

FRONT PAGE

Singapore | June 15-18, 2018

CONFERENCE ABSTRACTS

**2018 International Conference on Control and Computer Vision
(ICCCV2018)**

**2018 International Conference on Virtual Reality Technology
(ICVRT 2018)**

Singapore | June 15-18, 2018

Published by



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WELCOME

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Dear professors and distinguished delegates,

Welcome to 2018 International Conference on Control and Computer Vision (ICCCV 2018) and 2018 International Conference on Virtual Reality Technology (ICVRT 2018) in Singapore.

We wish to express our sincere appreciation to all the Conference Chairs, Program Chairs, and Technical Committees as well as all the authors for contributing their latest research to the conference. This conference program is highlighted by the four keynote speakers: Prof. Yulin Wang from Wuhan University, China, Prof. Xudong Jiang from Nanyang Technological University, Singapore, Prof. Jimmy Liu from Chinese Academy of Science, China; Singapore National Eye Research Institute, Singapore, and Prof. Chi-Man Pun from University of Macau, China.

Oral presentations are divided into three parallel sessions. One best presentation will be selected from each parallel session, evaluated from: Originality, Applicability, Technical Merit, Visual Aids, and English Delivery. Wishing you all the very best of luck with your presentations!

We believe that by this excellent conference, you can get more opportunity for further communication with researchers and practitioners with the common interest in control, computer vision and virtual reality technology fields.

We wish you a pleasant and memorable experience at this conference as well as in this city.

Yours sincerely,

Conference Organizing Committee
Singapore



NOTES & TIPS

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Notes:

- ✧ You are welcome to register at any working time during the conference.
- ✧ Please kindly keep your Paper ID in mind so that the staff can quickly locate your registration information onsite.
- ✧ Certificate of Listener can be collected in front of the registration counter. Certificate of Presentation will be awarded after your presentation by the session chair.
- ✧ One *Best Presentation* will be selected from each parallel session and the author of best presentation will be announced and awarded when the session is over.
- ✧ Your punctual arrival and active involvement in each session will be highly appreciated.
- ✧ Please kindly make your own arrangements for accommodations.
- ✧ Please keep all your belongings (laptop and hand phone etc.) with you in the public places, buses, metro.

Warm Tips for Oral Presentation:

- ✧ Get your presentation PPT or PDF files prepared.
- ✧ Regular oral presentation: 15 minutes (including Q&A).
- ✧ Laptop, projector & screen, laser sticks will be provided by the conference organizer.

VENUE

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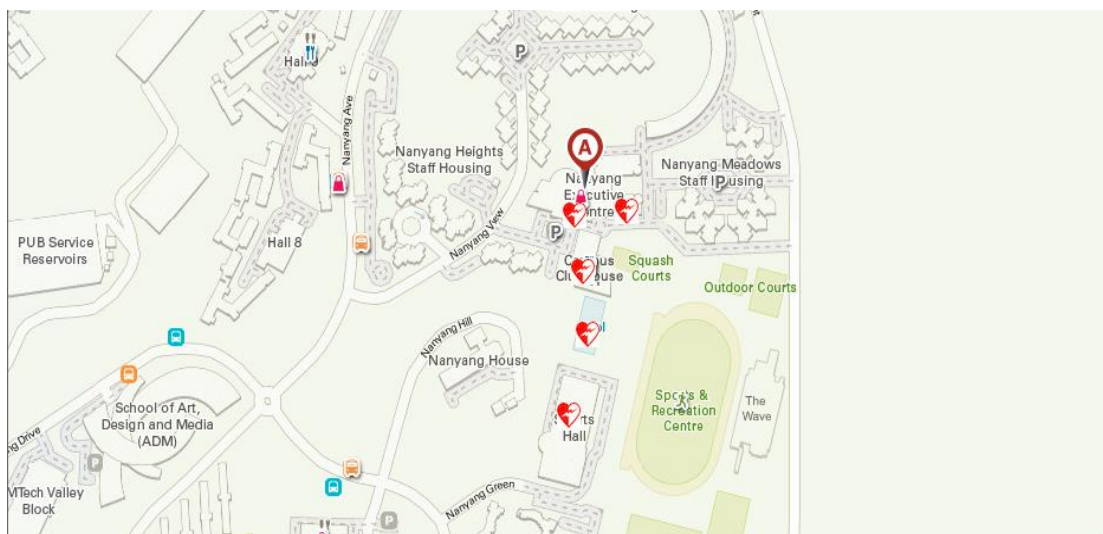
Nanyang Executive Centre in NTU

Add: 60 Nanyang View, Singapore 639673

<http://www.ntu.edu.sg/nec/Pages/default.aspx>

Location:

Nanyang Executive Centre is located at the Yunnan Garden Campus of Nanyang Technological University, offering a premier venue for corporate trainings, retreats and private events. The 170 guestrooms and suites have been designed to meet the needs of both training executives and business travelers. All the guestrooms are equipped with a work area and other modern amenities to ensure they provide guests with a pleasant stay. Complimentary Wi-Fi is available to all guests in their rooms, lobby and function spaces.



AGENDA

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<June 15, 2018, Friday>

 The Lobby	
10:00-17:00	Onsite Registration & Conference Materials Collection

<June 16, 2018, Saturday> Morning

 Lecture Room 6		
09:00-09:10	Opening Remarks	Prof. Xudong Jiang Nanyang Technological University, Singapore
09:10-09:50	Keynote Speech I	Prof. Yulin Wang Wuhan University, China
		<i>Speech Title: Image Authentication and Tamper Localization based on Semi-Fragile Hash Value</i>
09:50-10:20	Coffee Break & Group Photo	
10:20-11:00	Keynote Speech II	Prof. Xudong Jiang Nanyang Technological University, Singapore
		<i>Speech Title: Feature Extraction and Dimensionality Reduction for Visual Recognition</i>
11:00-11:40	Keynote Speech III	Prof. Jimmy Liu Chinese Academy of Science, China; Singapore National Eye Research Institute, Singapore
		<i>Speech Title: Artificial Intelligence and Ocular Medical Image Processing</i>
11:40- 12:20	Plenary Speech	Prof. Chi-Man Pun University of Macau, China
		<i>Speech Title: Reversible Watermarking Using Prediction Value Computation with Gradient analysis</i>





AGENDA

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Lunch @Restaurant <12:20-13:30>

<June 16, 2018, Saturday> Afternoon

13:30-15:45	Session I- Target detection and pattern recognition 9 Presentations	 Lecture Room 6
	SG006, SG017, SG018, SG032, SG035, SG022, SG041, SG044, SG037	
	Session II- Image analysis and processing 8 presentations	 Breakout Room 11
	SG1004-a, SG009, SG020, SG051, SG1002, SG1005, SG045, SG007	
 Coffee Break <15:45---16:00>		
16:00-18:00	Session III- Computer Theory and Application Technology 8 presentations	 Lecture Room 6
	SG012-a, SG014, SG034, SG039, SG046-a, VT010, SG038, VT011	



Dinner @Restaurant <18:00-20:00>

<June 17, 2018, Sunday>

Campus Visit * Participants need to sign up in advance.	
9:30-12:00	NTU (Nanyang Technological University) Art, Design and Media School Building, Chinese Heritage Centre, Yunnan Garden, etc.

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<June 18, 2018, Monday>

Social Event

* Participants need to sign up in advance.

Merlion Park → Gardens by the Bay → St. Andrew's Cathedral → Little India → Chinatown



Gather point: NTU (Nanyang Technological University)

Time: 08:50am



Merlion Park, is a Singapore landmark and major tourist attraction, located at One Fullerton, Singapore, near the Central Business District (CBD). The Merlion is a mythical creature with a lion's head and the body of a fish that is widely used as a mascot and national personification of Singapore. Two Merlion statues



Gardens by the Bay is a nature park spanning 101 hectares (250 acres) of reclaimed land[2] in central Singapore, adjacent to the Marina Reservoir. The park consists of three waterfront gardens: Bay South Garden, Bay East Garden and Bay Central Garden. The largest of the gardens is Bay South Garden at 54 hectares (130 acres).



Little India (Tamil: லிட்டிண்டியா) is an ethnic district in Singapore. It is located east of the Singapore River—across from Chinatown, located west of the river—and north of Kampong Glam. Both areas are part of the urban planning area of Rochor. Little India is commonly known as Tekka in the Indian Singaporean community.

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Prof. Yulin Wang
Wuhan University, China

Prof. Yulin Wang is a full professor and PhD supervisor in International School of Software, Wuhan University, China. He got PhD degree in 2005 in Queen Mary, University of London, UK. Before that, he has worked in high-tech industry for more than ten years. He has involved many key projects, and hold 8 patents. He got his master and bachelor degree in 1990 and 1987 respectively from Xi-Dian University, and Huazhong University of Science and Technology (HUST), both in China. His research interests include digital rights management, digital watermarking, multimedia and network security, and signal processing. In recently 10 years, Prof. Wang has published as first author 3 books, 40 conference papers and 45 journal papers, including in IEEE Transactions and IEE proceedings and Elsevier Journals. Prof. Wang served as editor-in-chief for International Journal of Advances in Multimedia in 2010. He served as reviewer for many journals, including IEEE Transactions on Image Processing, IEEE Signal Processing Letters, Elsevier Journal of Information Sciences. He served as reviewer for many research funds, including National High Technology Research and Development Program of China ('863' project). Prof. Wang was the external PhD adviser of Dublin City University, Ireland during 2008-2010. He was the keynote speakers in many international conferences. He has been listed in Marcus 'who's who in the world' since 2008.

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Prof. Xudong Jiang
Nanyang Technological University, Singapore

Prof. Xudong Jiang received the B.Sc. and M.Sc. degree from the University of Electronic Science and Technology of China, in 1983 and 1986, respectively, and received the Ph.D. degree from Helmut Schmidt University Hamburg, Germany in 1997, all in electrical and electronic engineering. From 1986 to 1993, he worked as Lecturer at the University of Electronic Science and Technology of China where he received two Science and Technology Awards from the Ministry for Electronic Industry of China. He was a recipient of the German Konrad-Adenauer Foundation young scientist scholarship. From 1993 to 1997, he was with Helmut Schmidt University Hamburg, Germany as scientific assistant. From 1998 to 2004, He worked with the Institute for Infocomm Research, A*Star, Singapore, as Senior Research Fellow, Lead Scientist and appointed as the Head of Biometrics Laboratory where he developed a fingerprint verification algorithm that achieved the fastest and the second most accurate fingerprint verification in the International Fingerprint Verification Competition (FVC2000). He joined Nanyang Technological University, Singapore as a faculty member in 2004 and served as the Director of the Centre for Information Security from 2005 to 2011. Currently, Dr Jiang is a tenured Associate Professor in School of Electrical and Electronic Engineering, Nanyang Technological University. Dr Jiang has published over hundred research papers in international refereed journals and conferences, some of which are well cited on Web of Science. He is also an inventor of 7 patents (3 US patents), some of which were commercialized. Dr Jiang is a senior member of IEEE and has been serving as Editorial Board Member, Guest Editor and Reviewer of multiple international journals, and serving as Program Committee Chair, Keynote Speaker and Session Chair of multiple international conferences. His research interest includes pattern recognition, computer vision, machine learning, image analysis, signal/image processing, machine learning and biometrics.

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Prof. Jimmy Liu

**Chinese Academy of Science, China; Singapore National Eye Research Institute,
Singapore**

Prof. Jimmy Liu Jiang joined Chinese Academy of Sciences in March 2016 through the China “Thousand Talent Program”, and became the founding executive director of Cixi Institute of Biomedical Engineering of Ningbo Institute of Industrial Technology, Chinese Academic of Science. He graduated from the University of Science and Technology of China with a computer engineering bachelor degree, and obtained his Master and Ph.D degrees from the National University of Singapore majoring in Computer Science. Jimmy is currently holding the position of an Honorary Professor in Dundee University and is an adjunct principle research scientist in the Singapore National Eye Research Institute. Jimmy has served many years in IEEE EMBS (Engineering in Medicine and Biology Society) society, and was the 2014 chairman of the IEEE EMBS society of Singapore.

Jimmy has spent 27 years in Singapore before 2016. Jimmy established the Intelligent Medical Imaging Program (iMED), which was once the largest ocular imaging research team in the world, in A*STAR (Agency for Science, Technology and Research) Singapore. Ever since joining the Chinese Academy of Sciences. In June 2016, he established an international joint lab “Sino-US Eye-Brain joint research lab” with North Carolina University United States to conduct eye and brain diseases diagnosis research; in Feb 2017, he signed a MOU with Singapore Eye Research Institute to jointly conduct ocular imaging research, and in April 2017, he signed an agreement with Singapore National Health Group in Ningbo to jointly conduct medical technology research as well as explore translational and clinical research in China and Singapore. In May 2017, Jimmy established a new joint laboratory with world leading ophthalmological equipment manufacture TOPCON Inc. in China focusing on new areas such as advanced ocular medical equipment manufacturing and Artificial Intelligence based Chinese “big” medical image and data research. In Feb 2018, he further set up a new joint laboratory with another world leading ophthalmological equipment manufacture Tomey Inc. focusing on OCT image processing and Cataract Automatic Diagnosis Research.

PLENARY

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Prof. Chi-Man Pun
University of Macau, China

Prof. Pun received his B.Sc. and M.Sc. degrees in Software Engineering from the University of Macau in 1995 and 1998 respectively, and Ph.D. degree in Computer Science and Engineering from the Chinese University of Hong Kong in 2002. He is currently an Associate Professor and Head of the Department of Computer and Information Science of the University of Macau. He has investigated many funded research projects and published more than 100 refereed scientific papers in international journals, books and conference proceedings. He has also served as the editorial member / referee for many international journals such as IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Image Processing, IEEE Transactions on Information Forensics and Security, Pattern Recognition, etc. His research interests include Digital Image Processing; Multimedia Security and Digital Watermarking; Pattern Recognition and Computer Vision. He is also a senior member of the IEEE and a professional member of the ACM.

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Opening & Speeches June 16, 2018, Saturday Time: 09:00-12:20 📍 Lecture Room 6	
09:00-09:10	Opening Remarks Prof. Xudong Jiang Nanyang Technological University, Singapore
09:10-09:50	<p style="text-align: center;"><i>Image Authentication and Tamper Localization based on Semi-Fragile Hash Value</i></p> <p style="text-align: center;">Prof. Yulin Wang Wuhan University, China</p> <p>Abstract- Image authentication can be used in many fields, including e-government, e-commerce, national security, news pictures, court evidence, medical image, engineering design, and so on. Since some content-preserving manipulations, such as JPEG compression, contrast enhancement, and brightness adjustment, are often acceptable—or even desired—in practical application, an authentication method needs to be able to distinguish them from malicious tampering, such as removal, addition, and modification of objects. Therefore, the traditional hash-based authentication is not suitable for the application. As for the semi-fragile watermarking technique, it meets the requirements of the above application at the expense of severely damaging image fidelity. In this talk, we propose a hybrid authentication technique based on what we call fragile hash value. The technique can blindly detect and localize malicious tampering, while maintaining reasonable tolerance to conventional content-preserving manipulations. The hash value is derived from the relative difference between each pair of the selected DCT AC coefficient in a central block and its counterpart which is estimated by the DC values of the center block and its adjacent blocks. In order to maintain the relative difference relationship when the image undergoes legitimate processing, we make a pre-compensation for the AC coefficients. Experimental results show that our technique is superior to semi-fragile techniques, especially in image fidelity, tolerance range of legitimate processing, and/or the ability to detect and localize the tampered area. Due to its low computational cost, our algorithm can be used in real-time image or video frame authentication. In addition, this kind of proposed techniques can be extended to use other characteristic data, such as high-level moment, statistical data of image, and so on.</p>
 Coffee break & group photo 09:50--10:20	
10:20-11:00	<p style="text-align: center;"><i>Feature Extraction and Dimensionality Reduction for Visual Recognition</i></p> <p style="text-align: center;">Prof. Xudong Jiang Nanyang Technological University, Singapore</p>

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	<p>Abstract- Finding/extracting low-dimensional structures in high-dimensional data is of increasing importance, where images/signals lie in observational spaces of thousands, millions or billions of dimensions. The curse of dimensionality is in full play here: We have to conduct inference with a limited or no human knowledge. Machine learning is a solution that becomes hotter and hotter to boiling. This is evidenced by numerous techniques published in the past decade, many of which are in prestige journals. Nevertheless, there are some fundamental concepts and issues still unclear or in paradox. For example, we often need many processing steps in a complex information discovery/recognition system. As the information amount cannot be increased and must be reduced by any processing, why do we need it before the main processing? This seemingly simple question easily answerable if each step uses different prior knowledge is nontrivial in machine learning. People proposed numerous machine learning approaches but seem either unaware of or avoiding this fundamental issue. Although extracting the most discriminative information is indisputably the ultimate objective for pattern recognition, this talk will challenge it as a proper or effective criterion for the machine learning-based dimension reduction or information/feature extraction, despite the fact that it has been employed by almost all researchers.</p>
11:00-11:40	<p style="text-align: center;"><i>Artificial Intelligence and Ocular Medical Image Processing</i></p> <p style="text-align: center;">Prof. Jimmy Liu Chinese Academy of Science, China; Singapore National Eye Research Institute, Singapore</p> <p>Abstract- In the talk, Jimmy will update the ocular imaging research work in the past years. He will share his AI-based image processing work on various ocular imaging modalities on the following 4 areas: ocular disease screening, robot assisted eye micro-surgery, ocular biometrics, as well as ocular medical informatics using genome study. He will introduce the current issues, technologies and approaches in this inter-disciplinary research area.</p>
11:40-12:20	<p style="text-align: center;"><i>Reversible Watermarking Using Prediction Value Computation with Gradient analysis</i></p> <p style="text-align: center;">Prof. Chi-Man Pun University of Macau, China</p> <p>Abstract- This paper proposes a reversible watermarking method that embeds binary bits into a digital image. The embedded information could be inserted into the host image without much image quality degradation and both of the watermark as well as the original image could be restored at the decoding end. By using the gradient analysis method, the prediction value computation process could be more accurate which reduces the prediction error correspondingly. The watermark embedding procedure is implemented based on the difference expansion of image pixels in each stage of two-step embedding process. The gradient analysis is introduced to detect whether a horizontal or vertical edge exists in the pixel context which would improve the accuracy of the prediction value. The two-step embedding process also aims at accurate</p>

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	<p>prediction value computation. Since the prediction error is the key factor in the embedding process, the lower of the prediction error, the better the watermarked image quality. Several standard grayscale images are tested to show the performances of the proposed reversible watermarking method. Both of the watermarked images and image quality related line charts are exhibited in this paper to show the property of the proposed method that reflects decent image quality in different embedding payload situations. Experimental results illustrate a higher percentage of zeros in the prediction error distribution histogram. Compared with other state-of-the-art reversible watermarking methods, better image quality can be realized by proposed method.</p>
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Lunch Time <12:20-13:30> Location: Cosmo

Note: lunch coupon is needed for entering the restaurant.

Session I- Target detection and pattern recognition	
Time: 13:30-15:45	
📍 Lecture Room 6	
Chair: Dr. Manoj Ramanathan, Nanyang Technological University, Singapore	
SG006 13:30-13:45	<p>Hand Shape Recognition Using Very Deep Convolutional Neural Networks</p> <p>Alexander Rakowski, Lukasz Wandzik</p> <p>Fraunhofer IPK, Germany</p> <p>Abstract—This work examines the application of modern deep convolutional neural network architectures for classification tasks in the sign language domain. Transfer learning is performed by pre-training the models on the ImageNet dataset. After fine-tuning on the ASL fingerspelling and the 1 Million Hands datasets the models outperform state-of-the-art approaches on both hand shape classification tasks. Introspection of the trained models using Saliency Maps is also performed to analyze how the networks make their decisions. Finally, their robustness is investigated by occluding selected image regions.</p>
SG017 13:45-14:00	<p>Pest detection on Traps using Deep Convolutional Neural Networks</p> <p>Nguyen Tuan Nam, Phan Duy Hung</p> <p>FPT University, Vietnam</p> <p>Abstract—It is commonly known that toxic pests have a negative influence on the production process and ultimately on the product quality of many industries. Therefore, it is reasonable to consider pest detection a crucial task in these production procedures in order to make relevant pest management decisions. However, the challenge here is that localization and classification of different insect species are fairly difficult due to high similarity in features between them, and it is even more</p>

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	<p>challenging when particularly dealing with those already caught on traps. Inspired by the achievement of the Deep Convolutional Neural Network (CNN), this paper proposes a method of identifying various types of trapped insect species by making prediction based on available images. Using a database of 200 pictures (from a confectionery factory) including approximately 3,000 insects of 6 kinds, the accuracy rates of detection and classification are about 84% and 86% respectively.</p>
<p>SG018 14:00-14:15</p>	<p style="text-align: center;">Palmprint template protection scheme with matrix transformation Hengjian Li, Jian Qiu, and Caifeng Wang University of Jinan, China</p> <p>Abstract—In this paper, we proposed a palmprint template protection scheme based on matrix transformation. Firstly, the competition code features of original palmprint is extracted through the Gabor filters. Then, a general permutation matrix is generated randomly and two elementary permutation matrices are obtained by changing any two rows of it. Next, irreversible matrix is generated by XORing operation. Finally, cancelable palmprint templates are produced by multiplying the irreversible matrix and the original palmprint feature. Our experiments were carried out in a public database of Hong Kong Polytechnic University. The experimental results show that our cancelable palmprint scheme can not only ensure high safety but also meet the recognition accuracy requirements.</p>
<p>SG032 14:15-14:30</p>	<p style="text-align: center;">Skybiometry and AffectNet on Facial Emotion Recognition Using Supervised Machine Learning Algorithms Mirafe Prospero, Edson Lagamayo, Anndee Christian Tumulak, Arman Bernard Santos and Bryan Dadiz Technological Institute of the Philippines-Manila, Philippines</p> <p>Abstract—Nowadays, supervised machine learning aims to mimic human sanity such as recognition of facial emotion, interaction abilities and gaining insights about the environment. This machine learning is being utilized in different forms ranging from the exposure of human increase on the way to the patterns of personal interactions. Facial emotion recognition fundamentally identifies emotion which shapes how humans' self-control and reaction based on situations as well as the environment to which they belong. With these, there are great numbers of researches into developing supervised machine learning to recognize human facial emotions. In recognition of facial emotion, Skybiometry and AffectNet have been employed. Skybiometry is considered to be a state of the art in recognizing and detecting facial expressions. It allows developers and marketers to do more with the use of cloud biometrics api [1]. On the other hand, Mollahosseini prepared, collected and even annotated new database of facial emotions approximately from the internet. AffectNet serves as the largest database of facial expressions, valence, and arousal represented in two different emotion models. With the help of evaluation metrics, deep neural network baselines can perform better than the conventional learning methods [2].</p>
<p>SG035 14:30-14:45</p>	<p style="text-align: center;">Combining Pose-Invariant Kinematic Features and Object Context Features For RGB-D Action Recognition Manoj Ramanathan, Jaroslaw Kochanowicz and Nadia Magnenat Thalmann</p>

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	<p style="text-align: center;">Nanyang Technological University, Singapore</p> <p>Abstract—Action recognition using RGBD cameras is a popular research topic. Recognizing actions in a pose-invariant manner is very challenging due to view changes, posture changes and huge intra-class variations. In this paper, we propose a novel pose-invariant action recognition framework based on kinematic features and object context features. Using RGB, depth and skeletal joints, the proposed framework extracts a novel set of pose-invariant motion kinematic features based on 3D scene flow and captures the motion of body parts with respect to the body itself. The obtained features are converted to a human body centric space that allows partial view-invariant recognition of actions. The proposed pose-invariant kinematic features are extracted for both foreground (RGB and Depth) and skeleton joints and separate classifiers are trained. Borda-count based classifier decision fusion is employed to obtain an action recognition result. For capturing object context features, a convolutional neural network (CNN) classifier is proposed to identify the objects involved. The proposed context features also include temporal information on the object interaction and help in obtaining a final action recognition. The proposed framework works even with non-upright human postures and allows simultaneous action recognition for multiple people, which are less researched topics. The performance and robustness of the proposed pose-invariant action recognition framework are tested on several benchmark datasets. We also show that our method is real-time.</p>
SG022 14:45-15:00	<p style="text-align: center;">Facial Expression Recognition using 2D Stationary Wavelet Transform and Gray-Level Co-occurrence</p> <p style="text-align: center;"><i>Matrix Nikunja Bihari Kar, Korra Sathya Babu</i></p> <p style="text-align: center;">National Institute of Technology, Rourkela, India</p> <p>Abstract—This paper presents an automated facial expression recognition (FER) system based on two dimensional stationary wavelet transform (2D-SWT) and gray-level co-occurrence matrix (GLCM). The proposed scheme employs 2D-SWT to decompose the image into a set of sub-bands. Then GLCM features are obtained from the 2D-SWT sub-bands. Subsequently, linear discriminant analysis (LDA) is harnessed to select the most relevant features. Finally, these features are used for classification of facial emotions using least squares variant of support vector machine (LS-SVM) with radial basis function (RBF) kernel. The performance of the proposed system is evaluated on two standard datasets namely, Extended Cohn-Kanade (CK+) and Japanese female facial expression (JAFFE). Experimental results based on 5-fold cross validation strategy indicate that the proposed scheme earns an accuracy of 96.72% and 99.79% over CK+ and JAFFE dataset respectively, which are superior to other competent schemes.</p>
SG041 15:00-15:15	<p style="text-align: center;">Dimension Reduction Techniques Analysis on Image Processing for Facial Emotion Recognition</p> <p style="text-align: center;"><i>Alfrie L. Sarmiento, Jerome L. Liwanag, Rhommel R. Avinante and Bryan G. Dadiz</i></p> <p style="text-align: center;">Saint Michael's College of Laguna, Philippines</p> <p>Abstract—As the rapid growth of technology continuously increases the accuracy, effectivity, and efficiency of human's effort, technology also requires some</p>

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	<p>improvements in order to sustain its capabilities. One of the latest technologies today when it comes to biometrics is facial emotion recognition.</p> <p>Facial emotion recognition initially detects the face of a person before it recognizes human's emotion using image processing or video sequence method. The different algorithm was applied to related studies to increase the accuracy on recognizing the emotion. However, the efficiency of the data needed in order to identify the emotion of a person is also a big factor to reduce time on image processing part.</p> <p>This research analyzed three dimension reduction techniques on image processing for facial emotion recognition such as dimension reduction by forward selection, dimension reduction by decision tree, and dimension reduction by principal component analysis. The application of online recognition API and data mining tool on controlled dataset serves as the materials to generate the numerical and logical result which is used in the process of analysis.</p>
SG044 15:15-15:30	<p>Smart Gloves: A novel 3-D work space generation for compound two hand gestures <i>Harsh Bharadawaj, Mohit Dhaker, Sivani K., H.R. Nandi Vardhan</i> Amrita School of Engineering Bangalore, India</p> <p>Abstract—Speechlessness is a colossal barrier of communication between the ordinary people and the speech impaired. This paper presents a novel methodology with a working model which is used to convert the sign language to speech in order to help speech impaired people. It uses flex sensor and Inertial Measurement Unit in order to determine the position of finger as well as the position of hand in 3-Dimensional space. These sensors are embedded into the gloves, which when processed, outputs the accurate gesture which has been made by the user, thereby making it smart. The paper also presents a unique division of a matrix in 3-Dimensional space comprising of states. These states have to be estimated in a generalized manner in order to be used by anybody irrespective of their gender or height. The paper also highlights the use of both hands for compound two hand gestures with static and dynamic gesture recognition system. The smart gloves can further be used in a variety of applications such as motion sensing gaming, remote medical diagnosis, and robotics.</p>
SG037 15:30-15:45	<p>The Unsupervised Learning Algorithm for Detecting Ellipsoid Objects <i>Artem Kruglov</i></p> <p>Abstract—This paper is devoted to the analysis and implementation of the algorithms for automatic detection of the circular objects in the image. The practical aim of this task is development of the algorithm for automatic detection of log abuts in the images of roundwood batches. Based on literature review four methods were chosen for the further analysis and the best performance out of them was provided by ELSD algorithm. Some modifications were implemented to the algorithm to fulfill the requirements of the given task. After all, the modified ELSD algorithm was tested on the dataset of the images. The relative accuracy of the algorithm in comparison with manual measurement is 95.2% for the images with total area of background scene less than 20%.</p>

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Session II- Image analysis and processing Time: 13:30-15:30 📍 Breakout Room 11 Chair: Dr. Witchaya Towongpaichayont, King Mongkut's Institute of Technology Ladkrabang, Thailand	
SG1004-a 13:30-13:45	<p>DeepDisc: Optic Disc Segmentation based on Atrous Convolution and Spatial Pyramid Pooling</p> <p>Zaiwang Gu, Jun Cheng, Jiang Liu Cixi Institute of Biomedical Engineering, Chinese Academy of Sciences, China</p> <p>Abstract—The optic disc (OD) segmentation is an important step in retinal fundus image based disease detection, such as age-related macular degeneration and glaucoma detection. The OD segmentation can be considered as a pixel classification problem. It assigns each pixel a label, indicating whether this pixel belongs to the OD or not. In the traditional fully convolutional network (FCN) like structures, the consecutive pooling and convolutional striding operations lead to the loss of some detailed spatial information, which is essential for OD segmentation. Intuitively, maintaining high-resolution feature maps at the middle stage can boost segmentation performance. However, to accelerate training and ease the difficulty of optimization, the size of feature map should be small. Therefore, there is trade-off between accelerating the training and maintaining the high resolution. In this abstract, we introduce a novel and effective deep learning based method called DeepDisc to segment the OD. It mainly contains two components: atrous convolution and spatial pyramid pooling. The atrous convolution allows us to efficiently enlarge the field-of-view of filters to incorporate multi-scale context. It learns high-level semantic features in high resolution and preserves more spatial details. The spatial pyramid pooling strategy is adopted to ensure the pooling operation at multiple kernel sizes and effective field-of-views. Both of them are used to further boost OD segmentation performance. The proposed OD segmentation method, DeepDisc, is validated on both ORIGA and Messidor datasets. It achieves an overlap error of 0.069 in the ORIGA dataset and 0.064 in the Messidor dataset respectively, better than state-of-the-art methods without any post-processing strategies, such as dense conditional random field.</p>
SG009 13:45-14:00	<p>Object Tracking based on KCF and Sparse Prototypes</p> <p>Xiaojia Xie, Feng Wu and Qiong Liu South China University of Technology, China</p> <p>Abstract—Recently, many correlation filter-based tracking methods have received lots of attention and achieved great success in visual object tracking. Among correlation filter-based methods, the most influential one is kernelized correlation filter (KCF) which has excellent performance both in efficiency and accuracy. However, due to the virtual nature of cyclic shifts samples, the training and detecting of KCF are imprecise. To alleviate the influence of virtual samples, we take the following two measures. 1) We extract image patches at positions of samples which have local maximum KCF responses and treat them as candidates. We further evaluate their true responses. 2)</p>

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	<p>Instead of estimate the target position directly according to the KCF results, we use the sparse prototypes (SP) as the target model to evaluate the similarities between candidates and target. The results of KCF and SP are combined by adaptive weight to estimate the target position. In addition, KCF degrades due to its unreasonable update scheme. To do reliable update, we set different update modes and generate an adaptive update rate based on two tracking confidence indices. Experiments on a commonly used tracking benchmark show that the proposed method improves KCF about 8% on the average success rate and 10% on the precision, and achieves better performance than other state-of-the-art trackers.</p>
SG020 14:00-14:15	<p>Research and Implementation of Image Encryption System Based on Plaintext Association</p> <p>Biao Wang, Hengjian Li, and Caifeng Wang University of Jinan, China</p> <p>Abstract—The traditional chaotic mapping encryption algorithm has the disadvantage of being vulnerable and insecure. Therefore, in order to improve the anti-attack capability and security of encryption system, an improved image encryption Method-plaintext association scrambling image encryption algorithm is proposed. The encryption process consists of two diffusion algorithms and a scrambling algorithm, and the inverse of the encryption process is the decryption process. The simulation results show that the system can obtain better encryption effect, and the security is higher than the traditional encryption algorithm.</p>
SG051 14:15-14:30	<p>Review of Different Approaches for identify a Software Component</p> <p>Anil Pandey and Tulika Pandey Invertis University, India</p> <p>Abstract—Component based software engineering offers inherent benefits in software quality, developer productivity and overall system cost. There are different ways to classify the components like physical and logical type. This paper introduces different method for components classification. We consider the logical components aspects of a component. To identify the component is a very difficult task. There are many evaluation and non-evaluation approaches are available for evaluate the components.</p>
SG1002 14:30-14:45	<p>MAFL: Multi-scale Adversarial Feature Learning for Saliency Detection</p> <p>Dandan Zhu, Ye Luo, Jianwei Lu, Lei Dai, Guokai Zhang, Xuan Shao Tongji University, China</p> <p>Abstract—Previous saliency detection methods usually focus on extracting features to deal with the complex background in an image. However, these methods cannot effectively capture the semantic information of images. In recent years, Generative Adversarial Network (GAN) has become a prevalent research topic. Experiments show that GAN has ability to generate high quality images that look like natural images. Inspired by the effectiveness of GAN feature learning, we propose a novel multi-scale adversarial feature learning (MAFL) model for saliency detection. In particular, we model the complete framework of saliency detection is based on two deep CNN modules: the multi-scale G-network takes natural images as inputs and generates</p>

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	<p>corresponding synthetic saliency map, and we designed a novel layer in D-network, namely a correlation layer, which is used to determine whether one image is a synthetic saliency map or ground-truth saliency map. Quantitative and qualitative experiments on three benchmark datasets demonstrate that our method outperforms seven state-of-the-art methods.</p>
SG1005 14:45-15:00	<p>Moving Object Tracking Method Based on n-Step-ahead Prediction Using Artificial Neural Network Algorithm Faris Adnan Padhilah, Wahidin Wahab Universitas Indonesia, Indonesia</p> <p>Abstract—This paper described a method of tracking a moving object based on 1 to 5 step ahead prediction. The prediction was using the artificial neural network with back propagation method for training the network. The moving object used in the experiments is a small table tennis ball. The ANN structures have six inputs neurons and five outputs neurons with ten neurons in the hidden layer. Using 70% data of the object movement positions for training, and 30% data for testing the prediction of the ball positions. It was shown that the training of the ANN can achieved means square error (MSE) as small as 0.0091 for the X coordinate and 0.0012 for the Y coordinate. At the ball position prediction testing, it was shown that the method can achieved the MSE of 4.72% for X coordinate and MSE of 2.48% for Y coordinate.</p>
SG045 15:00-15:15	<p>Automatic Localization of Optic Disc using Modified U-Net Zaiwang Gu, Shanshan Jiang, Jimmy Lee, Jianyang Xie, Jun Cheng and Jiang Liu Cixi Institute of Biomedical Engineering, Chinese Academy of Science, China</p> <p>Abstract—The optic disc (OD) localization plays an important role in the automatic retinal image analysis for many applications such as glaucoma detection, macular localization, and retinal vessel analysis. In this paper, we propose a method based on U-net and Depth-First-Select Graph to accurately and efficiently locate the OD. The adopted U-net architecture is based on ResNet-50, and it produces a probability map of pixels belonging to OD. Then based on the probability map, we use the Depth-First-Select algorithm to select the brightest and largest region, which is most likely to be the OD. The proposed method is evaluated on both the ORIGA and Messidor datasets. Our experimental results show that the proposed method achieves 100% accuracy in ORIGA and 99.83% accuracy in Messidor for OD localization. It outperforms other OD localization algorithms.</p>
SG007 15:15-15:30	<p>A novel model for compressed sensing MRI via smoothed ℓ_1-norm regularization Zhen Chen, Youjun Xiang, Yuli Fu and Junwei Xu South China University of Technology, China</p> <p>Abstract—Compressed sensing magnetic resonance imaging (CS-MRI) using ℓ_1-norm minimization has been widely and successfully applied. However, ℓ_1-norm minimization often leads to bias estimation and the solution is not as accurate as desired. In this paper, we propose a novel model for MR image reconstruction, which takes as a smoothed ℓ_1-norm regularization model that is convex, has a unique solution. More specifically, we employ the logarithm function with the parameter in</p>


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	our optimization, and an iteration technique is developed to solve the proposed minimization problem for MR image reconstruction efficiently. The model is simple and effective in the solution procedure. Simulation results on normal brain image demonstrated that the performance of the proposed method was better than some traditional methods.
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Coffee Break <15:45---16:00>

Session III- Computer Theory and Application Technology Time: 16:00-18:00  Lecture Room 6 Chair: Assoc. Prof. Jian Wu, Tsinghua University, China	
SG012-a 16:00-16:15	<p>A Visual System for Ball Trajectory Prediction of Table Tennis Robotic Arm Hsiang-Chieh Chen, Chung-Hsun Sun and Hsuan Chen National United University, Taiwan</p> <p>Abstract—This work presents a vision-based sensory system for the ping-pong robotic arm. Since the fast reaction is quite critical to the proposed arm for hitting a ball successfully, the proposed vision system attempts to predict the ball's movement in a very short time. Before flying through the net, the ball is detected, localized and tracked using a binocular vision approach. An orange-colored ping-pong ball is first extracted from a captured image by chromacity thresholding, and then is bounded with a smallest enclosing circle. Here, several early-detected positions of a ball are used to compute the initial velocity and direction. The flying trajectory is estimated by an extended Kalman filter (EKF) in which considering the projectile motion, air resistance, and physical impact on the table. Finally, the contact point can be predicted accurately from the proposed EKF-based flying and rebound model.</p> <p>In the experiments, each camera grabs the image frames with resolution of 1280 × 1024 pixels while the framerate is 60 FPS. The camera calibration is completed to obtain the intrinsic and extrinsic parameters of our binocular vision system; in addition, the lens distortion is also corrected. Twelve measured positions of a ping-pong are adopted to form a moving trajectory with a parabolic formula form. The approximated curve also provides the initial conditions for the proposed flying model; accordingly, the contacting point can be accurately predicted. The experimental results verified the performance on the real-time trajectory estimation. It can be summarized that the presented Kalman-filter based prediction method is superior to one-shot prediction that is frequently used in a ping-pong robotic system.</p>
SG014 16:15-16:30	<p>Central sleep apnea detection using an accelerometer Phan Duy Hung FPT University, Vietnam</p>

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	<p>Abstract—Central sleep apnea (CSA) is a serious condition most commonly seen in patients with heart failure (heart failure refers to the inability of the heart to adequately pump blood and oxygen around the body, often caused by enlarged, stiffened and damaged heart chambers). 30-80% of patients with heart failure have central sleep apnea. Therefore, many attempts have been made to produce a monitoring system for automatic Central Sleep Apnea scoring to reduce clinical efforts. This paper describes a method for detection of Central Sleep Apnea using signals obtained from an accelerometer sensor placed on the patient's chest and a Multilayer Perceptron network (MLP). Results show that a minute-by-minute classification accuracy of over 84% is achievable.</p>
<p>SG034 16:30-16:45</p>	<p style="text-align: center;">Dynamic Search Space Particle Swarm Optimization Approach for Portfolio Optimization <i>Cong Feng, Yijiang Dong, Yuehan Jiang, Maopeng Ran</i> Beihang University, China</p> <p>Abstract—The multi-objective programming model of portfolio investment is based on the Markowitz portfolio theory with risk and return considered in the meantime. There have been many studies for portfolio optimization problem and over recent years heuristic techniques are widely used and proved to have good performance. The main purpose of the present study is the solving of portfolio optimization problem by using Particle Swarm Optimization (PSO). Thus in this paper, we propose an approach based on a dynamic search space particle swarm optimization algorithm (DSPPSO) for the portfolio selection problem. DSPPSO is proposed to improve the performance of PSO combining the classical particle swarm optimization algorithm philosophy and population entropy. To verify the effectiveness of the algorithm, we used the closing prices of thirty sample stocks in Chinese stock market and carried out several sets of experiments. The results show that DSPPSO approach is suitable in portfolio optimization and is able to find securities portfolio with certain interests at low risk. Also we evaluate the effect of the value of risk aversion parameter on the results and found that the algorithm can effectively control risk. Furthermore, two groups of contrast experiments are carried out to substantiate the conclusion and suggest the application for future predictions.</p>
<p>SG039 16:45-17:00</p>	<p style="text-align: center;">Peculiarities of Development of the Mobile Software for Log Batch Volume Measurement <i>Georgiy Malkov, Artem Kruglov</i> Ural Federal University, Russia</p> <p>Abstract—This paper is devoted to the stages of initialization and design in the software development process. The idea of the developed software is in the automatic detection and measurement of the log abuts in the images of the timber batches using image processing and pattern recognition algorithms. The implementation of the appropriate structure and GUI is a significant task in the same way as development of the novelty image processing algorithms, however, commonly it is not satisfactorily detailed. For the given task which involves the development of the specific tool for</p>

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	<p>mobile devices and its implementation in the extreme application environment the principle of interaction with the user has strict requirements. That means that the software should be simple, robust and user-friendly. Thus the development process was based on these principles.</p>
SG046-a 17:00-17:15	<p>3D Scanning System for Factory Work Station by using graph SLAM with LiDAR Cloud Points</p> <p><i>Sungkyung Woo, Changmin Lee, Taeseok Lee, Kunwoo Lee and Hweeyoung Han</i> Seoul National University, South Korea</p> <p>Abstract—Recently, 3D mapping algorithm using LiDAR is used in various spaces. Especially for factory automation systems, real-time mapping of internal environment is very important. SLAM is mainly used in this mapping algorithm.</p> <p>The most of the 3D scanning using SLAM with LiDAR focuses on broadband, however The target inside of factory is not large compared to the environment of factory. Since the target is smaller than the error range of LiDAR scanning range, the matching result is incredibly problematic. In order to solve this problem, this study proposes a high-precision scanning system for a small area with the same equipment used for the same broadband. Through this algorithm, we propose that 3D mapping and accuracy of small objects in the target area play an important role in the internal algorithm of the factory atomization.</p> <p>In order to propose this method, we first designed a 3D scanning system prototype controlled by a motor. And then we tracked the movement of LiDAR through control data of the movement saving device. Then we collected point cloud data for graph-SLAM based on LiDAR motion. The movement information is added to the matching of the point cloud data to acquire a 3D model through the SLAM. Finally, it is aimed to obtain the global coordinate of the three-dimensional model and use it in the automation algorithm.</p>
VT010 17:15-17:30	<p>Ultrasonic Ray-tracing Based Endocardial Surface Reconstruction</p> <p><i>Rao Fu, Yifan Fu, Cheng Wen, Riqing Chen, Chunxu Shen and Jian Wu</i> Graduate School at Shenzhen, Tsinghua University, China</p> <p>Abstract—Accurate and fast reconstruction of the endocardium is a fundamental step for performing a successful ablation operation. This paper proposes an ultrasonic ray-tracing based endocardial surface reconstruction algorithm, which utilizes a new proposed non-contact ultrasonic catheter. The proposed catheter is composed of an electromagnetic position sensor and three miniature transducers, and it can sample a point cloud from the targeted endocardium in real-time. The 3D Delaunay triangulation of the sampled point cloud is first calculated, and then each tetrahedron is marked internal or external via ultrasonic ray-tracing and the boundary of all internal tetrahedra is extracted as a coarse surface mesh. Finally, HC Laplacian is applied to smooth the coarse mesh for the benefit of avoiding shrinkages. The basic idea of the proposed surface reconstruction algorithm relies on the fact that tetrahedra intersecting with the ultrasonic rays provide a volumetric estimation of the measured heart. Simulations on a heart phantom are given to support the superiority of the</p>

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	<p>proposed algorithm. Compared to the prior arts, the proposed algorithm could reconstruct a realistic endocardial surface while preserving the features of vena cava and atrium appendage without shrinkages.</p>
SG038 17:30-17:45	<p>Automatic Detection of Round Timber in Digital Images Using Random Decision Forests Algorithm <i>Yurii Chiryshv, Artem Kruglov, Anastasia Atamanova</i> Ural Federal University, Russia</p> <p>Abstract—The problem of automatic detection and isolation of logs in a pile based on digital image processing is investigated within this paper. At present, the approaches to determination of the qualitative and quantitative characteristics of round timber by image processing. The paper gives a review of existing methods and presents a detection algorithm that develops the previously described approach based on the histogram of oriented gradients with random decision forest. The authors thoroughly consider the problem of detector adjustment by multiple training and empirical selection of such parameters as the number, maximum depth of trees and the characteristic size of log abuts in the images of the training sample. The parameters of the detector are selected based on the requirement of high recognition rate. Due to this adjustment the algorithm was significantly improved so it surpasses analogs or shows comparable results with respect to accuracy.</p>
VT011 17:45-18:00	<p>Death Escape: A Case Study of Merging Ubiquitous Activities into a Hardcore Computer Game <i>Prawit Yasothorn, Tachasit Chueprasert, and Witchaya Towongpaichayont</i> King Mongkut's Institute of Technology Ladkrabang, Thailand</p> <p>Abstract—Ubiquitous games can be designed in several settings. This paper presents a case study of designing and developing Death Escape, a role-playing survival ubiquitous game, which is intended to transform user's daily-life activities to in-game player's stats in the concept of 'avatar grows as the user grows'. This game is expected to blend the game mechanics with user's behaviours seamlessly. The game collects data from built-in inertia sensors in mobile phones (accelerometer and gyroscope) and GPS, utilises human medical data to transform the collected data into in-game meanings realistically, and presents those in-game values to motivate the user to maintain healthy behaviours. This paper describes those methods of data collections and transformations as well as additional findings during the process of design and development. This can set an example for those who are developing ubiquitous games which are blended with the user's lifestyle.</p>



Dinner Time <18:00-20:00> Location: Cosmo

Note: dinner coupon is needed for entering the restaurant.

