Conference Program

September 25-27, 2019

Amsterdam, Netherlands

ISCSIC 2019

> 2019 3rd International Symposium on Computer Science and Intelligent Control

IARCE 2019

> 2019 3rd International Conference on Industrial Automation, Robotics and Control Engineering

CPSIOT 2019

> 2019 2nd International Conference on Cyber Physical Systems and IoT

Welcome

Dear Distinguished Participants,

Welcome to 2019 3rd International Conference on Industrial Automation, Robotics and Control Engineering (IARCE 2019), 2019 3rd International Symposium on Computer Science and Intelligent Control (ISCSIC 2019) and 2019 2nd International Conference on Cyber Physical Systems and IoT(CPSIOT 2019).

After one-year painstaking preparation, we're delighted to declare that September conference organized by IASED will be held in Amsterdam, Netherlands as scheduled.

First of all, we'd like to express our sincere gratitude for your participation, which is the vital note to make the conference a great forum for the collision and fusion of ideas and knowledge. Besides, we'd like to say that the kind help and great efforts offered to our conference by our conference chair Prof. Zhang Jie and Prof. Massimo Marchiori are greatly appreciated. Meanwhile, we also appreciate our Plenary Speakers: Prof. Tom Heskes, Prof. Peter Andras, and Keynote Speakers: Prof. Zhang Jie, Prof. Peng Yang, and Prof. Massimo Marchiori who will share their newest and outstanding research achievements on the conference site. Besides, we also appreciate the support of our local chair Prof. Dr. John-Jules Ch. Meyer.

In this big data age, the ever-changing information technology has updated and revolutionized the structure and content of our knowledge. The aim as well as the objective of IARCE&ISCSIC&CPSIOT 2019 is to present the latest research and results of Industrial Automation, Robotics and Control Engineering, Computer Science and Intelligent Control, Cyber Physical Systems and IoT. By providing opportunities for the delegates to exchange new ideas face-to-face, to establish business or research relations as well as to find global partners for future collaborations, we do hope that the conference will intensify mutual improvement and facilitate academic exchange, as a result that leading to significant contributions to the knowledge in these up-to-date scientific fields.

Finally, we wish 'IARCE&ISCSIC&CPSIOT 2019' will be held with a complete success. At the same time, we wish you enjoy a very splendid time during the conference days in the impressive city of Amsterdam, Netherlands!

Thank you!

IARCE&ISCSIC&CPSIOT 2019 Committee

❖ **Registration**

The registration desk will be situated at **Meeting Foyer, Park Inn by Radisson Amsterdam Airport Schiphol** during the following time: **9:00-17:00, Wednesday 25th September, 2019.**

❖ **Reception**

An ice break reception will be held during:**15:00-16:00, Wednesday 25th September, 2019** at **Meeting Foyer, Park Inn by Radisson Amsterdam Airport Schiphol.**

❖ **Remarks**

❖ **Conference will provide free coffee breaks, lunch and dinner on 26th September, 2019, beyond the fixed menu will be on personal bill. The conference venue is open to participants only, The children is off limits to the conference room.**

❖ **A Polite Request to All Participants**

Participants are requested to arrive in a timely fashion for all addresses. Presenters are reminded that the time slots should be divided fairly and equally by the number of presentations, and that they should not overrun. The session chair is asked to assume this timekeeping role and to summarize key issues in each topic.

❖**Dress Code:** Formal or national custom

Sandals or Slippers   Tank Top   Shorts

❖ **Certificate**

Certificate of Attendance

A certificate of presentation indicates a presenter's name, affiliation and the paper title that is presented in the scheduled session, certifying the paper has been presented on the conference site.

Certificate of Best Paper & Best Student Paper & Best Poster

Presenters who presents a great oral presentation or poster presentation will be awarded as the Best Paper, the Best Student Paper or the Best Poster in ceremony on 26th September, 2019.

Certificate Distribution

Oral presenters will receive a certificate of presentation from the session chair at the end of your presentation.

Poster presenters will receive a certificate of presentation from the conference chair at the poster session.

Listener will receive a certificate from the conference chair at the end of the conference.

❖ **Preparation for Oral Presentations**

All presentation rooms are equipped with a screen, an LCD projector, and a laptop computer installed with Microsoft Power Point. You will be able to insert your USB flash drive into the computer and double check your file in PowerPoint. We recommend you to bring two copies of the file in case that one fails. You may also connect your own laptop to the provided projector, however please ensure you have the requisite connector.

Regular Oral Session: about 15 minutes of Presentation, 2-5 minutes of Q&A.

❖ **Preparation for Poster Presentation**

Materials Prepared by the Conference Organize

Adhesive tapes

Materials Prepared by the Presenters:

Home-made poster (s)
Material: not limited, can be posted on the canvases.
Recommended poster size: weight*height: A0
(841mm×1189mm)

Park Inn by Radisson Amsterdam Airport Schiphol

Address: Beech Avenue 142-160 Schiphol-Rijk NL - 1119 PR Amsterdam Netherlands

❖**Transportation**

From Schiphol Airport	**Travel with navigation system** Some satellite navigation systems do not accept the location 'Schiphol-Rijk'. Instead use 'Haarlemmermeer' or search for the zip code '1119 PR'.	
	By shuttle bus The train station of Schiphol is located below Amsterdam International Airport Schiphol. You can find the Radisson Blu shuttle bus at stops A9-A13, look out for a black and green bus. The shuttle departs every 20 minutes and takes you to the hotel and back to the airport for free. The shuttle runs starting from 06:00 to 23:30. During the night the shuttle runs on demand. For actual train information please visit www.ns.nl/en. For a step by step description to hotel please visit: maps.google.nl	
	By public transport Take the bus 181 or 342 (dir. Uithoorn Busstation) and get off at Schiphol-Rijk, Beechavenue stop (250 m from the hotel).	
	By taxi The ride takes 10 minutes (6 km).	
From Amsterdam Central Station	**By public transport** The Sprinter train takes your to Amsterdam Schiphol, where you have to switch for bus 342. Get off at Schiphol-Rijk, Beechavenue (250m from the hotel). It takes around 40min in total.	
	By taxi The ride takes 30min (25km).	

Venue Information

Item	Room
Registration	Meeting Foyer, Ground Floor
Welcome Reception	Meeting Foyer, Ground Floor
Plenary Session	Calatrava + Citer, Ground Floor
Keynote Session	Calatrava + Citer, Ground Floor
Oral Presentation A, A-1	Calatrava + Citer, Ground Floor
Oral Presentation A-2	Harp, Ground Floor
Coffee Break	Meeting Foyer , Ground Floor
Poster Presentation	Meeting Foyer, Ground Floor
Award Ceremony & Closing Ceremony	Calatrava + Citer, Ground Floor
Lunch	Meeting Foyer, Ground Floor
Dinner	Restaurant, Ground Floor

Program Overview

	Wednesday 25-September		Thursday 26-September			Friday 27-September
08:20-08:35			Welcome Address			
08:35-09:20			Plenary Speech 1 *Prof. Dr. Tom Heskes*			
09:20-10:05			Plenary Speech 2 *Prof. Peter Andras*			
10:05-10:30			Group Photo & Coffee Break			
10:30-11:10			Keynote Speech 1 *Prof. Jie Zhang*			
11:10-11:50	Registration		Keynote Speech 2 *Prof. Peng Yang*			
11:50-12:30			Keynote Speech 3 *Prof. Massimo Marchiori*			
12:30-13:30			Lunch			
13:30-13:45			Oral Session A	S1001		
13:45-14:00				S1003		
14:00-14:15				S022		
14:15-14:30				S023		Free day
14:30-14:45				S026		
14:45-15:00				S028		
15:00-15:15	Reception	Registration		S029		
15:15-15:30				S030		
15:30-15:45				S1002		
15:45-16:15			Coffee Break & Poster Presentation			
16:15-16:30	Registration		Oral Session A-1	S034	Oral Session A-2	R005
16:30-16:45				S039		R006
16:45-17:00				OT1001		R013
17:00-17:15				OT007		R014
17:15-17:30				OT008		R015
17:30-17:45				OT009		R017
17:45-18:00				OT1002		R1001
18:00-18:30			Award Ceremony & Closing Ceremony			
18:30-19:30			Dinner Banquet			

Plenary Speech 1

08:35-09:20, Thursday, 26th September, 2019

Calatrava + Citer, Ground Floor

Title: Causal Discovery from Big Data

Prof. Dr. Tom Heskes

Radboud University Nijmegen, Netherlands

Abstract

Discovering causal relations from data lies at the heart of most scientific research today. In apparent contradiction with the adagio "correlation does not imply causation", recent theoretical insights indicate that such causal knowledge can also be derived from purely observational data, instead of only from controlled experimentation. In the "big data" era, such observational data is abundant and being able to actually derive causal relationships from very large data sets would open up a wealth of opportunities for improving business, science, government, and healthcare. In this talk, I will sketch how insights from statistics and machine learning may lead to novel approaches for robust discovery of relevant causal relationships with applications in health and genomics.

Introduction to Prof. Dr. Tom Heskes

Tom Heskes is full professor of Artificial Intelligence. After receiving his PhD on neural networks, he worked as a postdoc at the Beckman Institute in Champaign-Urbana, Illinois. Back in the Netherlands, he joined SNN, the Foundation for Neural Networks. Tom Heskes is VICI laureate, received two TOP grants (EW and ZonMW), and has been (co-)leading various other national and European projects.

Heskes' research concerns the development, understanding, and application of machine learning methods, currently in particular deep learning and causal inference. He works on applications in other scientific disciplines, in collaboration with physicists, astronomers, neuroscientists, biologists, and medical specialists, as well as in industry, among others through his spin-off company Machine2Learn.

Title: Trust, privacy and intelligent control

Prof. Peter Andras

School of Computing and Mathematics, Keele University, UK

Abstract

Intelligent control is widespread today and is used in cars, home appliances and factory robots among other things. The advent of deep learning made possible to develop successful applications in many areas where classification, regression or pattern recognition is required on the basis of data. However, the success of these applications often masks unexplored uncertainties due to complex models of the data, naïve assumptions of the users, and unexpected situations of use. In order for devices relying on intelligent control to become fully and reliably accepted and to realize their potential benefits, it is important to understand how human trust relates to machines equipped with intelligent control. A particular aspect of trust relates to guaranteeing the privacy of the users, who let these machines access their behavioral data. This talk will address these issues, discuss illustrative examples and indicate possible directions of development for trustworthy and privacy preserving machines with intelligent control.

Introduction to Prof. Peter Andras

Professor Peter Andras has a BSc in computer science (1995), an MSc in artificial intelligence (1996) and a PhD in mathematical analysis of neural networks (2000), all from the Babes-Bolyai University, Cluj, Romania. He is a Professor in the School of Computing and Mathematics, Keele University, UK. He has published 2 books and over 100 papers. He works in the areas of machine learning, complex systems and computational neuroscience. Professor Andras is senior member of the IEEE, member of the International Neural Network Society (INNS), of the Society for Artificial Intelligence and Simulation of Behaviour (AISB), of the International Society for Artificial Life (ISAL) and fellow of the Royal Society of Biology (RSB).

Coffee Break & Group Photo

Thursday, 26th September, 2019	**10:05-10:30**	**Meeting Foyer, Ground Floor**

Keynote Session

Keynote Speech 1

10:30-11:10, Thursday, 26th September, 2019

Calatrava + Citer, Ground Floor

Title: Multivariate Statistical Process Performance Monitoring

Prof. Jie Zhang

University of Newcastle, UK

Abstract

In today's chemical and process industries, plants are becoming larger, more complex and heavily instrumented. The requirements to manufacture products with minimal variations around desired quality targets and to operate safely according to health, safety and environmental protection regulations, have become essential due to market and public demand. The key to successful operation is efficient on-line process monitoring, which enables the early warning of process disturbances, process malfunctions or faults. This talk presents some multivariate statistical process performance monitoring techniques that capitalise on the huge amount of historical process operational data. Many industrial processes are characterised as "data rich and information poor". Discovering useful information through analysing the huge historical process operational data is the key in successful process monitoring. The bases of multivariate statistical process performance monitoring techniques are multivariate projection techniques, such as principal component analysis (PCA), partial least squares (PLS), multidimensional scaling (MDS), and canonical variate analysis (CVA). The philosophy behind these approaches is to reduce the dimensionality of the problem by forming a new set of latent variables to obtain an enhanced understanding of the process behaviour. The basic techniques of multivariate statistical process monitoring will be presented. Techniques for coping with nonlinear processes, batch processes, processes with multiple operating modes, and fault diagnosis will also be discussed.

Introduction to Prof. Jie Zhang

Dr. Jie Zhang received his PhD in Control Engineering from City University, London, in 1991. He has been with the School of Engineering, Newcastle University, UK, since 1991 and is currently a Reader in Process Systems Engineering and Degree Programme Director for MSc in Applied Process Control. His research interests are in the general areas of process system engineering including process modelling, batch process control, process monitoring, and computational intelligence. He has published over 290 papers in international journals, books, and conference proceedings. He is on the Editorial Boards of a number of journals including Neurocomputing published by Elsevier, PLOS ONE and International Journal of Automation and Control.

Keynote Speech 2

11:10-11:50, Thursday, 26th September, 2019

Calatrava + Citer, Ground Floor

Title: Motion intention recognition and advanced control strategies for wearable exoskeletons

Prof. Peng Yang

Dean of School of Artificial Intelligence and data science, Hebei University of Technology, China

Abstract

Wearable exoskeleton is a power assist robot with actuated joints which has significant value in military, industry and rehabilitation. The complex interaction between exoskeleton and human body makes it an intractable problem to realize the cooperation movement of human-robot system. The specific challenges can be summarized as recognition of human motion intention, construction of controllable dynamics and development of control strategies for human-robot system. For the motion intention recognition problems of muscles selection and fatigue, the recognition strategies by EMG are proposed based on complex network theory and causal detection method. For the control problems of fast convergence, modeling difficulties, data transportation and computation, the advanced control strategies are proposed including fixed-time, model-free and event-triggered control theories.

Introduction to Prof. Peng Yang

Peng Yang was born in Beijing, China, in 1960. He received the M. S. degree in automation from Harbin Institute of Technology, Harbin, China, in 1988, and the Ph. D. degree from the Hebei University of Technology, Tianjin, China, in 2001. Since 1982, he has been with the Hebei University of Technology, where he is currently a Professor and the Dean of School of Artificial Intelligence and data science. Since 2005, he has been with the University of Munich as a Visiting Scholar. Dr. Yang is the Director of Engineering Research Center of Intelligent Rehabilitation and Detecting Technology, China, and the Deputy Director of Life Modeling and Simulation Committee

of China System Simulation Society. His research interests include complex system modeling and control, robot control, and prosthetics. Dr. Yang received awards and honors including the Nature Science Award of Hebei Province, the Science and Technology Progress Awards of Hebei Province, and the Nature Science Award of Chongqing.

Keynote Speech 3

11:50-12:30, Thursday, 26th September, 2019

Calatrava + Citer, Ground Floor

Title: Cyber Physical Systems and Data Science: the public and private challenge

Prof. Massimo Marchiori

University of Padua, Italy; European Center for Science, Media and Democracy, Belgium

Abstract

Cyber Physical Systems have expanded in scope and impact, due to the amazing progress in hardware components. There are however also missed opportunities, due to the fact that technological advances are only one side of the coin. Alongside, the power of Data Science has also made tremendous progress, enabling new views of the collected data. Societal components, like companies and institutions, have anyway to face also other issues, like financial constraints, that are often overlooked when designing new advanced technology. In this keynote we consider cyber physical systems under this perspective, and show how suitable handling of the cost factor brings to new intermediate technological solutions that can empower various real-world scenarios using suitable data analysis. Seeing is better than believing, and so we will present a number of interesting success stories, developed both for public organizations and for private companies, and also illustrate some key lessons learnt along the way.

Introduction to Prof. Massimo Marchiori

Massimo Marchiori is currently Professor at the University of Padua (Italy) and Technical Director of the European Institute for Science, Media and Democracy (Belgium). Working at MIT (USA) he led the development of several world standards, like P3P (web privacy), XQuery (semi-structured information) and OWL (web reasoning).

Among others, he created Hypersearch (Google's forerunner), Volunia (the next-generation social search engine), Negapedia (the negative version of Wikipedia). He works in many multidisciplinary fields, also in cooperation with several companies, focusing on new technologies that can impact our society.

He won a variety of awards, including the IBM research award, the Lifetime Membership Award of the Oxford Society, the Microsoft Data Science Award, the MIT Technology Review TR35 award given to the world best innovators.

Lunch

Oral Session A

Conference Chair: Prof. Jie Zhang and Prof. Massimo Marchiori

A Compensation Method for FOG Temperature Drift Error Based on Double-section Polynomial Fitting

Yang Li │ Ke Chen │ Liuwei Mao

S1001
Dr. Yang Li
Navy Research Academy, China
15 min

The problem of large modeling error exists in the modeling and compensation of Fiber Optic Gyroscope (FOG) temperature drift by traditional polynomial fitting. In the case, a compensation method for FOG temperature drift error based on double-section polynomial fitting is studied, which can build the model of the FOG temperature drift error in both the startup section and the balanced section. Experimental results show that the new method can improve both the accuracy of modeling and the effect of compensation effectively.

Octree-Based Hierarchical 3D Pathfinding

Timur Muratov │ Aleksandr Zagarskikh

S1003
Timur Muratov
(Student)
Design and Urbanistics Institute

Despite the fact that the problem of pathfinding exists for quite a while, most of the related work is focused on methods that are applicable only in 2D environment. However, there is a demand for methods that can provide a solution for pathfinding tasks in 3D working space. These tasks mostly come from area of robotics and game development, where it is often required to get a solution in real-time.

The main problem, besides the lack of appropriate methods, is that in 3D environment the working space size increases greatly in comparison with 2D case, and it becomes harder to construct a precise representation of this space while maintaining low size of search graph. To overcome this, methods

ITMO University Russian Federation **15 min**	that lower graph size, whether explicitly or implicitly, are used.
	This paper provides a brief review on some of existing approaches, comparison of their effectiveness and presentation a new method of real-time pathfinding in 3D environment that can be helpful in real-time calculations (i.e. game development area). This brief review will be referred to when comparing proposed method with existing ones.
	A proposed method combines advantages of using octree structure as search graph (such as sparce free space representation) and hierarchical path planning (effective reduction of graph size by clustering). Thus, an appreciable speed-up is achieved.

Gait Tracking for Lower Extremity Exoskeleton Based on Impedance Control

Yanli Geng | YaweiChen | BokaiXuan | QianWang

S022 Assoc. Prof.Yanli Geng Heibei University of Technology, China **15 min**	In the process of human and exoskeleton cooperative movement, precise tracking of joint position will significantly enhance the cooperation between user and exoskeleton. Especially in the support phase, the exoskeleton contacts with the environment, not only to make the exoskeleton adapt to the changes of the environment, but also to track of the position. So, a position-based impedance control strategy is proposed. In this paper, dynamic model of exoskeleton system in the support phase is established, an impedance-based gait tracking controller is designed and also proved the stability of the closed-loop system.

The Research of Gait Recognition Based on High Dynamic Force Sensing Resistor

Yanli Geng | PengYang | XiaoDongCai | LinglingChen

S023 Assoc. Prof.Yanli Geng Heibei University of Technology, China **15 min**	The human gait contains the information of lower limb movement posture. Gait recognition and analysis can provide control information for lower limb rehabilitation robots. In different gait phases, the position of the foot touching the ground is different. Therefore, gait classification can be performed according to plantar pressure. This study investigated the changes in plantar pressure information during human lower limb walking. Firstly, the STM32 single-chip microcomputer is used to collect the plantar pressure information detected by the high dynamic force sensing resistor(HD-FSR); secondly, the collected information is transmitted to the upper computer through Bluetooth; finally, all kinds of gait phases pressure features are analyzed and classified. Since the two constant parameters in the Support Vector Machine(SVM) classification algorithm have a great influence on the classification effect, a SVM classification algorithm based on the Particle Swarm Optimization(PSO) is proposed to realize the recognition of different phases.

An IoT-based HIS for Healthcare Risk Management and Cost Control: a Proposal

Frances Gargiulo | M. Arciprete | R. Chianese

In the last decade Hospital Information Systems (HIS) received extensive research attention because international studies [1] [4] show how the introduction of HISs contributes to general errors reduction and could result in substantial improvement in patient safety. This paper introduces FIDMED, a Hospital Information Systems (HIS) based on a deep integration between hardware and software, both of them specifically designed and implemented by Kiranet I.C.T. Research Centre. It comprises a web based clinical application, named FIDCARE, a set of smart medical carts, smart medical cabinets and smart pocket dispenser, respectively named FIDRUN, FIDROK and FIDRAY. From a high-level user perspective, FIDMED aims to: a) reduction of the healthcare services clinical risk, b) cost control and cost reduction and c) improvement in the overall quality assurance of clinical processes. From a technical point of view, FIDCARE is a platform implementing an interesting architecture combining technologies such as Representational State Transfer (REST) services, Radio-Frequency IDentification (RFID), Barcodes Management, Adaptive Graphical User Interface, Gesture Interface and Voice User Interfaces everything under the "hat" of Internet of Things (IoT).

S026
Dr. Francesco Gargiulo
Healthcare Services, Italy
15 min

Diagnosing Clinical Manifestation of Apathy Using Machine Learning and Micro-facial Expressions Detection

Sara Makki | Antoun Yaacoub | Zainab Assaghir | Radwan Almokdad

Apathy is a behavioral and personality change and is generally defined as a loss of motivation. In this study, we will explore the detection of apathy in two phases. An apathy detection phase, and relevant features identification phase. In the first one, we apply micro-facial expressions detection systems and counter for the purpose of diagnosing clinical manifestation of apathy from a video for Lebanese citizens. The method works by applying Histogram of Oriented Gradients (HOG) as a feature descriptor on video dataset of spontaneous micro facial movements. Micro-facial expressions appear by video recording participants reacting to emotional stimulating COPE cards. Results are compared to Lille Apathy Rating Scale LARS scores. Kappa agreement was calculated to be 95.96% showing the proposed classification method has a high accuracy of estimation.

In a second phase, we aim to identify the demographics and habits that might be affecting the manifestation of apathy using machine leaning algorithms. A statistical model is built based on the results to identify the characteristics that affect the manifestation of apathy by analyzing the data and making a

S028
Sara Makki
(Student)
University of Claude Bernard Lyon 1, France
15 min

statistical description. Using a sample of 470 participants, we base our results on the decision tree (CART) combined with logistic regression. Finally, we found that insomnia, genetic background and stress are the most important features that influence the manifestation of apathy, with an accuracy of 96.7%.

Hardware Scheduler Implementation based on Replicated Resource Architecture for Reconfigurable Systems
Ionel ZAGAN ｜ Vasile Gheorghiță GĂITAN

S029
Asst. Prof.
Ionel ZAGAN
Stefan cel Mare
University of
Suceava,
Romania
15 min

Among many others aspects, technological improvements in the field of microelectronics and microprocessor architectures have radically changed modern systems integrated in real-time applications. The purpose of this study is to extend the hardware implementation of real-time operating system functions (HW-RTOS), thus improving the performance of the interrupt system and the hardware-handling block for events. The research presented in this paper regards the hardware implementation of the event selection mechanism and the introduction of specialized instruction to allow the automatic management of the events.

Formation Maintenance and Collision Avoidance in a Swarm of Drones
Jawad Naveed Yasin ｜ Mohammad-Hashem Haghbayan ｜ Jukka Heikkonen ｜ Hannu Tenhunen ｜ Juha Plosila

S030
Jawad Naveed
Yasin
(Student)
University of
Turku, Finland
15 min

Distributed formation control and obstacle avoidance are two important challenges in autonomous navigation of a swarm of drones and can negatively affect each other due to possible competition that arises between them. In such a platform, a multi-priority control strategy is needed to be executed in each node to dynamically optimize the trade-offs between formation control and collision avoidance w.r.t. given system constraints, e.g. on energy and response time, by reordering priorities in run-time and choosing the appropriate formation and collision avoidance approach based on the state of the swarm, i.e., the kinematic parameters and geographical distribution of the nodes as well as the location of the observed obstacles. In this paper, we propose a method for formation/collision co-awareness with the goal of energy consumption and response time minimization. The algorithm is composed of two partial nested feedback-based control loops and based on three observations: 1) the relative location of the neighbor nodes for formation maintenance; 2) a boolean value indicating an observation of an obstacle by a local sensor, used for both formation control and collision avoidance; and 3) the distance of an obstacle to the node for collision avoidance in critical situations. The obtained comprehensive experimental results show that the proposed approach appropriately keeps the formation during the swarm's travel in the presence of different obstacles.

Epidemic System Conversion on Industry 4.0's perspective under Dynamic Network Condition

Pasu Poonpakdee ｜ Jarotwan Koiwanit ｜ Chumpol Yuangyai

S1002
Dr.Pasu Poonpakdee
King Mongkut's Institute of Technology Ladkrabang, Thailand
15 min

In large-scale manufacturing operations with increasing global competition, success depends on a reliable network system to complete a value chain transformation. The use of the Industry 4.0 paradigm is increasingly evolving in many areas of different industries to ensure significant increases in factory productivity, flexibility, and efficiency. Consequently, the system transformation requires a shift from single automated node to a fully integrated system. However, selected methodology and results require study to fully understand the digital transformation as well as its characteristics. This investigation presents a system conversion study, between centralized and decentralized systems, using the concept of epidemic membership protocols in the context of Industry 4.0. This paper proposes the method based on membership protocols focusing on the system conversion methodology under dynamic network condition. The experimental results show that the proposed method provides an ability to rewrite the structure of the network topology with optimal accuracy of epidemic application.

Coffee Break & Poster Session

Thursday, 26th September, 2019	15:45-16:15	Meeting Foyer, Ground Floor

Poster

Oral Session A-1

Thursday, 26th September, 2019	16:15-18:00	Calatrava + Citer, Ground Floor

Conference Chair: Prof. Jie Zhang

A l_1 -Norm Regularized Copula based Feature Selection
Snehalika Lall ｜ Sanghamitra Bandyopadhyay

In this paper, we develop a novel feature selection method called RCFS (Regularized Copula based Feature Selection) based on regularized

S034 **Snehalika Lall** **(Student)** Machine Intelligence Unit,Indian Statistical Institute Kolkata, India **15 min**	copula. We use l_1 regularization, as it penalizes the redundant co-efficient of features and makes them zero, resulting in non-redundant effective features set. Scale-invariant property of copula ensures good performance in noisy data, thereby improving the stability of the method. Three different forms of copula viz., Gaussian copula, Empirical copula, and Archimedean copula are used with l_1 regularization. Results prove a significant improvement in the accuracy of the prediction model than any non regularized feature selection method.The number of optimal features to achieve a fixed accuracy value is also less than any other non regularized feature selection techniques.

S039
Vladislav
Gorshkov
(Student)
Design and Urbanistics Institute ITMO University, Russian Federation
15 min

Development of tactical level AI for melee and range combat
Vladislav Gorshkov ｜ Aleksandr Zagarskikh

The development of AI directly affects the emergence of new technologies. In modern video games, AI faces a wide range of tasks at various levels. The current situation is such that in addition to standard decision-making, to which the average player is casual, AI often has to do more complex things: to perceive the environment, interact with it, interact with the other AI, move in a complex three-dimensional space and other various tasks. Given the constant development of the gaming industry, the requirements for AI are constantly increasing. Therefore, there is the problem of AI flexibility. In video games, we can increasingly see how the battle of two NPCs turns into a simple search of teams to attack and defend. These primitives repel the player, destroying a decent part of the gameplay conceived by the developer. In the same way it is applicable to the visualization of historical events. For accurate reconstruction, it is necessary that the behavior of the agents be similar to human ' s behavior.

In this paper, we give a brief review on some of well-known AI development methods, compare their effectiveness and present a new method of AI development that simulate the behavior of non-player character in melee and ranged combat based on the interaction of three levels: strategic, tactical and operational for decision-making. Combination of the well-known methods of AI development, base agent's model change and improvement in agent understanding of the environment by using the Voronoi diagram.

The method proposed in this paper are showing significantly different results from the most popular design methods and the Utility-AI-Behavior Tree method, significantly reducing the distance in terms of key indicators such as survive time, use of useful resources, number of enemies killed. The used method imitates the player's actions, while excluding the human

error factor and unexpected actions. The designed AI simulates the player's logical actions with a good accuracy, but is still more predictable than the real players. Mathematical calculations and the distribution of weights on each frame do not have a significant impact on performance, which allows simulating the behavior of many agents at once in one scenario, without losing performance and influencing the resulting sensations from the gameplay.

OT1001
Dr. Yoong Cheah Huei
Singapore University of Technology and Design, Singapore
15 min

Framework for Continuous System Security Protection in SWaT
Yoong Cheah Huei | Jonathan Heng

Researchers implemented algorithms and attack techniques in programmable logic controllers of cyber physical systems like water treatment testbeds and power testbeds. However, in a real-life water plant such methods are almost impossible to be realised because the public utility company will not risk the damages may cause to the existing system by the software changes as the plant is actively producing water for the consumers. A reduction or stoppage of water due to system modifications will affect the daily life of many people.

Thus, this paper focuses on the architecture framework to generate, run, and test research techniques particularly machine learning invariants in Secure Water Treatment (SWaT) that can be used in a real-life water treatment plant through a non-intrusive method. This framework has been thoroughly tested in SWaT using single or multiple invariants. The software in this framework allows substantial code reuse of data structures and algorithms. The programs to generate, run, and test the invariants are written in Python. The supervised machine learning invariants can detect anomalies without any false alarms for continuous systems in SWaT through physical device attacks and software generated attacks. This framework is also applicable to other cyber physical systems like power and gas testbeds with certain modifications such as the access interfaces and invariant designs. The future direction of this research is to provide a wider coverage protection solution framework to detect anomalies for discrete and continuous systems in cyber physical systems.

OT007
Taner Sundu
OBASE Bilgisayar ve

A Modular System That Monitors Product Shelf-Stock and Planogram Information for Retailers Smart Shelf with IoT
Taner Sundu | Alper Sisman

Empty shelves in retail stores leads to reduced customer satisfaction and as a result of that causes loss of revenue. Most retailers spend considerable effort to overcome the problem by using conventional approaches like daily basis shelf touch-up control. Since current research eliminating human factor for automatized-shelf systems has high costs,

DAnışmanlık Hiz. Tic A.Ş.Turkey **15 min**	they got limited attention by industry. This study proposes novel approaches to make this technology affordable. The system has three main parts: 1. Sensor nodes, 2. Local broker for the shop, 3. Main hub for data management and analytics. Collected data shows remaining item counts and shelf planogram for each product in every shops. Stock information and its change are stored for short/long term BI analytics. The system can produce detailed real-time reports (shelf stock and planogram) and forecast about near future sales. And also system creates automatic stock replenishment orders and alerts to prevent 'out of stock' situations when stock levels gets low or items get high demand from customers.

OT008
Nilakantha Paudel
Gran Sasso
Science Institute,
Italy
15 min

A General Architecture for a Real-Time Monitoring System Based on the Internet of Things
Nilakantha Paudel | Ram C. Neupane

Recently there has been significant progress in the real-time monitoring system based on the Internet of Things (IoT). The use rate of IoT has been increasing exponentially because of its enormous application in different areas, with many of them are yet to be explored. This paper explains how to design an IoT system and describes its working mechanism. We present a general architecture of the real-time monitoring system using IoT and related services. We successfully implement our proposed architecture for a single domain. Then, we describe how to use the proposed architecture to monitor the different real-time contextual domains. Also, we present ideas on how to plug the data from a third-party application into the proposed architecture.

OT009
Lukas Merkle
Department of
Informatics,
Technical
University of
Munich, Germany
15 min

Cloud-Based Battery Digital Twin Middleware Using Model-Based Development
Lukas Merkle

Following the trends of electrification, the energy storage of vehicles is gaining importance being the most expensive part of an electric car. Since lithium-ion batteries are perishable goods and underlie e.g. aging effects, environmental and operating conditions during the product-life need tight supervision. With regard to the paradigm of digital twins, data from various life cycle phases needs to be collected and processed to improve the general quality of the system. To achieve this task, a suitable framework is needed in order to operate the fleet of digital twins during engineering and manufacturing processes, the automotive usage and a potential second life in energy storages. Based on a literature review, we formulate requirements for a digital twin middleware in the field of battery systems. We propose a model-based framework to develop and operate a fleet of digital twins during all life cycle phases.
Results feature a case study in which we implement the stated framework

in a cloud-computing environment using early stages of battery system production as test bed. Based on the case study, we describe the methodology of implementing the framework as well as the development and operation of the digital twin fleet using the framework. To verify and test the approach, prototypical analysis regarding self-discharge during storage and transportation steps of battery modules are carried out with the aim of enhancing testing procedures. Real world data e.g. temperature during transportation is gathered from various steps of the value added chain and sent to the framework using an IoT-simulator. With the help of a self-discharge model of li-ion cells, the system can estimate the SOC of battery modules and provide this information to the arrival testing procedures. Concluding, this paper proposes an approach of a framework enabling development and operation of a fleet of digital twins. Focus is set to the automotive battery system as a field of application.

IoT-aided Smart Lawnmower

Mutaz Ryalat | Mahmoud Alsherqatli | Hisham ElMoaqet

The merging of Robotic and Internet of things (IoT) technologies have led to the appearance of a novel concept known as IoT-aided robotics technology or Internet of Robotic things (IoRT). Triggered by the tremendous development and fast advancement in both technologies, a number of innovative technological applications in this domain is continually appearing. This paper discusses the development of IoT-based domestic mobile robot, which is used for the lawn mowing of home gardens. The paper investigates the hardware design of the mobile robot and the connection of the robot with the IoT platform leading to a smart lawnmower. Experiments have been carried our that demonstrate the effectiveness of the proposed design.

OT1002
MUTAZ RYALAT
The German
Jordanian
University, Jordan
15 min

Oral Session A-2

Thursday, 26th September, 2019	16:15-18:00	Harp, Ground Floor

Conference Chair: Prof. Massimo Marchiori

Research on Denoising Localization Algorithm for Positioning Laser Spots and Noise Spots Interlaced Image

Tao He | Wenting Sheng | Shurong Wen | Wenchao Liu | Xing Wang | Liangen Yang

In the industrial production, both ceiling lighting and sunlight through the

R005
Tao He
Hubei University of
Technology
15 min

ceiling in the workshop can cause noise spots in the image acquired in the CCD laser online positioning system. Moreover, these ambient noise spots are interlaced with the positioning laser spots in the image, which makes it difficult to obtain the position information of the positioning laser spots accurately. Aiming at this problem, in this paper, according to the geometric characteristics of both positioning laser spots and ambient noise spot, a denoising localization algorithm for positioning laser spots and noise spots interlaced image is proposed, and the cylindrical bar positioning system is used as the experimental object to verify the algorithm. The algorithm steps are as follows, firstly the noise spot is located according to the geometric characteristics of the two kinds of spots, and the non- overlapping region of the two kinds of spots are identified at the same time. Secondly, the noise spots in the non- overlapping area are eliminated. Finally, the existing Blob positioning algorithm is slightly modified to complete the accurate extraction of the position coordinates of the positioning laser spots pixel. The algorithm can effectively eliminate the ambient noise spots on the premise of ensuring that the positioning laser spots are not damaged, and accurately realize the measurement of the position coordinates of the positioning laser spots pixel.

R006
Liangen Yang
Hubei University of
Technology, China
15 min

Multi-Sample Unit Preprocessing Platform and Its Control System Design
Liangen Yang ｜ Jingjing Ran ｜ Zhiyong Fan ｜ Yamei Luo ｜ Tao He ｜ Xuanze Wang

Many complex samples must be preprocessed to analyze and detect. And sample preprocessed accounts for more than 60% of the entire sample analysis process. In order to improve efficiency and accuracy, an automated multi-sample preprocessing platform was designed and its automation control system was discussed. The functions of the platform mainly include: transferring 10 kinds of solvents, processing 96 samples, ultrasonic treatment, automatic cleaning. The control system of the platform is mainly composed of computer, PLC, syringe pump, distribution valve, sensor, stepping motor, ultrasonic pool, and the three-dimensional motion system. The platform adopts distributed control by LabVIEW and PLC, with friendly human-computer interaction interface and complete function. The platform selects six syringe pumps equipped with a dispensing valve to achieve the fluid transfer accuracy and efficiency requirements of the platform. The six syringe pumps are independent of each other, and the syringe range is 50 μL ~ 50ml.Its working mode divided into normal mode and micro-step mode, which can achieve high

throughput and ensure its volume accuracy. Install some proximity switches on the 3D motion system to achieve zero and limit point positioning for each axis. The PLC compares the current position with the received position command to obtain the difference in orientation. Finally, the PLC sends the required pulses to the stepper motor driver, and the proximity switch can verify the sample position.

An Adaptive Integral Sliding Mode Tracking Control for Robotic Manipulators

Anh Tuan Vo ｜ Hee Jun Kang ｜ Tien Dung Le

R013
Anh Tuan Vo
(Student)
University of Ulsan,
South Korea
15 min

This paper proposes an adaptive integral sliding mode tracking control for robotic manipulators. Our proposed control method is developed based on the benefits of both integral sliding mode control and adaptive control, such as high robustness, high accuracy, and estimation ability. In this paper, an integral sliding mode controller is designed with the elimination of the reaching stage to provide better trajectory tracking accuracy and to stabilize the closed-loop system. To reduce the computation complexity, an adaptive controller with only one simple adaptive law is used to estimate the upper-bound values of the lumped model uncertainties. As a result, the requirement of their prior knowledge is eliminated and then decrease the computation cost. Consequently, this controller provides better tracking accuracy and handles the dynamic uncertainties and external disturbances more strongly. The system global stability of the controller is guaranteed by using Lyapunov criteria. Finally, the effectiveness of the proposed control method is tested by computer simulation for a PUMA560 robotic manipulator.

Adaptive Neural Sliding Mode Control for 3-DOF Planar Parallel Manipulators

Thanh Nguyen Truong ｜ Hee Jun Kang ｜ Tien Dung Le

R014
Thanh Nguyen Truong
(Student)
School of Electrical
Engineering,
University of Ulsan,
South Korea
15 min

This paper proposes a combination between a neural network and an adaptive sliding mode control for trajectory tracking control of a 3-DOF planar parallel manipulator. It has a complicated dynamic model, including modelling uncertainties, frictional uncertainties and external disturbances. The proposed control algorithm is to use a PID sliding mode surface, an adaptive sliding mode controller with a neural network to overcome the drawback of the traditional sliding mode controllers, such as slow response rate with variation of uncertainties and external disturbances, chattering, and upper bound values of undefined dynamics which affects system performance, high wear of moving mechanical parts and high heat losses in power circuits. The radial basis function neural network is designed to compensate for uncertainties and external disturbances,

which allows small switching gain. Hence, the chattering can be significantly reduced. In addition, an adaptive control law is used to adaptively converge small switching gains of the sliding mode controller as the neural network reduces model uncertainties. The effectiveness of the proposed control strategy is demonstrated by simulations which are conducted by using the combination of Sim-Mechanics and SolidWorks.

Digital Flow of a 5 axis Machine Tool Based on a Digital Twin Concept
Steulet Mathieu | Claude Jeannerat | Arnaud Gay Des Combes

R015
Asst. Prof. Steulet
Mathieu
(Student)
Haute Ecole Arc,
Switzerland
15 min

This paper presents a novel concept aiming at rethinking the entire process and the underlying software tools to machine a real part starting from its digital CAD model. The major objective behind is to fully integrate and, thus, speed-up the entire CAD-CAM-CNC processes. The underlying key idea is to create a digital twin of the machine tool able to accurately simulate the machining process, which leads to a fully mastered manufacturing process. Manufacturing good parts from the first try becomes, thus, feasible.

The historic step-be-step and incremental evolution of the digital flow a machine tool has led to data and process discontinuities between the CAD, CAM and CNC worlds. Recent initiatives, like STEP-NC, tried to overcome this process and tool discontinuity. However, the impact of these initiates is very limited.

Our approach consists in rethinking the current dominating separation of concerns pattern in the machine tool industry, meaning the roles and responsibilities of CAD, CAM and CNC. The idea is to merge into a single simulation environment the capability of the CAM software and the interpolation ability of the CNC. This will allow the user to visualize really what will happen on the machine in the simulation environment. The positions and acceleration of each axis at each time is then known, these data can then be sent directly to the drive of each motor through a much lighter CNC than today.

The proposed concept opens a wide range of possibilities to master machining processes. It allows to evaluate the machining conditions and parameters before even having the real machine-tool. This allows an accurate optimization of cutting against various objectives like cycle time, energy consumption, etc. Further, the simulation environment can be used by artificial intelligence techniques like reinforcement learning to test and validate a large number of machining strategies of a part.

Towards Flexible Process Automation - An Approach for Flexible Service Robot Adaptation and Allocation

R017
Matthias Rollenhagen
Institute of Computer Science, University of Applied Sciences Ulm, Germany
15 min

Matthias Rollenhagen | Matthias Lutz | Nayabrasul Shaik | Kevin Andrews | Sebastian Steinau | Manfred Reichert | Christian Schlegel

The dynamic of today's markets demand automation systems that are flexible enough for being adapted to rapid requirement changes. The presented work describes how to make robotic systems more flexible in order to cope with changing processes, products, and environments. We propose flexibilizing service robot task modeling and assignment by coupling them with process management systems and utilize them similarly to human workers. Additionally, a variability management workflow is presented, for not fixing systems at design-time. Instead, variability is left open intentionally and reduced gradually. The combination of these two approaches enables users (e.g. workers) to adapt their robot systems to requirement changes by user-friendly tools and provides flexible service robot allocation.

R1001
Jeroen van Vugt
Krossfields, Vught, 5262AK, The Netherlands
15 min

Human body prediction of size and shape: a hormonal framework
Jeroen van Vugt

To achieve high prediction accuracy with minimal inputs from online retail respondents, a method was developed and tested to predict the size and shape of the human body in 3D using a hormonal framework. The prediction method is based on hormonal literature, geometric morphometrics, image analysis, and kernel partial least squares regression. The inputs required are answers to three closed-ended questions and a passport photo. Prediction accuracy was tested with the 3D body scan dataset of the Civilian American and European Surface Anthropometry Resource project. Results from the test dataset showed that approximately 82% of the error expectations of landmarks followed a log-normal distribution with an expectation of 8.816 mm and standard deviation of 1.180 mm. The remaining 18% of the error expectations of landmarks followed a log-normal distribution with an expectation of 18.454 mm and standard deviation of 8.844 mm, which may herald future research. Benchmarked with two other methods, the proposed method features much less input. In addition to high accuracy, the method in this paper allows for visualisation of results as real-size meshes in millimeters.

Thursday, 26th September, 2019   **15:45-16:15**   **Meeting Foyer, Ground Floor**

Process Parameters Optimization for Energy Efficiency in Swiss-Type Machining
Dylan Santos de Pinho

R011
Dylan Santos de Pinho
HE-Arc
Ingénierie, Suisse

Energy consumption of machine-tools is becoming a critical issue for machine-tool builders and end-users because of economic, ecological and legislation-related reasons. Many machine-tool builders are seeking for solutions that allow the reduction of energy consumption of machine-tools while preserving the same productivity rate and the same quality of machined parts. In this paper, we present the first results of a project conducted jointly by academic and industrial partners to reduce the energy consumption of a Swiss-Type lathe. We employ genetic algorithms to find optimal machining parameters – the set of parameters that lead to the best trade-off between energy consumption, part quality and tool life time [1]. Three main machining process parameters are considered in our optimization technique, namely depth of cut, spindle rotation speed and material feed rate. These machining process parameters have been identified as the most influential ones in the configuration of the Swiss-type machining process. A state-of-the-art multi-objective genetic algorithm has been used [2]. The algorithm combines three fitness functions which are fitness functions that permit to evaluate a set of parameters against the three objectives (energy consumption, quality of the machined parts, and tool life time). In this paper, we focus on the investigation of the fitness function related to energy consumption. Four different energy consumption related fitness functions have been investigated and compared. The first fitness function relates to the Kienzle cutting force model [3]. The second fitness function uses the Material Removal Rate (RMM) as an indicator of energy consumption. The two other fitness functions and non-deterministic, learning-based functions. One fitness functions uses a simple Neural Network to learn the relation between the process parameters and the energy consumption from experimental data. Another fitness function uses Lasso regression [4] to learn the same relation. The goal is, then, to find out which fitness functions predict best the energy consumption of a Swiss-Type machining process for given set of machining process parameters. Once determined, these functions may be used for optimization purposes – determine the optimal machining process parameters leading to minimum energy consumption.

The performance of the four fitness functions have been evaluated using a set of experiments designed by the Taguchi method. The Tornos DT13 Swiss-

type Lathe has been used to carry out the experiments. A mechanical part including various Swiss-type machining operations has been selected for the experiments. The evaluation process start with generating a set of CNC (Computer Numerical Control) programs for machining the part at hand. Each CNC program considers a different set of machining process parameters. Each program is used to machine three instances of the parts. During the machining process the power consumption of the spindle is measured. All collected data are assigned to the appropriate CNC program and thus to the set of machining process parameters. The evaluation approach consists in calculating the correlation between the normalized measured power consumption and the normalized power consumption prediction for each of the four fitness functions. The evaluation shows that the Lasso and Neural Network fitness functions have the highest correlation coefficient with 97%. The fitness function "Material Removal Rate" (MRR) has a correlation coefficient of 90%, whereas the Kienzle-based fitness function has a correlation coefficient of 80%.

To conclude, the first experiments conducted in our project related to the energy optimization of a Swiss-Type Lathe show that, although the multi-objective genetic algorithm is an appropriate technique to search for optimal machining process parameters, the choice of the fitness function is a critical step. The first results show also that the non-deterministic learning-based fitness functions outperform their deterministic counterparts. Future work consists in investigating fitness functions for the machining quality and tool life tool wear as well as the evaluation of combinations of different fitness functions in order to find out the best performing fitness functions that allow the optimization of the energy consumption while preserving the best part quality and the longest tool life.

WirelessHART-based Sensor Netwrok for Multichannel Measurement of machine-tool Energy Consumption in Production Environments
Arnaud Gay Des Combes │ Patrice Muller │ Patrick Neuenschwander │ Nuria Pazos, Nabil Ouerhani

R012
Arnaud Gay
Des Combes
HE-Arc
Ingénierie, Suisse

Mastering energy efficiency is an essential aspect that will become crucial for the machine-tool industry in the years to come. The introduction of an "energy" label similar to that used for household appliances, for example, is currently being studied in several countries. In order to achieve this objective, an in-depth study of the energy needed for the proper functioning of the various peripherals of the machines is necessary. Robust and reliable measurement of power consumption at machine component level is an essential building block for energy consumption reduction solutions.

This paper presents a flexible, easy to deploy, and industry proven solution for measuring the energy consumption of a Swiss-type machine-tool. Based on

WirelessHART sensor network architecture, the presented solution allows the measurement of the overall machine energy consumption as well as the energy consumption of the single machine components. In an analysis phase, we first identify the components with the potentially highest energy consumption. Then, an in-depth analysis of each individual component allows to specify, conceive and prototype a set of sensors able to measure, directly or indirectly, its energy consumption. Further, we extended a WirelessHART mote "DC9022A SmartMesh WirelessHART RF Certified" with a programmable micro-controller (NXP FRDM-K64f) in order to integrate the different sensors and thus, acquire the measurement data. The extended mote sends, then, the acquired measurement data to a WirelessHART Gateway. It must be noticed that the power consumption of certain machine components e.g. Spindle, Axes, etc is provided by the Fanuc CNC (Computer Numerical Control) controlling the machine-tool used in our work.

Different challenges have to be mastered in this work. First, we have to deal with the diversity of the energy forms of the different components to be measured. While measuring the overall energy consumption at machine level is rather straightforward (three phase power consumption sensor available on the market), the measurement of the energy consumption of compressed air is rather indirect. Airflow sensor data is converted into power consumption using specification data of the compressed air supplier. The second challenge is related to the synchronization of measurement data acquired by different sensors at different sampling rates. Precise Time Protocol (PTP) has been used in this work in order to synchronize the different measurement motes. Last but not least, guaranteeing a robust and reliable transmission of all measured data in a noisy industrial environment is a major challenge in this work. The number of motes that send data to the Gateway is sized so that congestion is avoided. The distances between motes and the Gateway has been empirically evaluated so that communication disturbances are minimized. This empirical study has been conducted using a Tornos Swiss-Type Lathe (DT13). A WirelessHART-integrated network analyzer has been used to evaluate the robustness of the data transfer. It has been observed that the communication reliability exceeds 99% and that Received Signal Strength Indication (RSSI) between all motes is higher than -75 dBm. The measured latency is below 150 ms.

The multichannel measurement solution based on WirelssHART sensor network and other data sources like CNC has been successfully deployed on a Tornos DT13 Swiss-Type Lathe. The measurement solution is extensively used for an energy optimization project and a real-time energy monitoring solution is being developed based on this multichannel measurement system.

A Study of FPGA-Based Supercomputing Platforms
Ola Challabi ｜ Zenki Raghad ｜ **Michael Opoku Agyeman**

Since computer architecture being able to be mixed up of flexible software with hardware designed reconfigurable of good showing like Programmable Gate Arrays (FPGAs) so that altogether included in supercomputing groups. Making hardware works with computer applications that will speed up the last one and that is what FPGAs doing in lastly and future. In this paper going to have a discussion on numbers of the area of the reconfiguring system (FPGA), so mainly going throw features an overview for high-performance computing. Additionally, how the FPGA supercomputing has been developed, for better understanding the author made mention to a software recently evaluated to accelerating extensive recreation assignments used with FPGA built supercomputers When it is showing the end up comments once tests yet trying to achieve.

S006
Assoc. Prof.
Michael Opoku
Agyeman
University of
Northampton,
United Kingdom

Protection of Memory Using Code Redundancies: A Brief Study
Raghad Zenki ｜ Ola Challabi ｜ **Michael Opoku Agyeman**

Neutron, and proton induced upset have been identified as the main reason for the soft error, which is a real threat to the safety and reliability of the microelectronic devices in the electronics industry. The most critical challenge in designing and implementation microprocessors is to eliminate the soft errors and protect the memory by using error detection and error correction technologies. Many technologies have been developed and can be used to achieve memory protection targets, such as Hamming code, Reed-Solomon codes, Parity Matrix codes, etc. the only drawback with these technologies that they necessitate more redundant memory space, transmission delay, and a sophisticated reliability architecture. This paper evaluates these technologies and their issues. Specifically, the paper discusses Decimal matrix code (DMC) with Encoder Reuse Technique (ERT).

S007
Assoc. Prof.
Michael Opoku
Agyeman
University of
Northampton,
United Kingdom

A Combination Method of Deep Learning Speech Separation and Independent Vector Analysis on Multi-channel Source Separation
Jie Zhu ｜ Chunpeng Wang

Multi-channel blind source separation problem is a difficult but commonly met task in daily life. How to separate every target signals well using several observed signals fascinates hundreds of researchers to study on it, especially when the input channels are less than output channels. In this paper, authors analyze the characteristics of different BSS methods and propose a new method to solve under-determined multi-channel source separation problem. The proposed method has a combination structure of deep learning model and independent component analysis algorithm. Comparisons and evaluations show that using proposed method in multichannel source separation boosts separation effect to a certain degree.

S021
Prof. Zhu Jie
Shanghai Jiao
Tong University,
China

28

Thursday, 26th September, 2019	**Calatrava + Citer, Ground Floor**

R005

Wenchao Liu

Hubei University of Technology, China

R006

Xuanze Wang

Hubei University of Technology, China

OT011

Adi Levin

Israel

OT012

Dmitry Kunitsa

Israel

S023

Lingling Chen

Hebei University of Technology, China

Local Chair

Prof. Dr. John-Jules Ch. Meyer

Utrecht University, Netherlands

Award Ceremony & Closing Ceremony

Thursday, 26th September, 2019   **18:00-18:30**   **Calatrava + Citer, Ground Floor**

Dinner Banquet

Thursday, 26th September, 2019   **18:30-19:30**   **Restaurant, Ground Floor**

Free day

Hope you'll enjoy your journey!

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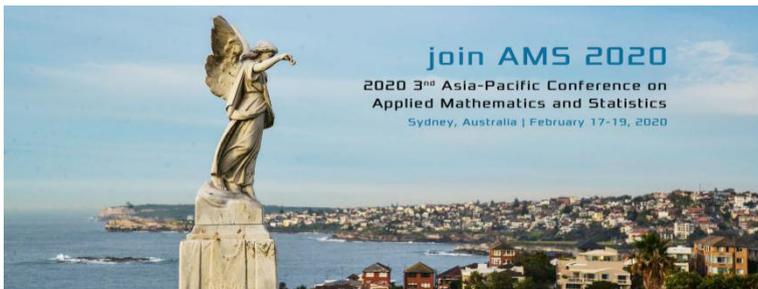
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