on Redundancy System
Lin Xu, Chao-Fan Xie, Lu-Xiong Xu, Fuquan Zhang

Redundant backup system is a common system in the real world, especially in aviation, electrome-chanics and other fields. Therefore, it is meaningful to give the parameter estimation of redundant systems. Previous research has given some results about the order and failure rate of the redundancy distributed redundant backup system, thus providing consumers with a computed and measurable product reliability calculation method. By using the irreplaceable censored life test, Providing a statistical significance of the estimation formula. However, the properties of estimation are not given and how to improve it. The study gives the estimation properties in probabilistic sense, which is asymptotic convergence in probability. Continue to improve the estimator on variance, so as to achieve asymptotic minimum consistent variance estimation. This ensures that the given estimation formula is available in practice.

WEA1B-2: Hepatic Texture Synthesis Method Based on the Accelerated CUDA
Lin Xu, Chao-Fan Xie, Lu-Xiong Xu, Na Wang

In the research of virtual hepatic surgery, the synthesis of hepatic texture space and the texture mapping of the hepatic body model are inseparable. Different methods for hepatic volume texture on the authenticity and mapping speed tend to have much difference. Based on computer unified device architecture (CUDA), this paper tries to present a texture synthesis and mapping method for the accelerating of hepatic body, which is used to solve the problem that traditional method under the hepatic volumetric texture synthesis and mapping process cost too much time. This new method may eliminate the traditional serial correlation of texture synthesis. What's more, it may improve the efficiency of texture synthesis when the multithreading parallel processing for synthesis in the hepatic volumetric texture space in selecting and distributing blocks based on CUDA architecture.

WEA1B-3: A P2P Multimedia Service System based on Mesh Chords
Zhiming Cai, Xuehong Huang

In recent years, real-time multimedia applications have attracted increased popularity. However, network congestion and unexpected intermittent interruption in live video broadcastings often reduces the users' perceived quality of service. In this paper, we propose a P2P architecture of multimedia service. Identical hash mapping is applied to deploy and search multimedia contents. Likewise, we present a topology Mesh-Chords, which based on Chord, to organize the P2P nodes. A routing algorithm is introduced for Mesh-Chords. We compare it with Chord of same scale. Experimental results show that MeshChords has greater ability to resist network churn.

WEA1B-4: Resolution Reduction for Two-Phase Test Sample Representation in Face Recognition
Ning Wu, Jinzhan Wei

The Two-Phase Test Sample Representation (TPTSR) scheme is a two-step method to improve the recognition accuracy of sparse representation. However, the computation load for the two-phase processing is then doubled, slowing down the face recognition task. This paper shows that the first phase nearest neighbor selection in the TPTSR can be achieved in a more efficient way without sacrificing the recognition performance. The experimental results show that by reducing the resolution of the training and testing face images in the first phase selection of the TPTSR, the computation efficiency can be increased significantly while keeping a comparable classification rate with the original TPTSR.

WEA1B-5: Path Finding for Road Accessibility in Maze using BLOB Extraction
Jinzhan Wei, Ning Wu

Road accessibility analysis in complex traffic environment usually adopts step-by-step analysis method, which is inefficient and difficult to analyze the feasibility of highly complex road environment. Based on this problem, a mace solving approach based on BLOB extraction is proposed in this paper and applied to road surface and point line space analysis. The application of BLOB extraction method for solving mace realizes fast and rigorous road accessibility analysis by avoiding the extraction of the road centerline by finding the boundary line of the road surface between the connectivity of maze walls. The maze solving method proposed in this study for road accessibility includes image processing with BLOB extraction and path finding. The advantage of this method is that the whole maze is captured and the path is found without going through the maze cell-by cell.

WEA2A-1: Improving the Implementation of Sensor Nodes for Illegal Logging Detection
Jen-Ting Chen, Chuan-Bi Lin, Jiun-Jian Liaw, Yu-Yan Chen

The characteristics of sound and vibration are used to detecting the illegal logging of woods for those proposed approaches. In this paper, an improved design of vibration and sound sensing nodes is proposed to make the nodes operated more effectively. We establish an actual sawmill experiment to simulate the situation of sawing woods. The sleep vibration sensing section is waked up by the vibration, and the data of sound and vibration is transmitted by wireless networks. In addition to the magnitude of the vibration, we use the simple subtraction of two data to obtain the differential signal strength (DSM) as a feature of the vibration. The experiments show that the improved deign has sufficient identification performance and can detect the logging behavior effectively.

WEA2A-2: A Study on CNC Machine Training Based on Virtual Reality Technology
Tzu-Chuen Lu, Rong-Chang Chen, Guang-En Hsuen

Computer Numerical Control (CNC) is the automation of machine tools that executes computers pre-programmed sequences of machine control commands. CNC course usually taught in senior high school or vocational school. There are many precautions when learning CNC machines. CNC operation is very danger, any slight wrong many cause injury or damage the machine. This study develops a system that combines virtual reality (VR) and CNC machines (called CNC VR system) that allows students to practice well without fear of failure. The system transfers the scores of the exercises to the web platform for the teacher to grasp which part of the student is not familiar with and strengthen guidance. This study also developed a 360-degree film by using Cardboard system to show the demo video which recorded by the teacher. In order to prove the effectiveness of the system, the study applies the technology acceptance model (TAM) to test acceptances of the proposed scheme. The experimental results show that the proposed CNC VR system has a positive relationship with the students' learning attitude.

WEA2A-3: Forecasting for the Total Electricity Consumption of Taiwan by Fuzzy Time Series
Jing-Rong Chang, Zhong-Qi Liu, Pei-Yu Yu

Prediction at present no matter in what industry is applicable. It is not only the price, enrollment, etc., and even energy is applicable. In today's era of so advanced technology, "electricity" is a very important energy source for the public. However, sometimes the generator is powered off due to excessive power consumption of the people, such as: the power outage in Taiwan in August 2017.In this paper, fuzzy time series will be used to explore the total electricity consumption in Taiwan in recent years. And we can also use the results to understand the people's electricity consumption, and even adjust the power supply when necessary. Among them, in the experimental part, the method of NQDA discrete will be used for data pre-processing, and then the corresponding fuzzy rules will be established. Finally, the fuzzy values will be de-fuzzified and the predicted values will be output. The strength of the method was verified by the total electricity consumption in Taiwan from 1996 to 2017.

WEA2A-4: Performance Analysis of Grouping Strategy in Relay-based Cooperative Networks
Jheng-Siam Li and Jyh-Horng WEN

Grouping method is an efficient transmitting mechanism in a relaybased cooperative networks. The grouping strategy in this paper focus on finding out the best two quality of links from user to neighboring relays, and the user accesses the same channels within the best and second best relays. In this paper, we proposed an analysis model using Markov process to evaluate the system performance, grouping success rate. Through comparing the results between the numerical and simulation results, our proposed analysis model and method can provide an efficient way to evaluate the performance under the grouping strategy in relay-based networks.

WEA2A-5: The Development of Display Interface for Automatic Identification System and Digital Selective Calling System
Chien Erh Weng, Zhu-Yun Zheng, Lie Yang

Due to Digital Selective Calling (DSC) under Global Marine Distress and Safety System (GMDSS), the existing software and equipment need to rely on foreign manufacturers. The maintenance cost is high, and the existing display interface of the software can only indicate the information of the vessels in distress by text message. In order to improve above-mentioned shortcoming. The Automatic Identification System (AIS) and DSC real-time information integration system was constructed. Through the customized system, the operators in the coast station can understand the vessels in distress and the relevant surrounding information of the vessels at the first time and thus shorten the emergency response time.

WEA2B-1: Intelligent Infant Monitoring System Involving a Wi-Fi Wireless Sensor Network
Chi-Chang Lu, Chung-Hsien Wu, Hui-Kai Su

Intelligent monitoring is the future of mainstream automation and networking technology. This study presents an infant care system involving a variety of sensors that detect the status of an infant's cradle, transmitting the data to a home server over Wi-Fi through a wireless transmission module and establishing a database. Users can interact with the system from a home based remote server, which stores the statuses and information on all monitored appliances. This enables them to remotely monitor and control the smart cradle, even from mobile devices such as smartphones or tablets. Thus, this intelligent infant monitoring system affords users both functionality and convenience.

WEA2B-2: Long Lifetime Data Aggregation Using Geographic Division in Wireless Sensor Networks
Chia-Hsin Cheng, Hui-Kai Su, Yi-Shiang Chen, Tao-Ping Wang, Feng-Cheng Wu and Yu-An Chen

This paper discusses the construction of a data aggregation routing method in wireless sensor networks (WSNs). It is important to design a routing protocol that efficiently collects data and extends network lifetime in WSNs. We use the concept of a local sink to solve routing problems according to the geographic division. The network environment is divided into several regions. We use the center method to find the local sink that collects data in that region and explore the best situation in various situations. The experiment results show that the proposed scheme can collect data efficiently and the lifetime of the sensor networks can be prolonged.

WEA2B-3: Distortion function for Steganography in Texture Synthesized Images
Lina Shi, Zichi Wang, Zhenxing Qian and Xinpeng Zhang

This paper proposes a distortion function for steganography in texture synthesized images. Given a small piece of texture, an image synthesis algorithm is employed to generate a texture image in arbitrary size with similar local appearance. The obtained texture image is used as cover for data embedding. A distortion function is designed for the cover image to measure the detection risk of modifications. The image texture, splicing of patches, and repetition of texture blocks are contained in the proposed distortion function to fit the properties of synthesized images, which results in high undetectability against steganalysis. Experimental results also prove that the proposed distortion function performs better than current state-of-the-art steganographic methods.

WEA2B-4: A Design Exploration of Wearable Companion of Smartphone
Wen Qi

Wearable devices are increasingly gaining more attentions in healthcare and fitness industry due to their potentials to measure valuable physiological signals on the move. There are many researchers who have proposed different types of designs that embed biosensors into miniature wearable devices. In this paper, we present a wearable companion that monitors the cardiac activities of a wearer with Smartphone. The device makes of use a single, integrated biosensor that is designed with a unique analog front-end circuitry and a dedicated signal processing pipeline. In order to meet the requirements of possible but different user scenarios, three types of product forms are presented. The experimental results show that electrocardiogram (ECG) signals collected are valid and consistent. Future topics include adding extra algorithms to removal motion artifacts in order to achieve better signal quality in various settings and include wireless communication through 4G.

WEA2B-5: Research and implementation of fuzzy control method of UAV formation with ad hoc network
Zhen-hao Zhang, Wei Sun, Wei Lu, Lei Bian

In order to solve the communication problems between clusters as well as achieve the goal of the high-precision flying of UAV clusters, a UAV formation realization using ad hoc network and fuzzy control technology was proposed. Firstly, Zigbee communication technology is used to set up an ad hoc network communication system that can achieve automatic networking, automatic routing, and dynamic maintenance. The custom data encoding format and specific complete encoding and decoding process are used to ensure the efficiency of ad hoc communication networks and the reliability of information transmission. By processing the GPS information of the cluster, the relative position information of the UAV in the cluster is solved. Then, the mathematical model of the formation of "leader-wingman" pattern was built. The formation navigation algorithm was designed to convert the relative position information of UAVs into three-dimensional position information under the mathematical model. Finally, the fuzzy PID controller is used to obtain three-dimensional position information in order to calculate the control volume on the three-dimensional coordinates of the rigid body of the machine body for achieving the high-precision fleet control variable of the formation of the UAV cluster.

WEA2B-6: Design and Implementation of a Host-based Intrusion Detection System for Linux-based Web Server
Cheng-Chung Kuo, Shu-Han Yao, Chia-Ling Hou and Chu-Sing Yang

In the era of blossoming computer sciences and internet technology, people cannot abolish network in our lives. However, the large number of users, website services will make itself became the most favorite targets for hackers. Although these malicious behaviors can be detected by network intrusion detection system, it is difficult to generate accuracy result owing to the shortage of data. This paper proposed a solution using host intrusion detection system that focus on the host log detection of webserver. Besides using port monitoring to monitor network environment, this paper also collected signatures of web attack and malicious activities by using signature-based approach. Furthermore, this research will find out the source of the malicious files with file monitoring function, and take appropriate action to protect web services. By using the proposed mechanism of host-based intrusion detection methods, it can provide a high accuracy to bring safety for managers and users.