

# FRONT PAGE

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2018 The 3rd International Conference on  
Robotics, Control and Automation (ICRCA 2018)



2018 The 3rd International Conference on  
Robotics and Machine Vision (ICRMV 2018)

August 11-13, 2018

Chengdu, China

Co-Sponsored by



Published by



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## **13:30-15:45 | Tanggula Hall @ 17th floor**

CA006	A Gas-Liquid Coupling Excitation Control System Development and Simulation
CA010	Robust stability analysis of fractional-order linear systems with polytopic uncertainties
CA024	Synergetic Controller for Hepatitis B Epidemic System
CA1009	An Improved Algorithm for Image Synthesis
CA3001	The Study of the Collision Risk Control across Flight Level between Military and Civil Aviation Based on Event Model
CA011	On Robust Stability of 2-D Linear Discrete Systems described by the Recursive Model
CA1019	Infrared and Visible Image Fusion in Realistic Streetscape
CA1021	Histogram Equalization Based on Custom Region of Interest
CA1020	Analysis and Comparison of Grayscale Correction

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## **16:00-18:30 | Tanggula Hall @ 17th floor**

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CA1011	A Fast Contour Model-based Localization Method for Robotic Picking in Shrimp Production Line
CA1013	Semantic Scene Segmentation for Indoor Robot Navigation via Deep Learning
CA1016	An Innovative Error Measuring Method for Modular Interfaces of Modular Reconfigurable Robots
CA023	Integral Backstepping-based Nonlinear Flight Control Strategy for Quadrotor Aerial Robot with Unknown Mass
CA033	Grip Force Estimation of Laparoscope Surgical Robot based on Neural Network optimized by Genetic Algorithm
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CA026	Design of Angle Measurement System for Dual Polarization Monopulse Radar in Main lobe Jamming	
CA029	Pulse Shape Discrimination of $n - \gamma$ Based on Pulse Shape Model and Adaptive Kalman Filter	
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# AGENDA

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[August 11, 2018]



The Lobby of Tibet Hotel Chengdu



西藏饭店一楼大厅



10:00-17:00



## Registration & Materials Collection

- Give your **Paper ID** to the staff



- **Sign your name** in the attendance list and check the paper information.



- Check your **conference kit**, which includes conference bag, name tag, pen, lunch & dinner coupon, conference program, the receipt of your payment, and the USB of paper collection.



## Tips for Participants

- ✧ Your punctual arrival and active involvement in each session will be highly appreciated.
- ✧ The listeners are welcome to register at any working time during the conference.
- ✧ Get your presentation PPT or PDF files prepared.
- ✧ Regular oral presentation: 15 minutes (including Q&A).
- ✧ Laptop (with MS-Office & Adobe Reader), projector & screen, laser sticks will be provided by the conference organizer.
- ✧ Please keep all your belongings (laptop and camera etc.) with you in the public places, buses, metro.

# AGENDA



[August 12, 2018]

MORNING





Tibet Hotel Chengdu



Tanggula Hall @ 17th floor (唐古拉厅-17楼)



## Keynote Speeches

09:00-09:10	Opening Remarks	<b>Prof. Zou Jianxiao,</b> University of Electronic Science and Technology of China, China
09:10-10:00	Keynote Speech I	<b>Prof. Toyomi Fujita,</b> Tohoku Institute of Technology, Japan
		Speech Title: Regions of Interest in Observation of Robot Hand Movement for Robot Cooperation
10:00-10:30	 <b>Coffee Break &amp; Group Photo</b> 	
	Poster display Foyer @ Tanggula Hall @ 17th floor	
	MV006 MV1002 CA007 CA009 CA013 CA016 CA017 CA020 CA031 CA1001CA1014 CA1015 CA1018	
10:30-11:20	Keynote Speech II	<b>Prof. Chiharu Ishii,</b> <b>Hosei University, Japan</b> Speech Title: Challenge for Development of Medical and Assistive Devices Toward Aging Society
11:20-12:10	Keynote Speech III	<b>Prof. Zou Jianxiao,</b> <b>University of Electronic Science and Technology of China, China</b> Speech Title: Key Control Techniques for Grid-Connected VSCs within Renewable Energy Generation Systems



Lunch @ Café, level 2 (2楼咖啡厅)

<12:10-13:30>

# AGENDA



[August 12, 2018]

AFTERNOON

<b>Tanggula Hall @ 17th floor (唐古拉厅-17楼)</b>	
<b>13:30-18:30</b>	
13:30-15:45	<b>Session I - Control theory and engineering</b> Chaired by Dr. Longzhi Zhang Harbin Institute of Technology, China
	<b>9 Presentations—</b> CA006 CA010 CA024 CA1009 CA3001 CA011 CA1019 CA1021 CA1020
15:45-16:00	<b>Coffee Break</b>
16:00-18:30	<b>Session II - Artificial intelligence and robot</b> Chaired by Asst. Prof. Yao Yeboah, Guangdong University of Technology, China.
	<b>10 Presentations—</b> CA1002 CA1011 CA1013 CA1016 CA023 CA033 CA018 CA2001 CA2002 MV1003

<b>Hongshan Hall @ 17th floor (红山厅-17楼)</b>	
<b>13:30-18:15</b>	
13:30-15:45	<b>Session III - Electronic information technology and applications</b> Chaired by TBA
	<b>9 Presentations—</b> MV003 CA005 CA022 CA025 CA026 CA029 CA035 CA1010 CA1024
15:45-16:00	<b>Coffee Break</b>
16:00-18:15	<b>Session IV - Pattern recognition and target tracking</b> Chaired by TBA
	<b>9 Presentations—</b> MV004 CA008 CA1007 CA1008 MV007 CA002 CA1005 CA1004 CA3004



**Dinner @ Café, level 2 (2楼咖啡厅)**

**18:30-20:00**

# AGENDA



## Excursion

[August 13th, 2018]

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08:30	Assemble at the lobby of Tibet Hotel Chengdu
8:30-12:00	Chengdu Giant Panda Base
12:00-13:00	Lunch
13:00-14:30	Kuan & Zhai Alley (China Lane)
14:30-16:00	Qingyang Taoist Temple
16:00-17:00	Jinli Ancient Street
17:00	End-Back to Tibet Hotel Chengdu

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### Notes:

1. The cost of one-day tour is 60USD per person for participants.
2. The payment of the excursion should be completed by August 1<sup>st</sup>.
3. Onsite excursion registration is unacceptable.
4. Please keep your belongings with you.



### Chengdu Giant Panda Base (成都大熊猫基地)

Chengdu Giant Panda Base is located just 10km (6miles) away from downtown Chengdu, the Chengdu Panda Breeding Research Center has been created and imitated the pandas' natural habitat in order that they might have the best possible environment for rearing and breeding.



### Kuan & Zhai Alley (China Lane) (宽窄巷子)

Kuan & Zhai Alley is one of the three historical and cultural protection areas in Chengdu. It is composed of three urban old streets arranged in parallel: wide alley, narrow alley and well alley and the quadrangle courtyard community between them.

# AGENDA

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## **Qingyang Taoist Temple (青羊宫)**

Qingyang Taoist Temple is known as "the first Taoist temple in western Sichuan" and "the first jungle in southwest China", it is a national famous cultural relic and tourist attraction, and the largest Taoist temple in southwest China



## **Jinli Ancient Street (锦里)**

Jinli was one of the oldest and most commercial streets in the history of western shu, and was famous throughout the country as early as the qin and han dynasties and The Three Kingdoms period. It fully shows the unique charm of Sichuan folk customs.



# WELCOME

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Dear professors and distinguished delegates,

It is our great honor and pleasure to welcome you to Chengdu, China for 2018 The 3rd International Conference on Robotics, Control and Automation (ICRCA 2018) and 2018 3rd International Conference on Robotics and Machine Vision (ICRMV 2018), which is co-sponsored by Hefei University of Technology, China, University of Electronic Science and Technology of China and China University of Geosciences and also technically assisted by many universities worldwide.

The theme of the conferences is to proclaim knowledge and share new thoughts among the professionals, industrialists and students from research areas of robotics, control and automation as well as robotics and machine vision, and to demonstrate and examine different innovative approaches in related fields. The evaluation of all the papers was performed based on the reports from anonymous reviewers, who are qualified in the related field. As a result of their hard work, we are pleased to have accepted 41 presentations in this program.

Three keynote speeches will be presented from Prof. Zou Jianxiao, University of Electronic Science and Technology of China, China; Prof. Chiharu Ishii, Hosei University, Japan; P Prof. Toyomi Fujita, Tohoku Institute of Technology, Japan separately. We believe all the talks will be very impressive for the high level of professionalism, and in many cases original ideas and activities will be accomplished or proposed. We acknowledge the important contributions of these three professors here.

Apart from this, the conference is set up with 4 parallel Sessions. Participants will make presentations and discussions over 4 topics, i.e. Control theory and engineering; Artificial intelligence and robot; Electronic information technology and applications and Pattern recognition and target tracking. In addition to the core oral presentation, the conference also has poster session, which provides more opportunities for experts and scholars to communicate with each other.

We believe that by this excellent conference, you can get more opportunity for further communication with researchers and practitioners with the common interest in this field. Obviously, your suggestions are warmly welcomed for the further development of the conferences in the future. Wish you have a fruitful and memorable experience in Chengdu, which is known as the “Country of Heaven” and the “Land of Abundance”!

We look forward to meeting you again next time.

Yours sincerely,

Conference Organizing Committee

# VENUE



Add: No.10, North Renmin Road, Chengdu, China

地址：成都人民北路一段 10 号

Website: <http://www.tibethotelchengdu.cn/index.html>



Tibet Hotel Chengdu Location:

Tibet Hotel Chengdu is located at No.10, North Renmin Road, Chengdu. It is near Manjusri Square, Living Water Park. It may just take you 5 minutes from the hotel to Chengdu North Railway Station(2 km), and 30 minutes to Chengdu Shuangliu International Airport(27 km).

Distance From Chengdu North Railway Station: 2 km

Distance From Chengdu South Railway Station: 18 km

Distance From Chengdu Shuangliu International Airport: 27 km

Distance From Chunxi Road: 4 km

Distance From Pacific Department Store (Quanxing shops): 2 km

Warm tips:

Weather: Cloudy, temperature 24 °C ~ 34 °C, carry an umbrella with you.

# KEYNOTE I

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**Prof. Zou Jianxiao,**

**University of Electronic Science and Technology of China, China**

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Prof. Dr. Jianxiao Zou is vice president of Department of Automation Engineering, University of Electronic Science and Technology of China. He is visiting Professor of University of California, Berkeley (UC Berkeley). His main research directions are intelligent information processing and control, new energy control and integration, monitoring and control system signal processing technology.

As a leader and a total commitment to the primary research included 863 projects, the National Natural Science Foundation of China, the General Armament Department pre-research, all kinds of national and provincial Department more than 20 projects, including a horizontal cooperation. Research in wind power, electric cars, scenery storage co-generation systems, aircraft gas turbine power and other new energy to change direction, and equipment acquired medical equipment, get a good economic and social benefits. MW class wind power generation control system is completed, the electric multi- leaf collimator system, aircraft gas turbine power generation system has been modified to achieve industrialization.

He won the Sichuan Provincial Science and Technology Progress Award in 2012, the Ministry of Education Science and Technology Progress Award in 2008 , and the Sichuan Provincial Science and Technology Progress Award in 2006. In recent years, he applies for more than twenty national invention patents. He has published SCI, EI retrieved 20 papers, as the first author published and been reviewers of numbers of international conferences and magazines.

**Presentation Title: Key Control Techniques for Grid-Connected VSCs within Renewable Energy Generation Systems**

**Abstract:** With the increasing demand for more effective and environmentally friendly electrical power system, the development of distributed generation and microgrid is promoted in a rapid pace. The grid-connected voltage source converter (VSC), with flexible topologies, becomes the most employed interface to realize renewable energy generation and power quality improvement. The performance of VSC relies heavily on the main circuit topologies, control techniques, electro-magnetic interference (EMI), etc. In this speech, the most recent research work regarding control strategies for grid-connected VSCs, which have been carried out in the Renewable Energy and Smart Grid Automation Technology Lab at UESTC, will be introduced. It includes design of internal model based current control strategy and finite control set model predictive control for grid-connected VSCs, aiming at improving the performance of VSCs as well as the high power quality of the injected power.

# KEYNOTE II

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**Prof. Chiharu Ishii,**  
**Hosei University, Japan**

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Chiharu Ishii received Bachelor of Engineering degree in Mechanical Engineering from Sophia University in 1992, Master of Engineering degree in Mechanical Engineering from Sophia University in 1994 and Doctor of Engineering degree in Mechanical Engineering from Sophia University in 1997.

He worked at Ashikaga Institute of Technology between 1997 and 2002, at Kogakuin University between 2002 and 2009, and at Shibaura Institute of Technology between 2009 and 2010. He has been working at Hosei University since 2010, and currently working as a Professor with the Department of Mechanical Engineering, Faculty of Science and Engineering at Hosei University.

Dr. Chiharu Ishii has received several awards such as The Best Paper Award in the area of Tactile and Haptic Interfaces at the 4th International Conference on Human System Interaction (HSI2011); Best Paper Award at the 1st International Conference on Computer Science, Electronics and Instrumentation (ICCSE2012); Best Presentation Award at the International Conference on Intelligent Mechatronics and Automation (ICIMA2013).

He is currently a member of IEEE, SICE, JSME, RSJ, IEEJ and JSCAS. His research interests are in medical robotics, assistive technology and robust control.

**Presentation Title: Challenge for Development of Medical and Assistive Devices Toward Aging Society**

**Abstract:** Japan is facing a serious problem of population aging. The percentage of elderly people of age 65 years or over (aging ratio) is 27.3% in 2017, and it is forecasted that the aging ratio becomes 33.4% in 2035. In this way, Japan has reached a super-aged society which no country in the world has experienced. Becoming the super-aged society, it is necessary to respond to the demand of medical care and nursing of elderly people. Therefore, challenge for development of medical and assistive devices through an application of the Robot Technology (RT) has been promoted. In this talk, some medical and assistive devices developed in my laboratory are explained.

The robotic surgical system for single-port-surgery termed "HASROSS", the lightweight power assist suit termed "Cool Vest" to reduce care giver's burden in transfer work, the ultra-lightweight power assist suit termed "Aero back" to support the work with a half-sitting posture, control system of the electric wheelchair based on user's biosignals, such as EMG, EOG and EEG, and sensory feedback device for myoelectric prosthetic hand, are mentioned.

# KEYNOTE III

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**Prof. Toyomi Fujita,**  
**Tohoku Institute of Technology, Japan**

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Toyomi Fujita have received his Ph.D. in Robotics from the Tohoku University, Japan, in 1997. From 1997 to 2001 he has been a Research Associate at the Graduate School of Information Systems, the University of Electro-Communications, Tokyo, Japan. He joined, in 2001, the Neurology and Telerobotics Units, in the School of Optometry at the University of California, Berkeley, USA. He has been with the Department of Electronics and Intelligent Systems, Tohoku Institute of Technology, Japan. He is currently a Professor of the Department of Electrical and Electronic Engineering, Tohoku Institute of Technology. His research interests include robotics, robot vision, and human interface.

**Presentation Title: Regions of Interest in Observation of Robot Hand Movement for Robot Cooperation**

**Abstract:** Visual functions are important for robots who engage in cooperative work with other robots. In a cooperative work, a robot needs to observe its partner robot using vision and be aware of its action. In order to develop an effective visual function for robots, it is important to detect some regions-of-interest in the visual field like human visual scanpath.

Our research group has therefore investigated features of the human visual scanpath in a scene of robot hand movement observed by a cooperative robot. Human regions-of-interest (hROIs) were measured by psychophysical experiments based on eye-movement measurement and different sets of hROIs were compared by using a positional similarity index. This talk will describe an overview of the experiment and results.

In addition, this talk will present a method for generating regions-of-interest in the scene of robot hand movement. Image processing algorithms based on active top-down feature patterns and bottom-up spatial kernels were applied. The algorithms have produced energy maps from the images observed by the robot and they were combined with different weights to generate algorithmic regions-of-interests. They were compared with measured hROIs and an algorithmic predictability of scanpath was evaluated. Several results of this experiment showed that presented method is applicable to the detection of regions-of-interests in hand movement.

# Session I

13:30-15:45  
Tanggula Hall @ 17th floor

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**August 12th, 2018**

## Session I

**[Control theory and engineering]**

**🕒 13:30-15:45**

**📍 Tanggula Hall @ 17th floor**

**(唐古拉厅 - 17楼)**

**Chaired by Dr. Longzhi Zhang**

**Harbin Institute of Technology, China**

**9 presentations—**

CA006 CA010 CA024 CA1009 CA3001 CA011 CA1019 CA1021 CA1020

**\*Note:**

- Please arrive 30 minutes ahead of the sessions to prepare and test your PowerPoint.
- After each presentation, a certificate will be awarded to each presenter by the session chair one by one.
- 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.

# Session I

13:30-15:45  
Tanggula Hall @ 17th floor

<p>CA006 13:30-13:45</p>	<p>A Gas-Liquid Coupling Excitation Control System Development and Simulation</p> <p><b>ZHANG Huixian</b>, ZHANG Lijie, MIAO Lingxia</p> <p>Luoyang Institute of Science and Technology, Henan Province, China</p> <p>ABSTRACT--In order to study proactively generated cavitation bubble, a gas-liquid coupling excitation mode is proposed and the gas-liquid coupling test system is developed. In this control system, the gas and the hydraulic oil are mixed alternately and whose pressure can be adjusted manually, through which the generated cavitation bubbles can strip contaminants adhered to the pipe inner wall rapidly. The cavitation bubble kinematics model is established and the numerical simulations are carried out. The factors affecting the cavitation bubble growth is studied. The results show that the cavitation effect will be enhanced with increasing air pressure. Meanwhile, the cavitation process will evolve from steady state to transient state. So, it can be concluded that the gas-liquid coupling excitation-induced cavitation process is controllable, which provides a new cleaning method for the complex hydraulic system and some theoretical basis on the gas-liquid coupling excitation are obtained.</p>
<p>CA010 13:45-14:00</p>	<p>Robust stability analysis of fractional-order linear systems with polytopic uncertainties</p> <p><b>Jing Yang</b>, Xiaorong Hou</p> <p>School of Automation Engineering, University of Electronic Science and Technology of China, Sichuan, P.R.China</p> <p>ABSTRACT--The issue of robust stability for fractional-order linear systems with polytopic uncertainties is dealt with in this paper. Based on the Kronecker product and <math>\mu</math>-analysis, stable condition is established. Moreover, the robustness bounds of fractional-order linear systems with polytopic uncertainties are given. Two examples are presented to confirm the proposed conditions.</p>
<p>CA024 14:00-14:15</p>	<p>Synergetic Controller for Hepatitis B Epidemic System</p> <p>Arsit Boonyaprapasorn, Thanacha Choopojcharoen, Parinya Sa Ngiamsunthorn and <b>Kaned Thung-Od</b></p> <p>Mechatronics Research Unit, Maharakarm University, Thailand</p>

# Session I

13:30-15:45  
Tanggula Hall @ 17th floor

	<p>ABSTRACT--The hepatitis B virus (HBV) has been interested by researchers to define control policy for the epidemic of this virus. In this study, the synergetic control approach was applied to determine the policy which consists of isolation, treatment, and vaccination for the epidemic system, including susceptible, acute infected, chronic infected and recovery individuals. The simulation was used to present the feasibility of the synergetic control approach in defining of all types of control inputs. It is clear from the simulation results that the hepatitis B epidemic system can be controlled based on the control policy including the isolation, treatment and vaccination provided by the synergetic control method. According to the results of this study, the control objective of the hepatitis B epidemic system can be achieved by using the synergetic controller. Additionally, the hepatitis B epidemic system could be controlled with the chattering free control inputs. Thus, it is suitable to utilize the synergetic approach for determination of control policy for the considered hepatitis B epidemic system.</p>
<p>CA1009 14:15-14:30</p>	<p>An Improved Algorithm for Image Synthesis based on gradient and database <b>Xiang Zhang</b>, Wei Yang, Yunhe Zhang, Jie Liu, Shishi Zhou Chongqing University, China</p> <p>ABSTRACT--With the problem of distortion in boundary and time-consuming in image synthesis, an improved algorithm base on Image Quilting is proposed. Firstly, the gradient of image is add to the color feature which is used as the metric for texture blocks stitching. Further, the way of texture blocks selecting is improved by storing the feature information of four edges to the database. The experiment shows that the improved algorithm reduces the distortion and time for generating high quality images effectively</p>
<p>CA3001 14:30-14:45</p>	<p>The Study of the Collision Risk Control across Flight Level between Military and Civil Aviation Based on Event Model <b>Han LI</b>, Guhao Zhao, Dengkai YAO College of Air Traffic Control and Navigation, Air Force Engineering University Xi'an, China</p> <p>ABSTRACT--In order to easy the contradiction in airspace using between military and civil</p>



# Session I

13:30-15:45  
Tanggula Hall @ 17th floor

	<p>aviation, and to ensure air safety, Event model is used to make delimitation more scientific and credible. The case is half a roll back. By simulating war craft's path and calculating frequency of side spacing loss under the influence of the navigation error, pilot error and lateral wind, the collision probability model can be used to military aerobatic training flight, so that someone can put forward some suggestions about airspace and flight.</p>
CA011 14:45-15:00	<p>On Robust Stability of 2-D Linear Discrete Systems described by the Recursive Model</p> <p><b>Xiaoxue Li</b> and Xiaorong Hou</p> <p>University of Science and Technology of China</p> <p>ABSTRACT--In this paper, we present a new criterion on robust stability of two-dimensional (2-D) linear discrete systems. This method is based on the discriminant systems of polynomial and Hurwitz theorem. By the fractional linear transformation, the problem of stability analysis for uncertain 2-D systems can be turned to a new problem whether the polynomials are Hurwitz stable, which can be easily checked by the discriminant system of polynomial. It simplifies some existing methods of analyzing stability for 2-D systems with uncertain parameters. A comparison is included to illustrate the presented criterion is more effective than previously reported criterion.</p>
CA1019 15:00-15:15	<p>Infrared and Visible Image Fusion in Realistic Streetscape</p> <p><b>Huang Yudong</b>, Xu Wei, Tan Hanlin, Long Xin and Ben Zongcheng</p> <p>National University of Defense Technology, China</p> <p>ABSTRACT--Infrared and visible image fusion plays an important role in military and civilian applications. However, most methods are focus on simple general scene, which only contains one person alone or a few buildings. It is not enough to fully reflect the diversity and complicated of reality. This paper presents a new fusion method for infrared and visible images based on saliency detection and guided filter, aiming to obtain a synthetic image that is suitable for human visual perception in complicated street scenes. The proposed method employs the saliency detection to extract target region from infrared images. Each image is decomposed into a base layer and detail layers based on a multi-scale decomposition through guided filter. Experimental results demonstrate that our method can achieve a superior</p>

# Session I

13:30-15:45  
Tanggula Hall @ 17th floor

	<p>performance compared with previous image fusion methods in both subjective and objective evaluation.</p>
CA1021 15:15-15:30	<p>Histogram Equalization Based on Custom Region of Interest</p> <p><b>Longzhi Zhang</b>, Huan Jin and Dongmei Wu</p> <p>State Key Laboratory of Robotics and System, Harbin Institute of Technology, China</p> <p>ABSTRACT--Image enhancement has been widely used in aerospace, biomedicine, industrial production, and public safety. However, problems such as poor real-time performance of methods and inflexible selection of local enhancement regions often occur during the period of enhancement. To solve these issues, we propose a histogram equalization method based on custom region of interest (CROIHE), which could arbitrarily select position and size of interest region to enhance. Compared with the commonly global enhancement methods, our method has shorter computation time and better performance in real-time field. Besides, the proposed approach also has good enhancement effect and strong robustness in enhancing interest areas of different positions and sizes.</p>
CA1020 15:30-15:45	<p>Analysis and Comparison of Grayscale Correction</p> <p><b>Longzhi Zhang</b>, Huan Jin and Dongmei Wu</p> <p>State Key Laboratory of Robotics and System, Harbin Institute of Technology, China</p> <p>ABSTRACT--Image enhancement as an effective means to improve image quality, is still a basic topic in image processing, which has attracted largely attentions from researches. Yet among enhancement algorithms, grayscale correction, including gray transformation and histogram processing, is widely used because of its simple principle. Hence, this paper discuss commonly used algorithms in above two categories, and apply them for different scenarios, to obtain their enhance effect. Through analyze and compare their distinctions from theory to experiment, we found that these methods are still to be improved, for instance in real-time, and grayscale. This paper is a fundamental investigate on image processing, which could provide a reference for further research on image enhancement.</p>

# Session II

16:00-18:30  
Tanggula Hall @ 17th floor

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**August 12th, 2018**

## Session II

**[Artificial intelligence and robot]**

**🕒 16:00-18:30**

**📍 Tanggula Hall @ 17th floor**

**(唐古拉厅 - 17楼)**

**Chaired by Asst. Prof. Yao Yeboah, Guangdong University of  
Technology, China.**

**10 presentations—**

CA1002 CA1011 CA1013 CA1016 CA023 CA033 CA018 CA2001 CA2002 MV1003

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# Session II

16:00-18:30  
Tanggula Hall @ 17th floor

CA1002 16:00-16:15	<p>Design and Reliability Analysis of The Hydraulic System of The Live Working Robot in Substation</p> <p>Xin Zhang, Shungui Liu, <b>Qiang Chen</b>, Jian Li, Huadong Zhang, Yuming Gao</p> <p>Shenzhen Power Supply Co. Ltd., China</p> <p>ABSTRACT--With the continuous development of the smart grid, the electrified work in the substation is becoming more and more important and urgent. According to the special working condition of live working, a hydraulic system suitable for the live overhaul robot in substation is designed, and the system reliability is analyzed</p>
CA1011 16:15-16:30	<p>A Fast Contour Model-based Localization Method for Robotic Picking in Shrimp Production Line</p> <p><b>Niya Chen</b>, Jiayang Ruan, Wei Yang</p> <p>ABB Corporate Research, China</p> <p>ABSTRACT--Irregular-shape food processing by robotic arms like shrimp picking is a common problem in industrial automation, which can be summarized as localization of particular points on an image, emphasizing on both good accuracy and high speed with relatively very limited hardware resources. In most cases, the points do not have a distinct visual characteristic in color or size. In this paper, first we outline the suspicious search range resorting to intelligently learning the coarse mapping function between shrimp shape and target points, based on the proposed contour model of shrimp body, which significantly simplifies numerical representation of the original image. Next, priori knowledge of the shrimp body is used for more accurate fine localization of the target points. More specifically, in this step, the shrimp body pose is normalized for edge extraction after proper rotation and projection. The extracted edge curve on the back of the shrimp is then analyzed to accurately pick out the target corner point. During validation, in the search region detection step, the method is able to efficiently avoid wrong search in neighboring joints of shrimp body. After finer localization of the target points, the final detection rate turns out to be 93%.</p>
CA1013	Semantic Scene Segmentation for Indoor Robot Navigation via Deep Learning

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16:30-16:45	<p><b>Yao Yeboah</b>, Cai Yanguang, Wei Wu, Ziad Farsi</p> <p>Guangdong University of Technology, China</p> <p>ABSTRACT--Indoor robot navigation is a challenging research problem dominated by solutions that exploit complex sensor hardware and stringent offline calibration techniques. This paper presents a vision-based approach which exploits semantic segmentation and deep learning for accurate and efficient indoor scene mapping and collision-free navigation for hardware constrained robotics. Firstly, an accurate and efficient path extraction from complex indoor scenes using deep convolutional neural networks (DCNNs) and transfer learning for semantic pixel-wise segmentation is put forward. Secondly, multiple DCNN architectures and semantic segmentation techniques are explored to highlight the challenges associated with implementation as well as the trade-offs between accuracy and efficiency associated with the state-of-the-art. Finally, the achieved models are deployed and experimentally analyzed. Experimental results highlight promising potential with good accuracies and real-time feasibility in path extraction for collision-free navigation. Results further highlight significant accuracy-efficiency trade-offs which are strongly driven by model decoder sub-network design.</p>
CA1016 16:45-17:00	<p>An Innovative Error Measuring Method for Modular Interfaces of Modular Reconfigurable Robots <b>Zizhen Jiang</b>, Wenbin Gao and Xiaoliu Yu</p> <p>Anhui University of Technology, China</p> <p>ABSTRACT--To improve the accuracy of modular reconfigurable robots by kinematic parameter calibration, currently, the studies mostly adopt calibrating and compensating methods of common robot arm to modular reconfigurable robots. This kind of methods need external measuring equipments to carry out sophisticated operations and cannot realize the original research intention of high precision operations after the rapid reconfiguration of a modular robot. By analyzing the geometric size errors of module body and the assembly errors between modules, this paper proposes a calibration method for modular reconfigurable robots based on parameters measurement, which is replacing the machining and assembly precision with measured ones. For this, a pair of module interfaces is designed. The position</p>

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	<p>and angle errors can be recognized in the assembly interfaces of module by using the relative geometric position between the range sensors of configuration and the pairing interfaces, and the sensor reading. The method achieves an active decoupling for assembly errors between modules. It establishes the foundation for the rapid compensation of the modular robot after reconfiguration.</p>
CA023 17:00-17:15	<p>Integral Backstepping-based Nonlinear Flight Control Strategy for Quadrotor Aerial Robot with Unknown Mass</p> <p><b>Jin Wang</b>, Zhou Fang and Wenjie Zhao</p> <p>School of Aeronautics and Astronautics, Zhejiang University, China</p> <p>ABSTRACT--This paper aims at obtaining a stable and rapid-responsive controller for quadrotor aerial robots with unknown or changeable mass. Based on Newton-Euler formula, integral backstepping method and fractional-order PI/PD control, an adaptive flight control strategy is carried out in Matlab with Lyapunov stability theorem to ensure its stability. The control strategy includes cascade fractional PI/PD control for rotational loop and integral backstepping control for translational loop. Through the comparison with conventional PID flight controller, main criteria for performance as setting time, maximum overshoot and steady-error show its improvement. After validating the proposed control system and controller tuning with several meta-heuristic algorithms, results from non-linear simulation verify the effectiveness and robustness for hovering or near hovering (near quasi-stationary) flight of quadrotors.</p>
CA033 17:15-17:30	<p>Grip Force Estimation of Laparoscope Surgical Robot based on Neural Network optimized by Genetic Algorithm</p> <p><b>Huang Jiaqing</b>, Yan Zhiyuan and Xue Renfeng</p> <p>State Key Laboratory of Robotics and System, Harbin Institute of Technology, China</p> <p>ABSTRACT--In this paper, we described a method of sensorless grip force estimation based on Neural Network (NN) optimized by Genetic Algorithm (GA) to address the gripping force estimation problem of laparoscope surgical robots. The gripping force estimation problem is the key of haptic feedback in Robotic Minimally Invasive Surgeries (RMIS). We</p>

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	<p>verified the proposed method and compared with the grip force estimated by dynamic model. The number of units of hidden layer was optimized so that it made a better fitting performance. The experimental results demonstrated that the proposed method had a good performance for the sensorless grip force estimation, which is well applied to our surgical robots.</p>
<p>CA018 17:30-17:45</p>	<p>Design of fractional order guidance law based on variable order state space <b>Changmao Qin</b>, Qiong Tang and Jianhua Wen China Academy of Launch Vehicle Technology,China</p> <p>ABSTRACT--In the reentry process of hypersonic vehicle, the influence of external disturbance and aerodynamic environment is the key factor to control precision of terminal guidance. Therefore, it is needed to design the guidance law with strong anti-interference to improve the precision of terminal guidance. Based on the variable parameters and nonlinear reentry model of hypersonic vehicle, the fractional order guidance law is designed by using the theory of fractional order system and the optimal control theory. Simulation results show that the fractional order guidance law improves the precision of terminal guidance, and is not sensitive to the change of the guidance coefficient, also has good correction ability and strong robustness to the parameter deviation of reentry initial point.</p>
<p>CA2001 17:45-18:00</p>	<p>Design and Implement of Vehicle-Based Experiment Prototype for Expressway Tunnel Intelligent Detection <b>LIU Xiao</b>, DUAN Ying-jie, XUE Chun-ming, LIU Bo, LI Yang Shanxi Engineering Research Center for Road Intelligent Monitoring, Shanxi Transportation Research Institute, Shanxi Taiyuan, China</p> <p>ABSTRACT--Traditional detection method used in expressway tunnel has the disadvantages of low detection speed, high risk and cannot realize disease information management, a method of design, implement and field test of vehicle-based experiment prototype for expressway tunnel intelligent detection is proposed in this paper. Firstly, based on the demands of expressway tunnel detection, the performance indicators of tunnel intelligent detection system are developed, which include detection speed, detection accuracy, visual</p>

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	<p>system depth and so on. Then, for the visual system, inertial navigation system and mechanical system, an application-oriented method of hardware calculation, selection and design for tunnel detection system is proposed. Finally, according to the above conclusions, the vehicle-based experiment prototype is developed, and field test is carried out in expressway tunnel. The engineering practice shows that the developed tunnel intelligent detection system can collect tunnel surface image quickly, and the research results lay a foundation for tunnel intelligent system developing, image processing and disease intelligent identifying in next step.</p>
CA2002 18:00-18:15	<p>The influence of wing kinematic pattern of biplane flapping wings on the production of aerodynamic forces</p> <p><b>Tao Jiang</b>, Juwei Huang, Hongwei Wang, Shen Tian, Long Cui</p> <p>State Key Laboratory of Robotics, Shenyang Institute of Automation Chinese Academy of Sciences, Shenyang, P.R China; Shenyang Ligong University, Shenyang, P.R China</p> <p>ABSTRACT--The aerodynamics of flapping wing micro air vehicle (FMAV) is significantly affected by the wing kinematics, primarily by the wing flapping and pitching. Designing the patterns of wing kinematics is an effective way to modulate the lift and thrust. This paper aims to investigate the aerodynamic effects of different combinations of flapping and pitching wings of biplane FMAV. We conducted three numerical simulations on biplane flapping wings using the computational fluid dynamics (CFD) method. Overset mesh technique was employed to improve the computational efficiency. Numerical simulation results showed that the thrust directly benefits from wing pitching, which also influences the lift. Explanation of this phenomenon was discussed. This work is highlighted by the insights into asymmetric wings pitching and the effects of it on the aerodynamic performance.</p>
MV1003 18:15-18:30	<p>Lane decision algorithm for active avoidance of intelligent vehicle based on improved back propagation neural network</p> <p>Yang Wang, Jindong Zhang, <b>Zengming Zhang</b>, Zifan Liu, Yuejia Song, Qipeng Miao</p> <p>College of Computer Science and Technology, Jilin University, Changchun, 130012, China</p> <p>Abstract— In view of the traditional intelligent vehicle lane decision algorithm is lack of</p>



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flexibility, and slow convergence speed of traditional back propagation neural network algorithm, the training time is long, easy to fall into local minimum values and without guiding network structure theory, by studying the traditional improving methods of back propagation neural network algorithm, introducing auxiliary weights adjustment parameters and contraction coefficient, abate sawtooth phenomenon, speed up the convergence speed and reduce the training time, and to some extent, improve the accuracy of intelligent vehicle lane decision for active avoidance. Through the synthetic judging three different lanes static target decision, compare the improved back propagation algorithm with the traditional algorithm in the actual lane decision algorithm for active avoidance accuracy and convergence time.



**Dinner @ Café, level 2 (2楼咖啡厅)**

**18:30-20:00**

# Session III

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Hongshan Hall @ 17th floor

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**August 12th, 2018**

## Session III

**[Electronic information technology and  
applications]**

**🕒 13:30-15:45**

**📍 Hongshan Hall @ 17th floor**

**(红山厅 - 17楼)**

**Chaired by**

**9 presentations—**

MV003 CA005 CA022 CA025 CA026 CA029 CA035 CA1010 CA1024

**\*Note:**

- Please arrive 30 minutes ahead of the sessions to prepare and test your PowerPoint.
- After each presentation, a certificate will be awarded to each presenter by the session chair one by one.
- 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.

# Session III

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<p>MV003 13:30-13:45</p>	<p>Research on key problems of data quality in large industrial data environment</p> <p>Aizhang Guo, <b>Xiuyuan Liu</b>, Tao Sun</p> <p>Qilu University of Technology (Shandong academy of science), China</p> <p>Abstract— At present, the modern manufacturing and management concepts such as digitalization, networking and intellectualization have been popularized in the industry, and the degree of industrial automation and information has been improved unprecedentedly. Industrial products are everywhere in the world. They are involved in design, manufacture, operation, maintenance and recycling. The whole life cycle involves huge amounts of data. Improving data quality is very important for data mining and data analysis. To solve the problem of data inconsistency is a very important part of improving data quality.</p>
<p>CA005 13:45-14:00</p>	<p>A Variable Precision Multi-granulation Rough Sets Model Based on Multiple Classification Error Rates and Constraint</p> <p><b>Biqing Wang</b> and Changyong Liang, Qi Ping</p> <p>Tongling University, Tongling, China; Hefei University of Technology, Hefei, China</p> <p>ABSTRACT—In this article, a variable precision multi-granulation rough sets model based on multiple classification error rates and constraint (VMRMC) is presented aiming at the problems of single classification error rate and neglecting constraint for granular spaces existed in current variable precision multi-granulation rough sets theory. The VMRMC enables classification error rates of different granulation to be adjusted independently and is in conformity with the practical applications. It can solve problems more efficiently and more flexibility. Further, a granular space reduction algorithm of VMRMC is designed, which can get ride of the irrelevant or redundant granular spaces. Eventually, an example illustrates the validity of the proposed model.</p>
<p>CA022 14:00-14:15</p>	<p>Research and Development of Data Acquisition System for Cement Enterprises Based on Multi-threading Technology</p> <p><b>He Zhu</b>, Shaohong Jing and Xiaohong Wang</p> <p>Jinan University, China</p> <p>ABSTRACT—This paper aims at the problems of low CPU utilization, poor independence</p>

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	<p>between tasks and poor stability of the system, which are common in the single-threaded data acquisition system of traditional cement enterprises, and carry out multi-threaded research and development for the data acquisition system of cement enterprises. The research and development uses the C# to complete the multi-threaded technology, uses the SQL Server 2012 to store the data, and realizes the collection of each data in the cement enterprise under the Visual Studio 2012 development environment. This paper first introduces the research of multi-threaded technology, and then introduces the design of this multi-threaded data acquisition system software and the design of specific modules. At the end of this paper, the design of data storage table structure and the realization of its function are introduced.</p>
CA025 14:15-14:30	<p>A rapid localization method of radiation sources used for multi-sensor networks</p> <p><b>Shi Chuan</b> and Zhang Yang</p> <p>LEETC, China</p> <p>ABSTRACT—When the distance information is used for localization, due to the influence of system equipment and environmental disturbance, the distance measured will introduce error, which affects the localization accuracy. Based on the multi-sensor network technology, the traditional range localization method is improved in this paper. A rapid localization method of radiation sources used for multi-sensor networks is provided, which can accomplish the target location of the radiation source effectively and improve the localization accuracy.</p>
CA026 14:30-14:45	<p>Design of Angle Measurement System for Dual Polarization Monopulse Radar in Main lobe Jamming</p> <p><b>Zhang Yang</b> and Shi Chuan</p> <p>LEETC,China</p> <p>ABSTRACT—Aiming at the mainlobe jamming problem of monopulse radar, based on the method of dual polarization decoupling estimation, a design scheme of angle measurement system for dual polarization monopulse radar in mainlobe jamming is proposed. The monopulse radar is changed to the dual polarization receiving mode. Combined with the goniometry algorithm, the coupling error of the jamming on the target angle estimation can</p>

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	<p>be eliminated and the target identification and tracking can be completed effectively.</p>
<p>CA029 14:45-15:00</p>	<p>Pulse Shape Discrimination of <math>n - \gamma</math> Based on Pulse Shape Model and Adaptive Kalman Filter</p> <p>Mingfu He, <b>Hongkun Yu</b>, Mingzhe Liu and Bingqi Liu</p> <p>Chengdu University of Technology,China</p> <p>ABSTRACT—Motivated by drawbacks resulting from current neutron (<math>n</math>)-gamma (<math>\gamma</math>) discrimination methods, this paper proposes a new method of <math>n</math>-<math>\gamma</math>discrimination on the basis of pulse shape model of scintillation detector and principals of adaptive Kalman filter. The proposed method extensively exploits model parameters' differences between <math>n</math> and <math>\gamma</math> ray. By properly establishing the state and measurement equations of linear Kalman filter based on pulse shape model with three exponential terms, the track framework of pulse signal is developed for a novel indicator of model residual denoting either the pure noisy component or a combination of model bias and noise. 7056 pulses signals sampled from a <math>^{252}\text{Cf}</math> source are studied for the performance comparison of discrimination between proposed method and other state-of-art methods. The qualitative and quantitative results demonstrated that the proposed method has better capacity of <math>n</math>-<math>\gamma</math>discrimination.</p>
<p>CA035 15:00-15:15</p>	<p>Prediction Model of Dissolved Oxygen Based on SADE-RVM</p> <p><b>Chengyun Zhu</b>, Rong Wang and Qiaoying Tong</p> <p>School of New Energy and Electronic Technology, Yancheng Teachers University,China</p> <p>ABSTRACT—Dissolved oxygen (DO) directly affects the growth status of fishes in intensive aquaculture, thus we set up a prediction model to determine the future changing trend of dissolved oxygen. The DO prediction model we proposed through fusing and improving the self-adaptive differential evolution and relevance vector machine (SADE-RVM) in the paper. To evaluate and compare the performance of the SADE-RVM, the least squares support vector regression (LS-SVR), back propagation neural network (BP) and multivariate linear regression (MLR) model were used for comparison. The calculated mean absolute percentage errors of the results of the four prediction models were 0.35%, 1.3%, 2.03% and 1.33%, respectively. The SADE-RVM model has a higher prediction</p>

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	<p>accuracy and more reliable performance than the other models. When the predicted values of dissolved oxygen fall below the safety level, the farmer can start an oxygen increasing machine in advance to maintain the safety of fishes. The prediction model was used in Yangzhong, Jiangsu province, China, and it performed well and helped farmers make decisions and reduce aquaculture risks.</p>
CA1010 15:15-15:30	<p>Vehicle Window Detection Based on Hough Transform and Integral Projection</p> <p><b>Xing Yang</b></p> <p>National University of Defense Technology, China</p> <p>ABSTRACT—Vehicle window size and position can provide important information for the occupant detection in the HOV system. Therefore, quickly and accurately locating and extracting vehicle windows will greatly improve the processing speed and detection accuracy. According to the characteristics of vehicle windows, we employed Hough transform and Integration projection to cut the window region. Experimental results show that the algorithm has merits of high computing speed and high accuracy of detection.</p>
CA1024 15:30-15:45	<p>Contrapositive Margin Softmax Loss for Face Verification</p> <p><b>Dongxue Xu, Qijun Zhao</b></p> <p>College of Computer Science, Sichuan University, Chengdu, China</p> <p>ABSTRACT--The performance of face recognition has been boosted by the features extracted from deep convolutional neural networks. Ideal features should have minimum intra-class variations and maximum inter-class variations. The most commonly used loss function for classification, softmax loss, however, does not necessarily learn features discriminative enough. Large margin classifiers have nice generalization properties in statistical machine learning. These properties have lead to the application of margin to deep learning in recent years. We hereby propose a new loss function called Contrapositive Margin Softmax loss for face verification task, which helps to learn invariant and discriminative features by introducing margins to both target logits and maximum negative logits of softmax loss. Competitive results on LFW (99.28%) and YTF (95.34%) demonstrate the effectiveness of our approach.</p>

# Session IV

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**August 12th, 2018**

## Session IV

**[Pattern recognition and target tracking]**

**🕒 16:00-18:15**

**📍 Hongshan Hall @ 17th floor**

**(红山厅 - 17楼)**

**Chaired by**

**9 presentations—**

MV004 CA008 CA1007 CA1008 MV007 CA002 CA1005 CA1004 CA3004

**\*Note:**

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# Session IV

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<p>MV004 16:00-16:15</p>	<p>Adaptive Hierarchical Siamese Network for Object Tracking</p> <p><b>Yongfeng Fang</b>, Yun Wu, Bingyu Sun, Chaoyuan Cui□</p> <p>Institute of Intelligent Machines, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei, China</p> <p>University of Science and Technology of China, Hefei 230026, China</p> <p>Abstract— A new object tracking algorithm based on hierarchical Siamese network is proposed to solve the challenges of target deformation and background interference in tracking tasks. The introduction of hierarchical features makes up for the lack of features information caused by too small target. A similarity measure mechanism is firstly learned through matching training of extracted hierarchical features on annotated datasets. Online target tracking is achieved by searching candidate images at multiple scales around the target center of the previous frame. The adaptive exemplar and the first frame exemplar are used to measure the similarity of the current frame to obtain an accurate score map, which allows the algorithm to adapt to the change of the target. Our algorithm achieves real-time target tracking without online fine-tune and achieves long-term effective tracking on multiple challenging video sequences.</p>
<p>CA008 16:15-16:30</p>	<p>Lower Limb Movement Intent Recognition Based on Grid Search Random Forest Algorithm</p> <p><b>Ge Song</b>, Yucheng Wang, Mingming Wang and You Li</p> <p>University of Science and Technology of China</p> <p>ABSTRACT--Intent recognition is the key technique in the research of exoskeleton robot, which has become a necessary and important tool in recovering the elderly and disabled people's walking ability. In this work, four-channel surface EMG signals were used as the control signal for exoskeleton robot of lower limbs. In order to improve the recognition accuracy of human motion intent, a new classification method based on grid search random forest algorithm was proposed. Firstly, the EMG signals were collected from the selected muscles of the two lower limbs. Secondly, IFFT was used for signal preprocess, then a 36-dimension feature vector was extracted for the next step. Finally, the random forest algorithm optimized by grid search method (GS-RFA) was used to recognize the five motion</p>



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	<p>patterns, i.e. go up stair, go down stair, sit, stand and walk. The average recognition accuracy of the three experiments for five motion patterns achieves 97.5%.</p>
CA1007 16:30-16:45	<p>Research of Unlabeled Identification Technology of Equipment Based on Machine Vision HUANG Shao-luo, <b>Zhang Jian-xin</b>, Gao Jian Army Engineering University, China</p> <p>ABSTRACT--In the grass-roots units, the speed of equipment identification directly affect the accuracy and timeliness of equipment maintenance. In this paper, several now-existing methods of identification are aggregated and combed. The problems in the supply-level application of the spare parts are found, and a method for identifying the equipment entities called “Unlabeled Identification Technology of Equipment Based on Machine Vision” is proposed. In addition, the advantages of the method, which is very beneficial to the promotion of battlefield support ability, are obtained by comparing the differences between the old and new methods.</p>
CA1008 16:45-17:00	<p>Target tracking based on improved STRCF algorithm <b>Xingting Yao</b>, Yong Xu, Denggui Zhang Beijing Institute of Technology, China</p> <p>ABSTRACT--Target tracking gets great attention in recent years. The correlation filter uses Fast Fourier Transform (FFT) to convert the convolution in time domain to the multiplication operation in frequency domain, thereby effectively training the filter model. The initial tracking frequency based on the Discriminant Correlation Filter (DCF) can reach 700 frames per second. DCF has progressed rapidly in recent years. Trackers such as Spatially Regularized DCF (SRDCF) and Continuous Convolution Operator Tracker(C-COT) have a high degree of accuracy when tracking targets. However, while pursuing better tracking performance, the high-speed and real-time characteristics of the relevant filters are also gradually declined. The increase in the complexity of the model and the variety of target features increases the risk of over-fitting of these trackers. To solve these problems, this paper proposes three solutions: 1. Use deconvolution algorithm to reduce the dimensionality of input image features, thereby reducing the amount of model update</p>

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	<p>operations, improve the speed of our tracker; 2. Prediction of the target position, which reduces the number of candidate boxes, speeds up the positioning process, and improves the tracking performance of moving targets. 3. Reduces the frequency of model updates, saves tracking time, and avoids model drift. Compared with STRCF, our tracker with deep features provides a 5× speedup with only 3.1% decrease in success plots rate (SR) on OTB-2015</p>
MV007 17:00-17:15	<p>Visual Path Tracking Control for Park Scene <b>Linjiong Zhu</b>, Wenfu Wang, Weijie Yang, Zhijie Pan, An Chen College of Computer Science and Technology, Zhejiang University</p> <p>Abstract— Autonomous driving application is developing towards specific scenes. Park scene has features such as low speed, fixed routes, short connection, less complex traffic, and hence is suitable for bringing autonomous driving technology into reality. This paper targets park scene, and proposes a visual path tracking lateral control method using only one webcam. First, we calculate error of distance and error of angle from camera images, and then use fuzzy logic to fuzzify them into a combined error degree. The PID control algorithm takes it as input, and outputs steering wheel angle control command. Fuzzification could tolerate the error brought by image transformation and lane detection, making PID control more stably. Our experiments in both virtual and real scene show that our method can accurately and robustly follow the path, even at night. Compared with pure pursuit, our method can make 5 meters turning.</p>
CA002 17:15-17:30	<p>The improved chaotic PSO for the optimization research on multi-cameras network Xiangjin Zeng, <b>Jinwen Tian</b> College of computer science and engineering, Wuhan Institute of Technology, Intelligent robot key Laboratory of Hubei Province, China</p> <p>ABSTRACT--The multi cameras network design has many characteristics of the multi parameters and multiple constraints and large computation, which is an optimization strategy for complex problems in theory. We find usually the exact optimal solution to be require the very large computation. Therefore, the algorithm efficiency must be considered. In the paper, we employ the heuristic attribute reduction algorithms based on the identifiable matrix to</p>

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	<p>reduce the attribute. Then predict the reduction attribute using the improved support vector machine. In order to obtain the optimal prediction accuracy, we use the chaotic particle swarm optimization (PSO) to prevent local optimization of SVM prediction models, which can make the prediction rate significantly increased. Finally, we compare the algorithm of particle swarm optimization , IPSO, CPSO for the multi camera network parameter optimization, and the analysis results show that, compared with other methods, the proposed method in convergence speed, prevent local optimization has improved performance.</p>
CA1005 17:30-17:45	<p>Quadratic Assignment Problem via a Convex and Concave Relaxations Procedure <b>Lei He</b>, Zhi-Yong Liu, Xu Yang, Feng-Yi Zhang Field Engineering College, Army Engineering University of PLA,Nanjing,China ABSTRACT--The convex and concave relaxations procedure (CCRP) was recently proposed to approximately solve the graph matching problem and exhibited a quite promising performance. To extend the CCRP to approximately solve the quadratic assignment problem (QAP), a major trouble is how to figure out the corresponding convex and concave relaxation functions. In this paper we will propose a general but simple QAP algorithm, and will then prove that the algorithm is exactly an type of CCRP algorithm, but without needing to figure out the convex or concave relaxation function in an explicit way. The proposed algorithm can be generally used on symmetric and asymmetric QAP's, and is simple to implement. Extensive experimental comparisons on the QAPLib benchmark data sets witness a state-of-the-art performance of the proposed algorithm.</p>
CA1004 17:45-18:00	<p>Image Augmentation for Classifying Facial Expression Images by Using Deep Neural Network Pre-trained with Object Image Database <b>Yoshihiro Shima</b> and Yuki Omori Meisei University,Japan ABSTRACT--Image augmentation of automatic facial expression classification is proposed on the basis of a combination of a deep neural network and a support vector machine. A neural network pre-trained with a large-scale object image database is used as a feature extractor for facial images. The accuracy of system performance is evaluated using the</p>

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	<p>database “ATR Facial Expression Image Database (DB99).” By using image augmentation, an average recognition rate of 97.92% was obtained, which was a 9.84 percentage point improvement compared with that without augmentation. The experimental results showed the effectiveness of our scheme.</p>
CA3004 18:00-18:15	<p>AVIRO - Modular Perception System for Space Robotics</p> <p><b>Marc Steven Krämer</b></p> <p>ABSTRACT--The effective control of robots needs an exact environment model together with a current state description. The aim of AVIRO is the development of such a system. To generate a robust three-dimensional model of the environment, the system can be mounted with modular sensor devices. A multi-sensorfusion combines the data of several connected units in real-time. Parallel to this, position, attitude and speed of the system are determined continuously. For the recognition of the surroundings, we use lidar in combination with the images of multiple cameras. The pose is given by high precise microelectromechanical (MEMS) and fiber optical inertial measurement units (IMU). One major challenge is the automatic online recalibration of the complete system. Because of aging and thermal or mechanical stress, the position and orientation of the mounted sensors could change. To detect and compensate this a comparison between the IMU and an environment sensor based odometric estimation is made. The processing part of AVIRO consists of two systems. With a field programmable gate array (FPGA) we make a preprocessing of the incoming sensor data. In this step, computationally intensive calculations, especially in the field of digital image processing is done in real-time. Finally, an embedded computer generates the environment model and state description. Unfavorable conditions such as those prevailing in space impose special challenges to the electronic components. Our system will be tested and qualified with technology readiness level 5 (TRL 5). The German Aerospace Center (DLR) funds the project AVIRO.</p>



**Dinner @ Café, level 2 (2楼咖啡厅)**

**18:30-20:00**

# POSTER

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MV006	<p>Node centrality analysis of multiplex networks under Computer virus spreading</p> <p>Yuang Wang, Hongfu Liu, Baoan Ren and Jing Chen</p> <p>College of Intelligence Science and Engineering, National University of Defense Technology, Changsha, P.R.China</p> <p>Abstract— Computer virus are evolving by developing spreading mechanisms based on the use of multiple vectors of propagation. Finding important nodes in the network and taking action can effectively control the range and speed of the computer virus. Most of the current research on the influential spreaders is on the single-layer network level. However, compared with single-layer network, the influential spreaders of multiplex networks will be more realistic. In particular, we design the propagation of a susceptible-infected-susceptible (SIS) model on multiplex networks (not only double-layers networks) where the state of each node is layer-interconnected and the dynamics in each network follows either a contact process or a reactive process, with different propagation rates. Here we show that node evaluation indicators of single-layer network (such as degree centrality, eigenvector centrality, closeness centrality, betweenness centrality and so on) are still applicable in the multiplex networks.</p>
MV1002	<p>Visual place recognition based on multi-level CNN features</p> <p>Zhenqiang Bao, Aihua Li, Zhigao Cui, Jinming Zhang</p> <p>College of war support, Rocket Force University of Engineering, Xi'an, Shanxi, China</p> <p>Abstract—In this paper, we propose a visual place recognition (VPR) detection method which utilizes multi-level CNN features. High-level CNN features contain much semantic information and can deal with the change of viewpoint, middle-level CNN features contain much geometric information and have good robustness to the change of light and so on. Fully integrating the advantages of high-level and middle-level CNN features, the place recognition detection method will own good robustness to challenge the environment with appearance and viewpoint changes. Due to the high dimension of CNN feature vectors, we pre-process the feature vectors before they are used to the detection. And we introduce how to choose the image representation and compute the similarity score in detail. Finally we</p>

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	<p>perform the experiments on three open datasets with viewpoint and appearance changes, which indicate that the performance of multi-level CNN features outperforms any other single-level CNN features and Fab-Map2.0.</p>
CA007	<p>Research on Terminal Guidance Law of Re-Entry Vehicle Attacking Slow Moving Target Song Chao, Li Zhiqiang and Hu Wenlin Naval Aviation University,China</p> <p>ABSTRACT--A kind of terminal guidance law based on Gauss pseudo spectral method (GPM) is provided for the target slowing moving property. Owing to high accuracy and fast convergence, GPM was adopted to solve the optimal reentry trajectory satisfied some performance index and constraints, and the waypoints were set as corrected points. Predictor-correction guidance method was adopted to revise the location error at waypoints. Simulations prove that the guidance method has higher accuracy and can be used to guidance online.</p>
CA009	<p>Dynamic Surface Active Disturbance Rejection Control for Two-Wheeled Self-Balancing Robot Chundong Wang, Jin Huang, Chao Wang and Rui Wu Dalian Maritime University,China</p> <p>ABSTRACT--Considering the control problem of two-wheeled self-balancing robot (TWSBR) under various disturbances, this paper combines the advantages of dynamic surface control (DSC) and active disturbance rejection control(ADRC) to get the dynamic surface active disturbance rejection controller(DSADRC). Firstly, the "total disturbance" of the system is estimated by the expansion state observer after being linearized by dynamic compensation. Then, two DSC controllers are designed for the linearized vertical subsystem and displacement subsystem respectively, and a PD controller is designed for the steering subsystem. Two different robot models, which are constructed on the plane and the undulating surface with known and unknown disturbance, are simulated by the parameter-fixed DSC controller to verify the ability of disturbance rejection. The simulation results show that the DSADRC has a strong ability to restrain various disturbances.</p>

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CA013	<p>Gas Discharge Tube's Electromagnetic Pulse Response Prediction Based on Elman Neural Network</p> <p>Jinjin Wang, Xin Nie, Beiyun Sun, Wei Wang, Hui Xiang, Zhizhen Zhu, Yuewu Shi and Jing Yang</p> <p>State Key Laboratory of Intense Pulsed Radiation Simulation and Effect (Northwest Institute of Nuclear Technology)</p> <p>ABSTRACT—Electronic equipments may be disturbed by electromagnetic pulse during operation in some fields. Gas discharge tube is usually added as surge protection device to protect electronic equipment from electromagnetic pulse. Electromagnetic pulse current injection experiment is used to test gas discharge tube's protective characteristics. In order to reduce experimental times and guide experimental process, Elman neural network was used to predict electromagnetic pulse responses of gas discharge tube. Elman neural network is a recurrent neural network with local memory units and local feedback connections. Experiments showed that the Elman neural network model on gas discharge tube at different grades of voltage injection experiments have had better prediction results.</p>
CA016	<p>Effect of Temperature on COD Measurement by UV-Vis Spectroscopy</p> <p>Jiang Zhengfu, Li Xisheng and Shi Peihua</p> <p>University of Science and Technology Beijing,China</p> <p>ABSTRACT--Changes of temperature affect absorbance in the UV-Vis spectrum, thus when using UV-Vis spectroscopy to monitor COD, we should eliminate the effect of temperature on the spectrum. In this paper, the spectral data of COD standard solution will be measured at different temperatures through experiments, then use linear regression to fit the data and obtain the specific relationship between temperature and absorbance, finally to provide a method for spectroscopic monitoring of COD modeling optimization.</p>
CA017	<p>Application of Wavelet and Wavelet Packet Transform in Water Quality Analysis Based on UV-visible Spectrum</p> <p>Tingting Wang, Xisheng Li and Peihua Shi</p> <p>School of Automation University of Science and Technology Beijing,China</p>

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	<p>ABSTRACT--In the online detection of water quality based on UV-Vis spectroscopy, there are different levels of interference in the original spectral signal. In order to improve the signal-to-noise ratio of the signal and the accuracy of the system parameter calculation, the original spectral signal acquired needs to be denoised. In this paper, the different water sample data obtained are processed by wavelet and wavelet packet transform, and the differences between the two methods are analyzed to determine the optimal denoising method for water quality spectral signals.</p>
CA020	<p>A Cloud-based Control System Architecture for Multi-UAV</p> <p>Chen Hong and Dianxi Shi</p> <p>National Laboratory for Parallel and Distributed Processing(PDL), National University of Defense Technology, China</p> <p>ABSTRACT--Unmanned aerial vehicle is considered one of the most promising technologies. Controlling UAV over the cloud is an emerging research area motivated by the emergence of Cloud Robotics and the Internet-of-Things (IoT). This paper presents a control system architecture based on cloud platform which has been developed in order to allow multiple users to control and monitor multiple UAVs simultaneously irrespective of the location. Furthermore, the system allows to build and allocate missions to UAV and analyze the execution data that collect by sensors. The architecture of the system is fully based on open source software and protocols. To demonstrate the effectiveness of the system architecture, we implemented and validated it using SITL (software in the loop) simulator. Experimental results show that the system is efficient in monitoring and controlling UAV remotely through the Internet.</p>
CA031	<p>Conservatism Reduction in Guaranteed Cost Control for a Class of Uncertain Nonlinear Systems</p> <p>Zhuangyu Liu, Jiwei Wen and Li Peng</p> <p>Jiangnan university,China</p> <p>ABSTRACT--This paper develops a conservatism reduction approach for neural-network-based uncertain nonlinear systems to achieve guaranteed cost control. First, a</p>



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	<p>multi-layer neural network model is used to approximate the nonlinearities in dynamic systems, and it is formulated as a linear difference inclusion (LDI) representation. Then, a multi-step ahead Lyapunov function is developed for guaranteed-cost control based on the LDI model. The advantage of such a Lyapunov function is to reduce the conservatism of the linear matrix inequality constraints so that a lower upper bound of the linear quadratic performance index could be expected. Finally, a numerical example is provided to demonstrate the effectiveness of the proposed method.</p>
CA1001	<p>Research on feature map generation based on Simultaneous localization and mapping Wang Dandan; Tan Kaituo; Hongjie Li College of Electronic Information and Electrical Engineering, Anyang Institute Of Technology Anyang, Henan Province, China</p> <p>ABSTRACT--In view of the problems of the low precision for localization based on traditional navigation with non-Gauss and non-linear model in underwater and the backward pipeline detection method, a pipeline feature map generation algorithm based on the simultaneous localization and mapping (SLAM) was proposed. By building the system state model and observation model based on SLAM, it used Cubature Kalman Filter algorithm to estimate and analysis the state of carrier and the characteristics, and the experimental results showed that the new filtering algorithm could realize high precision navigation with small error. Finally, it extracted the wreckage and pipeline characteristics with the Scan Invariant Feature Transformation (SIFT) algorithm based on the SLAM, and the experimental results proved that the new algorithm could achieve higher correlation of feature matching.</p>
CA1014	<p>Action Recognition with 3D ConvNet-GRU Architecture Guangle Yao, Xianyuan Liu and Tao Lei University of Science and Technology of China, China</p> <p>ABSTRACT--Video action recognition is widely applied in video indexing, intelligent surveil-lance, multimedia understanding, and other fields. Recently, it was greatly improved by incorporating the learning of deep information using convolutional neural network</p>

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	<p>(ConvNet). In this paper, we proposed a 3D ConvNet-GRU architecture to learn deep information for action recognition. Specifically, we use 3D ConvNet to learn spatiotemporal information from short RGB clips and optical flow clips, and impose gated recurrent unit (GRU) on the spatiotemporal information to model the temporal evolution for action recognition. The experimental results show that our 3D ConvNet-GRU method is effective to model temporal evolution for action and achieves recognition performance comparable to that of state-of-the-art methods.</p>
CA1015	<p>A Discriminatively Learning Model with Illumination Transfer for Inter-Camera Pedestrians Association</p> <p>Shijun Zhong, Chunyan Yu and Jiali Lin</p> <p>University of Science and Technology of China, China</p> <p>ABSTRACT--Inter-camera pedestrians association always employs appearance features to merge tractlets of the same pedestrian into a whole. However, appearance features are always view- and illumination- sensitive. In this paper, we present a method to solve inter-camera pedestrian association via discriminative learned feature in a stable way with illumination transfer. First, we proposed a discriminative feature learning model which is a convolution siamese network that combines the verification and identification losses. Furthermore, we introduce color brightness transfer reduce color distortions under different illumination. To learn proper brightness transfer function, a fuzzy color cluster is used to model the change of color brightness between different cameras. The experiments show the effectiveness of the proposed method and achieve the state-of-the-art in the benchmark NLRP_MCT dataset.</p>
CA1018	<p>Research on The boundary recognition of self-walking agriculture machine based on Vision</p> <p>Yibo Li and Qiushi Wang</p> <p>Shenyang Aerospace University, China</p> <p>ABSTRACT--The boundary recognition algorithm of self-walking agricultural machine based on vision was proposed in this paper,which combined 2D-gabor with uniform pattern of LBP to extract the texture features of boundary area .After that, an algorithm that fuzzy</p>

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	<p>extreme learning machine based on KFCM was presented to improve the accuracy of boundary recognition. The experiment result shows that the proposed method is effective in classifying the boundary of the working area in the process of self-walking agriculture tractor, and owns highaccuracy.</p>
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