NEW WAVE OF DIGITAL SCIENCE AND TECHNOLOGIES

ICSEC 2019

THE 23RD INTERNATIONAL COMPUTER SCIENCE AND ENGINEERING CONFERENCE

OCT 30 - NOV 1, 2019
NOVOTEL PHUKET RESORT
PHUKET, THAILAND

PROGRAM & ABSTRACT

ORGANIZED BY
COLLEGE OF COMPUTING
PRINCE OF SONGKLA UNIVERSITY,
PHUKET CAMPUS

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About ICSEC 2019

The International Computer Science and Engineering Conference (ICSEC) is the premier forum for the presentation of researchers, practitioners and educators to present and discuss the most recent innovations, research, experience, trends and concerns in the field of Computer Science, Computer Engineering, Software Engineering, and Information Technology. ICSEC 2019, will be held over three days, with special sessions and presentations delivered by researchers from the international communities, including presentations from well-known keynote speakers. Accepted Full Papers (4 to 6 pages) will be submitted to the IEEE Xplore database. In addition, the authors of the selected papers will be suggested to submit the paper to many journals which are indexed by SCOPUS and ISI.

Papers related to this conference theme include theories, methodologies, and emerging application are encouraged. Contributions covering theoretical developments and practical applications, including but not limited to the following technical areas, are invited:

- Artificial Intelligence
- Big data and its applications
- Bioinformatics/Biomedical Applications
- Computer Network and Architecture
- Content-Based Multimedia Retrieval
- Cultural Heritage Applications
- Data Science/Data Engineering
- Distributed Intelligent Systems
- Digital-Business
- Digital-Health
- Digital School Technologies
- Enterprise Architecture Design & Management
- Expert & Knowledge-based Systems
- High Performance Computing
- Human-Computer Interaction

- Image Processing
- Information Security & Risk Management
- Infrastructure Systems and Services
- Intelligent Devices/IoT
- Intelligent Home Environments
- IS/IT Planning and Operations Management
- IT Governance
- Modeling, System, & Control
- Multimedia Applications
- Multispectral and Hyperspectral Data analysis
- Natural Language Processing
- Neural Networks
- Pattern Recognition
- Robotic Systems
- Smart Sensor Networks
- Software Engineering
- Speech Processing
- Web Science and technology

Message from President of Prince of Songkla University

On behalf of Prince of Songkla University (PSU), it is my great pleasure to welcome all distinguished guests, prominent scholars, academics and participants to the 23rd International Computer Science and Engineering Conference (ICSEC 2019), organized by the College of Computing, Prince of Songkla University, Phuket Campus, in Phuket, Thailand.

I would like to invite all of you to visit our esteemed institution, one of the leading research universities in Thailand and in Southeast Asia. PSU is a public comprehensive institution of higher learning with a long-standing commitment to education for the benefit of humankind, as our motto states "Our Soul is for the Benefit of Mankind." It is a multi-campus university with five campuses located in Hat Yai, Pattani, Surat Thani, Trang, and Phuket.

Phuket City has been highlighted as a leading smart city by the Royal Thai Government along with its world-class tourist destination renown, and our Phuket Campus is part of the driving force to support the mission towards future innovation. Therefore, I am confident that during this conference in this wonderful place, where many ICT related domains are joining together, all of you will have the great opportunity to share knowledge, experiences, and most importantly, to establish networking with new people.

Once again, welcome to ICSEC 2019 and I wish the conference to be a great success. I also hope that all of you will enjoy this auspicious event and have a great time in Phuket, Thailand.

N. Keawpradub

Asst. Prof. Dr. Niwat Keawpradub
President of Prince of Songkla University

Message from Rector of University North, Croatia

Ladies and Gentlemen,

From the outset I would like to express my gratitude to Prince of Songkla University, Phuket Campus, Thailand, for the opportunity it has given to University North, Croatia in its partner role at the 23rd International Computer Science and Engineering Conference – ICSEC 2019.

It is my great honour to greet you on behalf of University North, Croatia. Our institution was established in 2001 and has been a public University since 2015. More than 4,000 students are studying at the two University Centres in Varaždin and Koprivnica, and there are more than 400 full and part-time employees. Over 85% of all active students are in the STEM (Science, Technology, Engineering and Mathematics) and Biomedicine fields. We are an integrated University with 27 study programmes.

With our contribution to this Conference we would like to expand our excellent collaboration with Prince of Songkla University, Phuket Campus, Thailand through the Erasmus+ Programme. We have initiated inter-institutional cooperation in several different strands: Professor/staff and student exchanges through the Erasmus+ Programme, teaching method exchanges, good education practise transfers, personal as well as institutional professional development, transfers of experiences in curriculum development, increasing the visibility and improving the internationalisation of our institutions, building new contacts and professional networks, joint research, international conferences and the publication of journal papers.

For now this collaboration has related to the topics which have also been included in this Conference: Computer Animation, Computer Graphics and Applications, Digital media in Educations, Gamification, Human-Computer Interaction, Image Processing, Multimedia Applications, Virtual and Augmented reality, Visualisation, Web Science and technology, etc. We believe that these areas of cooperation will expand over time.

We are honoured to have our professors involved in significant roles in organising this Conference. I hope that we will be able to live up to these expectations and thus create a basis for improved

cooperation in the future. We are also pleased to announce that better papers resulting from this Conference will be published in a special issue of our Journal - Technical Journal (ISI Indexed/WoS). This will create added value for the Conference itself and for those authors selected for publication.

Finally, I would like to convey to all those participating our desire to be proactive in the work at this Conference, to use the time spent at this Conference for quality exchange of experiences and further networking and to safely return to their homes richer for the new knowledge they acquire here.

Prof. Marin Milković, PhD
Rector of the University North, Croatia, EU

Message from General Chair

On behalf of the conference organising committee, it is our great honor to invite you all to the 23rd International Computer Science and Engineering Conference (ICSEC), hosted in Phuket, Thailand.

ICSEC was organised in the first time of 1998 by Thai University colleagues, to be a forum for sharing knowledge, experiences, as well as people networking. This year, it is the 23rd year of ICSEC where its location is one of the most well-known tourist destination; Phuket, not only for Thais but also the world wide people. We are sure that you will enjoy sun, sand, beaches, and Phuket unique local cultures and foods.

This year, we received 151 submitted papers, where authors are from 15 countries worldwide: Japan, Indonesia, Philippines, Myanmar, Malaysia, Singapore, Korea, Taiwan, US, Bangladesh, Vietnam, Brunei Darussalam, Germany, Croatia, and Thailand. We have accepted 81 papers for presentation which is 54% of the acceptance rate. These figures show the conference quality and good participations.

We hope that you will find the fruitful conference, enjoy your interactions with colleagues from difference domains and countries.

We would like to give big thanks to our sponsors for your supporting, co-hosts for co-working, all the committees, as well as reviewers for giving your effort on paper selection.

Finally, we wish you enjoy our warm welcome to Phuket, Thailand, giving us the honor of hosting ICSEC 2019.

Sinchai Kamolphiwong, Ph.D.
General Chair
ICSEC 2019

Keynote Speakers

Assoc. Prof. Dr. Mario Tomiša
Vice-Rector of the University Centre Koprivnica at the University North

Associate professor Mario Tomiša is the Vice-Rector of the University Centre Koprivnica at the University North in Croatia. Main focus of his work is directed towards the development and management of communication projects, development and production of creative campaigns and corporate identity, and the development of new models for evaluating competences. At the University North, he holds a number of design courses: Design basics, Graphic Design, Web Design, Creative Process, Information Design and others. He actively participates in scientific and professional conferences, and publishes many articles in the field of design, multimedia, typography, education, printing and web. He held six own art exhibitions and took part at thirteen group exhibitions. He is a member of Mensa and the Croatian Designers Society.

Professor Han-Chieh Chao
President National Dong Hwa University, Taiwan

Han-Chieh Chao received his M.S. and Ph.D. degrees in Electrical Engineering from Purdue University, West Lafayette, Indiana, in 1989 and 1993, respectively. He is currently a professor with the Department of Electrical Engineering, National Dong Hwa University, where he also serves as president. He is also with the Department of Computer Science and Information Engineering and the Department of Electronic Engineering, National Ilan University, Taiwan; College of Mathematics and Computer Science, Wuhan Polytechnic University, Wuhan, China, and Fujian University of Technology, Fuzhou, China. He was the Director of the Computer Center for Ministry of Education Taiwan from September 2008 to July 2010. His research interests include IPv6, Cross-Layer Design, Cloud Computing, IoT, and 5G Mobile Networks. He has authored or co-authored 4 books and has published about 400 refereed professional research papers. He has completed more than 150 MSEE thesis students and 11 Ph.D. students. Dr. Chao has been invited frequently to give talks at national and international conferences and research organizations. He serves as the Editor-in-Chief for the Institution of Engineering and Technology Networks, the Journal of Internet Technology, the International Journal of Internet Protocol Technology, and the International Journal of Ad Hoc and Ubiquitous Computing. He is a Fellow of IET (IEE) and a Chartered Fellow of the British Computer Society. Due to Dr. Chao's contribution of suburban ICT education, he has been awarded the US President's Lifetime Achievement Award and International Albert Schweitzer Foundation Human Contribution Award in 2016.

Surachate Chumpol
General Manager of Software Development Department,
TOYOTA TSUSHO NEXTY ELECTRONICS (THAILAND) CO., LTD.
Director of TOYOTA TSUSHO DENSO ELECTRONICS (THAILAND) CO., LTD.

Surachate Chumpol is the General Manager of Software Development Department, TOYOTA TSUSHO NEXTY ELECTRONICS (THAILAND) CO., LTD., and the Director of TOYOTA TSUSHO DENSO ELECTRONICS (THAILAND) CO., LTD. He earned B.Eng. in Electrical Engineering from Prince of Songkla University, Thailand in 1997. He had previously worked for FUJIKURA LTD., JAPAN as an Embedded Software Engineer. When TOYOTA TSUSHO ELECTRONICS (THAILAND) CO., LTD. was established in 2005, he returned to Thailand and joined the company where he has worked as the Project Manager in Automotive Embedded Software Development since then.

Note 1: The new TOYOTA TSUSHO NEXTY ELECTRONICS (THAILAND) CO., LTD. was born from the merging of TOYOTA TSUSHO ELECTRONICS (THAILAND) CO., LTD and TOMEN ELECTRONICS (THAILAND) CO., LTD in 2018.

Note 2: TOYOTA TSUSHO DENSO ELECTRONICS (THAILAND) CO., LTD. which was established in 2016 is a joint venture of DENSO Corporation and TOYOTA TSUSHO ELECTRONICS (THAILAND) CO., LTD.

Mr. Pracha Asawateera
Vice President Southern District Office of Digital Economy Promotion Agency (depa)

A transformational IT executive and strategist, Pracha Asawateera is a well-versed Information Technology (IT) professional with more than 18 years of progressive experience. He is currently a vice president southern district office of Digital Economy Promotion Agency (depa). He is responsible for promoting the development of digital industry and innovation and digital technology adoption in order to achieve the economic, social, cultural, and security benefits in the Southern provinces of Thailand. He has worked with both government agencies and private sectors, focusing on smart city projects, digital government transformation, policy reform, and digital economy. Additionally, Pracha is a technical adviser to many IT companies in Phuket, helping them to shape and deliver new services and products. Pracha has earned a master's degree in computer science from Thammasat University and a bachelor's degree in Computer Engineering from Suranaree University of Technology.

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Warodom Werapun, PSU, Thailand

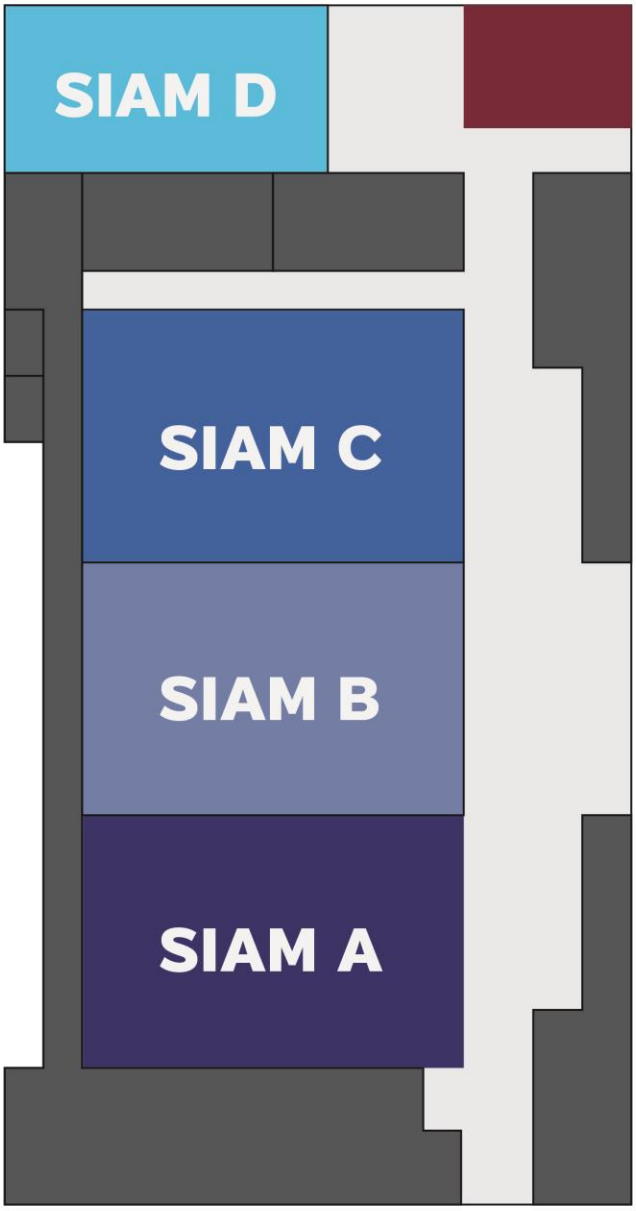
Conference Venue

Novotel Phuket Resort

Novotel Phuket Resort Layout

1. Siam Conference Centre
2. Coffee House Restaurant
3. Ruen Thong Restaurant
4. Rabiang Terrace
5. Le Mirage Pool Bar
6. Reception, The Hourglass Bar, and V-Lounge
7. Tennis Courts
8. Security & Shuttle Bus Service

Siam Conference Centre



Program at a Glance

Day 1: Wednesday, October 30, 2019

8.00-12.00	Registration (SIAM Conference Center)					
Session I						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Artificial Intelligence (I)**		**Image Processing (I)**		**Neural Networks (I)**	
Session Chair	Asst. Prof. Dr. Warodom Werapun		Wisarut Chantara		Dr. Thitinan Kliangsuwan	
9.00-9.20	Thai Scene Graph Generation from Images and Applications	(Supasit Kajkamhaeng, Kasetsart University, Thailand)	Text Localization and Extraction from Background with Texture and Noise in Digital Images Using Adaptive Thresholding and Convolutional Neural Network	(Pukjira Pattaranuprawatand, Chulalongkorn University, Thailand)	Learning Using LTE RSRP and NARNET in the Same Indoor Area	(Sun-Kuk Noh, CHOSUN University, South Korea)
9.20-9.40	Developing a Mobile Application for an Abdominal Exercise Machine Using an Accelerometer	(Rong Phoophuangpairoj, Rangsit University, Thailand)	Contrast and Color Balance Enhancement for Non-Uniform	(Preecha Vonghirandecha, Prince of Songkhla University, Thailand)	Lukthung Classification Using Neural Networks on Lyrics and Audios	(Kasina Euchukanonchai, Tencent, Thailand)
9.40-10.00	Bimodal Emotion Recognition Using Deep Belief Network	(Apichart Jaratrotkamjorn, Prince of Songkla University, Thailand)	Aircraft Detection Based on Saliency Map and Convolution Neural Network	(Yuwei Sun, The University of Tokyo, Japan)	Grape Disease Identification Using Convolution Neural Network	(Suneet Kumar, Bennett University Gr Noida, India)
10.00-10.20	A Case Study of Route Optimisation for Phuket Healthy Drink Delivery System	(Tanakorn Karode, Prince of Songkla University, Thailand)	Online Classroom Attendance System Based on RFID Technology and Cloud Computing	(Sri Listia Rosa, Universitas Islam Riau, Indonesia)	Edge Computing for Road Safety Applications	(Praphan Pavarangkoon, National Institute of Information and Communications Technology, Japan)
10.20-10.40	**Coffee Break**					

Session II						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Artificial Intelligence (II)**		**Image Processing (II)**		**Digital School Technologies, Digital-Business**	
Session Chair	Asst. Prof. Dr. Apichat Heednacram		Dr. Kittasil Silanon		Assoc. Prof. Dr. Sinchai Kamolphiwong	
10.40-11.00	Logic-Based Answer Set Creation for Question Answering System	(Apichaya Khwankaew, Rajamangala University of Technology Suvarnabhumi, Thailand)	Detecting Student Engagement in Classrooms for Intelligent Tutoring Systems	(Binh Tieu Hoang, Hanoi National University of Education, Vietnam)	The Difference Adoption of E-Commerce Technology Among Z and Y Generations	(Bernardinus Harnadi, Soegijapranata Catholic University, Indonesia)
11.00-11.20	Classification of Risk Attitudes from Customer Behavior with Machine Learning	(Teeranai Sriparkdee, Chulalongkorn University, Thailand)	EyeMath: Increasing Accessibility of Mathematics to Visually Impaired Readers	(Padchaya Srisingchai, Thammasat University, Thailand)	Voluntariness Difference in Adoption of ELearning Technology Among University Students	(Albertus Widiantoro, Soegijapranata Catholic University, Indonesia)
11.20-11.40	Parameters Learning of BPS M7 Banknote Processing Machine for Banknote Fitness Classification	(Thiti Kongprasert, Chulalongkorn University , Thailand)	Alternate Deflation-Inflation Gradient Vector Flow Snakes for Prescreening Glaucoma in Mobile Phone Retinal Images	(Pakinee Aimmanee, SIIT, Thammasat University, Thailand)	Investigation of Adoption of Smartphone Technology for Learning	(Fx Hendra Prasetya, Soegijapranata Catholic University, Indonesia)
11.40-12.00			Automatic Monomer Filling System Using Machine Vision	(Withit Kulpraneet, King Mongkut's University of Technology Thonburi, Thailand)	ArViz: An IoT Teaching Tool for High School Students	(Kullawat Chaowanawatee, Prince of Songkla University, Thailand)
12.00-13.30	**Lunch (Coffee House Restaurant)**					

13.30-14.00	**Opening Ceremony (SIAM Conference Center)**
14.00-14.40	**Keynote Session (SIAM Conference Center)** **Professor Han-Chieh Chao** **President of National Dong Hwa University, Taiwan**
14.40-15.20	**Keynote Session (SIAM Conference Center)** **Mr. Surachate Chumpol** **General Manager of Software Development Department, Toyota Tsusho Nexty Electronics (Thailand) Co., Ltd.** **Director of Toyota Tsusho Denso Electronics (Thailand) Co., Ltd.**
15.20-15.40	**Coffee Break**

Session III						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Future SDN: Security, Virtualization, Systems and Architectures / Data Science / Data Engineering (I)**		**Cultural Heritage Applications / Software Engineering**		**Image Processing (III)**	
Session Chair	Prof. San Yong Han		Dr. Korawit Prutsachainimmit		Dr. Noppon Lertchuwongsa	
15.40-16.10	Architecture for SDN-Independent GateWay	(Sunyoung Han, Konkuk University, South Korea)	Decision Support System to Discover Route for Cultural Tourism and Community Lifestyles Through Participation of Communities: a Case of Khaosamokhon Sub-district	(Chantorn Chaiprasurt, Thepsatri Rajabhat University, Thailand)	Using Image Features for Accuracy Investigation of Classification Techniques to Categorize the Visual Defect Types of Defective Yellow Soybean Seeds	(Walailuck Wongruen, Kasetsart University, Chalermphrakiat Sakon Nakhon Province Campus, Thailand)
16.10-16.30	SDN Based Fast Handover over IP Mobility	(Khin Mo Sue, Prince of Songkla University, Thailand)	An Analysis of Visitor's Highlights and Information Channels Used: A Study of Phuket	(Kris Sincharoenkul, Prince of Songkla University, Thailand)	Rubber Tapping Position and Harvesting Cup Detection Using Faster-RCNN with MobileNetV2	(Rattachai Wongtanawijit, Prince of Songkla University, Thailand)
16.30-16.50	Failure Prediction in Open-hole Wireline Logging of Oil and Gas Drilling Operation	(Maylada Pootisirakorn, Chulalongkorn University, Thailand)	Enhancing Software Testing with Ontology Engineering Approach	(Suraiya Charoenreh, Prince of Songkla University, Thailand)	Personal Verification System Using Thai ID Card and Face Photo for Cross-Age Face	(Kanda Saikeaw, Khon Kaen University, Thailand)
16.50-17.10	A Graph-Based Algorithm for Interpersonal Ties Clustering in Signed Networks	(Sumalee Sangamuang, Chiang Mai University, Thailand)	Impact Analysis Framework of Test Cases Based on Changes of Use Case Based Requirements	(Thiwatip Sriraksa, Prince of Songkla University, Thailand)		
18.00-20.00	**Welcome Reception (Ruen Thong Restaurant)**					

Day 2: Thursday, October 31, 2019

8.00-12.00	**Registration (SIAM Conference Center)**					
Session IV						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Neural Networks (II), Speech Processing**		**Bioinformatics**		**High Performance Computing, Information Security & Risk Management, Infrastructure Systems and Services, IT Governance**	
Session Chair	Yossawee Keaomanee		Asst. Prof. Dr. Aziz Nanthaamornphong		Dr. Kuljaree Tantayakul	
9.00-9.20	Massive Open Online Courses (MOOCs) Recommendation Modeling Using Deep Learningr	(Siriporn Sakboonyarat, Silpakorn University, Thailand)	Sleep Apnea Detection Using Deep Learning	(Hnin Thiri Chaw, Prince of Songkla University, Thailand)	Multiplication of Medium-density Matrices Using TensorFlow on Multicore CPUs	(Siraphob Theeracheepand, Chulalongkorn University, Thailand)
9.20-9.40	Speech Emotion Recognition Using 1D CNN with No Attention	(YuLan Li, University of Electronic Science and Technology, China)	Application of Random Forest in Limited Size Human Long Non-coding RNAs Identification with Secondary Structure Features	(Warin Wattanapornprom, King Mongkut's University of Technology Thonburi, Thailand)	A Preliminary Study of Finger Area and Keystroke Dynamics Using Numeric Keypad with Random Numbers on Android Phones	(Nareerat Benjapatanamongkol, Chulalongkorn University, Thailand)
9.40-10.00	A Hierarchical Classification Framework for Phonemes and Broad Phonetic Groups (BPGs): a Discriminative Template-Based Approach	(Kantapon Kaewtip, Ubon Ratchathani University, Thailand)	WiseMed: Medication Reminder for Seniors	(Sirion Vittayakorn, King Mongkut's Institute of Technology Ladkrabang, Thailand)	Design and Implementation of Connected DataLake System for Reliable Data Transmission	(Sun Park, GIST & GenoTech, South Korea)
10.00-10.20			Forecasting Bowel Sound Occurrence Frequency by SARIMA Model	(Yuki Ogino, Tokyo University of Science, Japan)	Modest Android Application Development for the Entrepreneurship in Art and Culture Organization	(Ridwan Sanjaya, Soegijapranata Catholic University, Indonesia)
10.20-10.40	**Coffee Break**					

10.40-11.20	**Keynote Session (SIAM Conference Center)** **Assoc. Prof. Dr. Mario Tomiša** **Vice-Rector of the University Centre Koprivnica at the University North**
11.20-12.00	**Keynote Session (SIAM Conference Center)** **Mr. Pracha Asawateera** **Vice President Southern District Office of Digital Economy Promotion Agency (depa)**
12.00-13.30	**Lunch (Coffee House Restaurant)**

Session V						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Special Session on Advanced Digital Media**		**Data Science/Data Engineering (II)**		**Software Engineering (I)**	
Session Chair	Asst. Prof. Dr. Robert Geček		Dr. Kwankamon Dittakan		Dr. Adisak Intana	
13.30-13.50	A Classification of Visual Style for 3D Games	(Voravika Wattanasoontorn, Prince of Songkla University, Thailand)	Optimizing RocksDB for Better Read Throughput in Blockchain Systems	(Jong-Hyeok Park, Sungkyunkwan University, South Korea)	A Systematic Mapping Review: a Mobile User Interface Guideline for Elderly	(Kulsiri Chirayus, Prince of Songkla University, Thailand)
13.50-14.10	Development of 4K Binocular Video See-through Display with Haptic Device for Task Training	(Kazuyo Iwamoto, National Institute of Advanced Industrial Science and Technology, Japan)	Data Clustering Using Hybrid Genetic Algorithm with k-Means and k-Medoids Algorithms	(Musharrat Khan, East West University, Bangladesh)	The Empirical Study: Encouraging Students' Interest in Software Development Using Test-Driven Development	(Aziz Nanthaamornphong, Prince of Songkla University, Thailand)
14.10-14.30	Towards Personalized Content Replacements in Hybrid Broadcast Broadband Environments	(Stephan Steglich, Fraunhofer FOKUS Berlin, Germany)	Efficiency Comparison of Data Analysis for Inverter System	(Watcharapan Sawangsri, Prince of Songkla University, Thailand)	Improvement of Software Productivity by the Integrated Software Test Management System	(Kazuhiro Morita, Hitachi High-Technologies Corporation, Japan)
14.30-14.50	Influence, Principles and Good Practice of Computer Game Elements: Mechanics and Dynamics	(Voravika Wattanasoontorn, Prince of Songkla University, Thailand)	Finding the Risk Factors and the Risk Areas for NCDs Using Data Mining Techniques	(Suthira Plansangket, Prince of Songkla University, Thailand)	Enhancement Agile for a Cyber-Physical Systems (CPS) Development with Cloud Computing	(Karanrat Thammarak, Walailak University, Thailand)
14.50-15.10	Performance Evaluation of Dynamic and Static WordPress-based Websites	(Marin Milković, University North, Croatia)	Towards Nature-Inspired Intelligence Search for Optimization of Multi-Dimensional Feature Selection	(Khin Sandar Kyaw, Prince of Songkla University, Thailand)	The Measurement of Software Size Based on Generation Model Using COSMIC FSM	(Thandar Zaw, University of Information Technology Myanmar)
15.10-15.40	**Coffee Break**					

Session VI						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Multimedia Applications, Special Session on Advanced Digital Media**		**Natural Language Processing**		**Digital-Health**	
Session Chair	Dr. Jakraphan Chaopreecha		Dr. Kitsiri Chochiang		Dr. Kwankamon Dittakan	
15.40-16.00	Effectiveness of Ptex Method in the Field of Texture Mapping and Polygon Topology	(Robert Geček, University North, Croatia)	Pattern-based Wordiness Reduction System for Thai Texts	(Thatsanee Charoenporn, Musashino University, Japan)	Real-Time Analysis of Heart Rate Variability Patterns During Hemodialysis	(Motoki Tanaka, Tokyo University of Science, Japan)
16.00-16.20	Application of Batu Belah Batu Bertangkup Folklore in Riau Province with Augmented Reality	(Ana Yuliantiand, Universitas Islam Riau, Indonesia)	Exploiting Dependency-based Pre-ordering for English-Myanmar Statistical Machine Translation	(May Kyi Nyein, University of Computer Studies, Myanmar)	Determination of Experimental Blood Pressure by Appllying an Engineering Model to Medical Diagnostic Equipment	(Masahiro Kuroda, Tokyo University of Science, Japan)
16.20-16.40	UI/UX-centric Design of In-the-Field Agricultural Data Acquisition System	(Kasidid Songsupakit, Kasetsart University, Thailand)	A Bangla Word Sense Disambiguation Technique Using Minimum Edit Distance Algorithm and Cosine Distance	(Anamika Das Mou, East West University, Bangladesh)	Applications to Screen Children with Autism Spectrum Disorder	(Kanda Saikeaw, Khon Kaen University, Thailand)
18.00-21.00	**Banquet (Rabiang Terrace)**					

Day 3: Friday, November 1, 2019

8.00-9.00	**Registration (SIAM Conference Center)**					
Session VII						
Session Room	**SIAM A**		**SIAM B**		**SIAM C**	
Session Topic	**Human-Computer Interaction, Pattern Recognition**		**Intelligent Devices/IoT**		**Computer Network and Architecture, Distributed Intelligent Systems**	
Session Chair	Asst. Prof. Dr. Aziz Nanthaamornphong		Maneenate Puongmanee		Dr. Jirawat Thaenthong	
9.00-9.20	BADHON: A High Performing Keyboard Layout for Physically Impaired People	(Mehrab Zaman Chowdhury, Green University of Bangladesh, Bangladesh)	Dynamic Frequency Allocation for D2D Communications in Multicell Environment Using Modified GADIA Algorithm	(Teerapat Sanguankotchakorn, Asian Institute of Technology, Thailand)	Intelligent Power Charging Strategy in Wireless Rechargeable Sensor Network	(Wei-Che Chien, National Chung Cheng University, Taiwan)
9.20-9.40	ScrambleSQL: A Novel Drag-and-drop SQL Tool	(Chanapat Phewkum, King Mongkut's Institute of Technology Ladkrabang, Thailand)	Modeling of Wireless Sensor Nodes Airdrop in Wind Field	(Yi Yang, Donghua University, P.R. China)	Mobility-based Performance Comparison of MBQA-OLSRv2 and MBMA-OLSRv2 Routing Protocols	(Waheb Abduljabbar Shaif Abdullah, Universiti Malaysia Pahang (UMP), Malaysia)
9.40-10.00	Evaluating Biometrics Fingerprint Template Protection for an Emergency Situation	(Ei Ei Mon, Prince of Songkla University, Thailand)	Arduino Visual Programming	(Kullawat Chaowanawatee, Prince of Songkla University, Thailand)	JSP Digital Asset Trading System	(Detchasit Pansa, Mahasarakham University, Thailand))
10.00-10.20	A Modified Graph Representation for Room Layout Matching	(Thamonwan Sa-ngawong, Chulalongkorn University, Thailand)	Fog - Cloud Computing Traffic Model and Performance Evaluation for Ubiquitous Sensor Network Infrastructure	(Chonnikan Sangmek, Prince of Songkla University, Thailand)	BlockVOTE: An Architecture of a Blockchain-based Electronic Voting System	(Chinnapong Angsuchotmetee, Prince of Songkla University, Thailand)
10.20-10.50	**Coffee Break**					
12.00-13.00	**Lunch (Coffee House Restaurant)**					
13.00-16.00	**Excursion**					

Main Track

A Bangla Word Sense Disambiguation Technique Using Minimum Edit Distance Algorithm and Cosine Distance

Tanni Mittra[1], Protap Kumar Saha[1], Anamika Das Mou[1]

[1]East West University, Bangladesh

Abstract: In natural language processing, Morphology known as the most decisive part. It can be more difficult when there are several meanings for only one word. Ambiguous word is a word which has those several meanings. The human brain can easily identify these ambiguities but for machines, it is very complicated to detect. Word Sense Disambiguation(WSD) is such a technique that trains machines to detect ambiguities. Different types of research work have been published in different languages for this technique. But developing an optimized Bangla WSD system is still a great research challenge. To overcome this challenge we have to propose a new technique to detect ambiguous word in a sentence. A corpus containing 3860 sentences is built from different resources. We applied the Levenshtein distance algorithm to detect ambiguous word and Cosine Similarity to sense actual meaning in a given Bangla sentence. The accuracy of our method is 80.82%. The validity of our claims has been proved through comparisons with other well-established methods.

Keywords: Bangla; WSD; NLP

A Case Study of Route Optimisation for Phuket Healthy Drink Delivery System

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[1]Prince of Songkla University, PHUKET Campus, Thailand, [2]Prince of Songkla University, Thailand

Abstract: This research aims to present the drinking water transportation framework which uses a mobile application to calculate the minimum distance of the transportation to reduce consuming resources and improve routing decision time. The Android application is developed to be able to display positions, traveling routes, approximate total distance and total duration spending for drinking water transportation. This framework provides 2 methods to calculate transportation routes 1) a fast calculating method using Nearest Neighbor algorithm and 2) an exact calculating method using Dynamic Programming algorithm. This research shows the result of testing and comparing processing times between these 2 algorithms to select the most appropriate choice for actual use. The results are illustrated that Dynamic programming always gives the best distance result. However, it spends much time to calculate. Eventually, the experimental results are described that searching the shortest route for 16 places takes about 5 minutes which is too slow for use in the real environment. Although Nearest Neighbor is not provided the minimum distance, the experiment route result is still acceptable by comparing with the experimental result of Dynamic Programming. In addition, it also provides less processing time to get a suitable route.

Keywords: Logistics; Transportation cost; Android Mobile Application,; Nearest Neighbor; Dynamic programming

A Graph-Based Algorithm for Interpersonal Ties Clustering in Signed Networks

Sumalee Sangamuang[1]

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Abstract: Social ties are formed as a result of interactions and individual preferences of the people in a social network. There are two opposite types which are interpreted as friendship vs. enmity or trust vs. distrust between people. The aforementioned social network structure can be represented by a signed graph where the people are graph's vertices and their interactions are graph's edges. The edges can be positive and negative signs. For determining trustworthiness, this paper considers a problem of a signed graph partitioning with minimizing the sum of the negative edge's weight and balanced size of its clusters. An efficient algorithm to solve such problem is proposed. The experimental results show that the proposed algorithm outperform in terms of the execution times and the accuracy within the given bounds.

Keywords: Social Ties; Signed Graphs; Social networks; Graph Partition; Min-Cuts

A Hierarchical Classification Framework for Phonemes and Broad Phonetic Groups (BPGs): a Discriminative Template-Based Approach

Kantapon Kaewtip[1]

[1]Ubon Ratchathani University, Thailand

Abstract: In this work, a novel framework to phoneme classification is presented. The framework combines discriminative classification approach to the traditional HMM framework. Unlike the traditional HMM approach to phoneme recognition, here all phones are modeled by one HMM. However, instead of using generative models (e.g., GMMs), this framework employs a discriminative classifier to predict the state probabilities and finds the optimal state sequence to obtain a time-alignment function between the acoustic feature vector sequence and the state sequence. For each state s, the corresponding feature vectors are averaged resulting in a single feature vector that represents the s-th vector of the block. All feature vectors of the block are then concatenated to a single feature vector to represent a phone unit, which is used as a feature vector for a phone classifier. The phone classifier is hierarchical is the sense that the broad phonetic groups (BPGs) are classifier followed by the phonemes belonging to those classes. Validated by the TIMIT database, the proposed framework with MFCCs has comparable performance to to related phoneme classification algorithms, but with flexibility to account for duration and other features such as articulatory features.

Keywords: template-based; phoneme classification; broad phonetic groups

A Modified Graph Representation for Room Layout Matching Using Spectral Embedding

Thamonwan Sa-ngawong[1], Nagul Cooharojananone[1]

[1]Chulalongkorn University, Thailand

Abstract: Graph matching is efficient to retrieve similar layout from the huge size of architectural layout. Since floor plan matching using spectral embedding is popular and its computational time is only in seconds. However, the weakness of this method is the isomorphism of each floor plan that reduces accuracy

in the matching process. In this paper, we propose a modified graph representation for room layout matching using spectral embedding. General graph representations of the floor plan assume the node as rooms and the edge as the connection between rooms. In addition, the spectral embedding aims to find the descriptor of each floor plan by ignoring the semantic of rooms. We also consider both room semantic that is the connection between the area outside and inside the room, and the structure of each layout. Moreover, we mathematically proved that adding an extra node can handle the isomorphism of a graph by eigenvalue testing. Our proposed method consists of three processes: i) floor plan extracting, ii) appended topology graph and iii) floor plan matching. The performance from our experiment shows that our proposed method can increase the matched accuracy from the conventional method for about 35.44 percent.

Keywords: floor plan; graph representation; spectral embedding

A Preliminary Study of Finger Area and Keystroke Dynamics Using Numeric Keypad with Random Numbers on Android Phones

Nareerat Benjapatanamongkol[1], Pattarasinee Bhattarakosol[1]

[1]Chulalongkorn University, Thailand

Abstract: The paper investigates the effectiveness of keystrokes dynamics data, obtained from numeric keypad with random numbers using android devices, in the identification process. The users' keystrokes dynamics data are collected via android application. Preliminary experiment was conducted, involving 24 users typing a pre-defined 10-digit numbers for ten times continuously. The features used in the analysis are dwell time, flight time and finger size. Random forest classifier is used and the weighted results were true positive rate of 97.9%, false positive rate of 0.1%, precision of 98% and recall of 97.9%.

Keywords: keystrokes dynamics; identification; authentication; random numbers

A Systematic Mapping Review: Mobile User Interface Design Guidelines for the Elderly with Cognitive Impairments

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Abstract: Elderly are having difficulty using the design-for-all user interface. The age-related issues of elderly increase over time. In the digital age, the mobile phone is famous among the elderly to support their daily living to make the elderly live more independently. However, there is a lack of mobile user interface guidelines that emphasis on an elderly specific group. Cognitive load is one of the crucial factors to consider when a software- developer, and designer develop a user interface for the elderly. To understand the topic research in this research area, we need to investigate the current literature to find an existing research gap. This study investigates what are the focus of mobile user interface design for the elderly by using a systematic mapping review method. At the moment, this research presented coarse view, classification type, and new cognition aspect of overall user interface design for the elderly. The findings show that there is a growing potential for a research paper after the year 2018.

Keywords: elderly; mobile user interface design; systematic mapping review

Aircraft Detection Based on Saliency Map and Convolution Neural Network

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Abstract: Detection of the aircraft from the remote sensing images attracts many attentions. Not only the aircraft taking off and landing but also the aircraft landing in the airport need to be monitored. This paper proposes a saliency-based CNN (convolutional neural network) method for aircraft detection in the remote sensing images. Many researches of aircraft detection access to a method of R-CNN (region convolutional neural network), which generates two thousand or more of proposal regions as candidates of the aircraft. The researches of using a saliency map to extract the objects from the images are still not so many. We adapt a series of preprocessing as transforming to a gray scale image, deleting the noise, binarizing by threshold, the closing operation, and floodfill to generate a saliency map where the contours of all objects are reinforced. Compared to R-CNN, the using of a saliency map greatly reduces the number of proposal regions, thus improving the efficiency. After this, we find the contours of objects and the minimum rectangles enclosing objects to extract proposed regions. Then, we prepare a negative dataset consisting of different types of backgrounds including the land, grass land and concrete. And for a positive dataset, we prepare images of aircraft in different angles and different sizes. To add more variation data into the dataset, we also use methods of augmentation like elastic distortion and perspective transforms. Then, we train a CNN model using the prepared dataset, which can tell whether a proposed region contains aircraft, after training. At last, we use a method named recall to evaluate the performance of the scheme, attaining an average recall of 0.7217, which shows the rate of aircraft successfully detected in all aircraft.

Alternate Deflation-Inflation Gradient Vector Flow Snakes for Prescreening Glaucoma in Mobile Phone Retinal Images

Thayanee Ruennark[1], Pakinee Aimmanee[2], Stanislav Makhanov[3], Navapol Kanchanaranya[1], Sakchai Vongkittiruk[1]

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Abstract: A rapid development of the mobile phone and lens technology makes retinal imaging through mobile phones become more widely used than ever before. However, the poor quality of retinal images obtained from the mobile phone is usually problematic for existing image processing algorithms. This paper proposed a method for prescreening patients with glaucoma from a collection of images obtained from a mobile phone with a retinal wearable lens. A new scheme so called Alternated Deflation- Inflation Gradient Vector Flow (ADI-GVF) snakes improves the conventional method of gradient vector flow snakes so that it can segment the regions of the optic disc (OD) and optic cup (OC) more efficiently in order to provide a more precise value of a cup- to-disk area ratio (CDAR). The proposed method yields up to 89.36 % of accuracy for glaucoma detection.

Keywords: Glaucoma; Iterative GVF; CDR

An Analysis of Visitor's Highlights and Information Channels Used: A Study of Phuket

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Abstract: Beach destination such as Phuket has positively been considered to be a great location for tourism from time to time since there are an increasing number of international tourists travelling to Phuket. The supporting reason is that Phuket has not only beaches but also offer a variety of highlights. However, tourists need to search information about the highlights and plan their trips. It would be benefits for highlight strategists to know which channels have been used in order to deliver direct and accurate messages to target customers. Thus, this study aims to identify the information channels used by tourists based on their highlight in the trip. Eight tourist highlights were examined by using eleven information channels including online, offline, and organic channels as the factors. The results were drawn from a survey of non-Chinese tourists as China has limitation in accessing to some online channels. The findings demonstrate the difference in information channels selection for each highlight. In addition, a comparative analysis of information channels used in each highlight resulting in a form of highlight's profile based on nationality. Lastly, discussion and implications of the results were offered in this paper.

Keywords: Beach destination; information channel; tourist highlight; demographic factors

Application of Batu Belah Batu Bertangkup Folklore in Riau Province with Augmented Reality

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Abstract: Batu Belah Batu Bertangkup is one of the folk stories originating from Riau Province. This folk tale has a fairly good moral value to be conveyed to the next generation, which is to be kind, caring, and not denying parents' orders. The current generation, commonly referred to as Z generation, is not accustomed to reading books, this generation uses smartphones more often to access technology, while the folklore of Batu Belah Batu Bertangkup is still in book form. This research raises the folklore of Batu Belah Batu Bertangkup using Augmented Reality technology, so the Z generation is interested in seeing and listening to this folk tale. This study uses Blender for making 3D animations and Kudan SDK libraries with markerless techniques for Augmented Reality, and runs on the Android operating system. Based on the testing of the light intensity and angle, this application displays the Augmented Reality of Batu Belah Batu Bertangkup in dim light with the intensity of 30 lux light with the angle of vision 10o to 90o.

Keywords: Folklore; Augmented Reality; Batu Bertangkup; Library Kudan; Markerless

Application of Random Forest in Limited Size Human Long Non-coding RNAs Identification with Secondary Structure Features

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Abstract: In this work, preliminary experiments of using diverse machine learning algorithms and testing of multiple relevant features to discriminate between human lncRNAs and coding/partial coding sequences

was performed. This research limited the size of human lncRNAs such that they are shorter than 1000 nucleotides. Various significant features in describing RNA sequence including sequenced based features, secondary structure features, base-pair features and structural robustness features were used in this study. Then, the top 20 significant features were selected using Wilcoxon rank-sum test and discovered that the secondary structure features are the unique characteristics for identifying the human lncRNAs which are quite difference with those in the groups of shorter and longer types of ncRNAs. Such features are suitable with the rule-based classifiers like Random Forest. According to 10-folding cross validation, the random forest model has shown the highest accuracy, sensitivity and specificity as well as the lowest false positive rate among all competitors. Furthermore, the model was compared with other state-of -the-art approaches such as CPC, CPAT, RNAcon and achieved the highest accuracy of 84.5% among all the participants.

Keywords: Long non-coding RNAs; Random Forest; Secondary Structure features

Applications to Screen Children with Autism Spectrum Disorder

Kanda SaiKeaw[1]

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Abstract: Currently, Autism Spectrum Disorder (ASD) is a highly prevalent disorder. Luckily, children with ASD can receive treatment lately. However, although screening tools are available, these tools can only be operated by medical staff. Some parents of children with ASD may not be able to take their children to get the appropriate medical treatments. These may be the results of time constraint, money expense, travel difficulty, and even unknowingly which medical condition their children are having. The consequence is that the children miss the opportunity to receive proper treatments and to have appropriate developments as early as possible. Thus this article proposed the development of both web and mobile applications that help parents access the ASD screening for their children more conveniently. The ASD screening tool was a Thai version of Modified Checklist for Autism in Toddlers, Revised, with Follow-Up (CM-CHAT-R/F)TM. Based on the field trial results of 20 participants, comparing the results of the application screening with the diagnosis from child and adolescent psychiatrists and a developmental pediatrician, the application had a sensitivity and specificity of 90.

Keywords: Digital health; Screening application; Web technology

Arduino Visual Programming

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Abstract: A graphical programming language called ArViz is proposed in this work. ArViz is an extension of Ardublockly and senseBox Blockly, which is an extension of Google Blockly. ArViz is designed as a programming tool for teaching an IoT programming concept to beginners. Once the blocks are com- pleted, ArViz automatically translates blocks into corresponding Arduino compatible C / C++ code. ArViz also provides more connectivity type blocks such as WIFI module, MQTT protocol related blocks, along with sensor and actuator related blocks in order to support the Internet of Things (IoT) applications. ArViz allows beginners to build their IoT applications by dragging and dropping interlocking blocks.

Keywords: Graphical programming; Blockly; Internet of Things

ArViz: An IoT Teaching Tool for High School Students

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Abstract: This work aims to evaluate ArViz as an IoT teaching tool for new inexperienced students. ArViz (Arduino Vis(z)ual Programming) is wrapped in a graphical interface to help inexperienced or novice programmers learning IoT programming skills with arduino compatible boards. Student performances in the class are analyzed based on the multiple choice tests and questionnaires. The evaluation results show that the pre-test score of students is at 29.46% while the post-test score of students is 76.79%. The overall satisfaction is 4.23 out of 5.

Keywords: Internet of Things; Block Programming; Learning Toolbox

Automatic Monomer Filling System Using Machine Vision

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Abstract: This paper presents the design and development of an automatic monomer filling system using machine vision in optics manufacturing. Currently, the production process is carried out by a trained worker. The monomer filling process, needs to be operated by hand and human vision is employed to control each step. The important procedure is to start-stop a valve to prevent liquid monomer overflow from glass molds. The proposed system consists of a Cartesian robot and a vision system. The vision system uses two cameras to capture four regions of interest (ROI) of four glass molds at the same time. The frame differencing technique is used to detect the difference between the last and the current video frames. The results show that each camera can be operated at real-time image processing at 52 frames per second, and the system can stop the valve for the filling monomer of each glass mold at the full level. As the result, productivity increased by 60% compared with the existing manual process making it possible to replace skilled workers.

Keywords: Cartesian robot; machine vision; real-time image processing

BADHON: A High Performing Keyboard Layout for Physically Impaired People

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Abstract: Although much work has been done and improved solutions have been proposed towards the design and development of keyboard layouts for non-disabled people, very few approaches have addressed the same issue for the physically handicapped group. In this paper, we propose a novel text entry system, namely BADHON, for a specific user base who are unable to use regular keyboards because of limited hand mobility and require a solution to interact with the computer using thumb toe and ankle movement. In order to resolve the inevitable trade-off between faster typing speed acquisition and inconvenience of

memorizing a new layout, two different layouts have been proposed. One combines movement time model and linguistic model to ensure good words per minute (wpm) count and other significantly reduces the burden of carrying manual while using the layout by keeping the alphabet's orientation as easy as possible.

Keywords: Human-Computer Interaction; Movement Time Model; Word Per Minute; Linguistic Model; Fitts' Law

Bimodal Emotion Recognition Using Deep Belief Network

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Abstract: The emotions are very important in human daily life. In order to make the machine can recognize the human emotional state, and it can intelligently respond to need for human, which are very important in human-computer interaction. The majority of existing work concentrate on the classification of six basic emotions only. In this research work propose the emotion recognition system through the multimodal approach, which integrated information from both facial and speech expressions. The database has eight basic emotions (neutral, calm, happy, sad, angry, fearful, disgust, and surprised). Emotions are classified using deep belief network method. The experiment results show that the performance of emotion recognition system, it has better improvement.

Keywords: Human-Computer Interaction; Face Detection; Speech Detection; Feature level fusion; Deep Belief Network

BlockVOTE: An Architecture of a Blockchain-based Electronic Voting System

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Abstract: Electronic voting systems provide many advantages over traditional ballot based voting systems mainly over the accuracy and speed of the tallying process of the voting. However, electronic voting systems suffer from many technical and security issues which have limited its deployment in voting scenarios such as company voting and political elections. Centralized electronic voting systems are, by nature not secure, and there are many avenues of cyber-attacks that could tamper the voting result. Electronic voting system should be highly secured, tampered-proof guaranteed, and the voting should be trusted worthy. In this study, we propose BlockVOTE, a Blockchain-based electronic voting system. Our proposal uses Blockchain to ensure that the voting process can be kept secure and trustable through the consensus handling mechanism of the Blockchain. The architecture design and implementation suggestion are provided in this study. The implementation of the proposal was developed and tested via experimentation. The experiment result and the discussion on the possibility of adopting our proposal in an actual election is provided at the end of this study.

Keywords: Blockchain; Voting System; Electronic Vote

Classification of Risk Attitudes from Customer Behavior with Machine Learning

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Abstract: Every product and service in the market has its characteristic which has an impact on a consumer's decision to buy or use them. The risk is a distinctive characteristic of financial products, so in financial product and service design must use risk as a key factor. On the other hand, the consumer has different attitudes to the risk which can distinguish in 3 categories: risk aversion, risk neutral and risk seeking. Therefore, knowing risk attitudes of consumer who is the target market is an important key to define marketing strategy such as designing service and product, campaign, and promotion which going to be offered to them. Using the customer historical data, machine learning can be used to classify risk attitudes of each consumer. In this paper, we compare three machine learning methods to classify consumer's risk attitudes from their behaviors and identify important features. The results of the experiment show that the ensemble method, XGBoost, when used with resampling method ADASYN shows the best accuracy.

Keywords: Risk Attitudes; customer behavior; Ensemble Model; Random Forest; XGBoost

Contrast and Color Balance Enhancement for Non-Uniform Illumination Retinal Images

Preecha Vonghirandecha[1], Montri Karnjanadecha[2], Sathit Intajag[2]

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Abstract: Color retinal images play an important role in supporting medical diagnosis. However, some retinal images are unsuitable for diagnosis due to the non-uniform illumination. For this problem domain, we propose a method for improving the non-uniform illumination that can enhance the image quality of a color fundus photograph suitable for reliable visual diagnosis. Firstly, a hidden anatomical structure in dark regions of the retinal images is revealed by improving the image luminosity with gamma correction. Secondly, multi-scale tone manipulation is then used to adjust the image contrast in the lightness channel of L*a*b* color space. Finally, color balance is adjusted by specifying the image brightness based on Hubbard's specification. The performance of our method has been evaluated against data from DIARETDB1 dataset. The results obtained show that our algorithm performs well for correcting non-uniform illumination of the color retinal images.

Keywords: Retinal image; non-uniform illumination; human visual perception; image contrast and color balance enhancement

Data Clustering Using Hybrid Genetic Algorithm with k-Means and k-Medoids Algorithms

Md. Touhidul Islam[1], Pappu Kumar Basak[1], Priom Bhowmik[1], Musharrat Khan[1]

[1]East West University, Bangladesh

Abstract: Clustering methods separate a set of data points into groups or clusters, where data points of each cluster have the similar properties and are dissimilar from those of other clusters. In general k-means and k-medoids methods are used for data clustering. These clustering methods are heuristic and may stuck in a local optima. To avoid this problem, we propose a hybrid Genetic Algorithm (HGA) used in conjunction

with k-means and k-medoids methods. For this purpose, we propose a genetic encoding of the clustering problem, where data points are separated into k clusters and the fitness of the generated clustering is determined using the distance measure of each data point from its cluster center using both k-means and k-medoids methods. We experiment with Iris, Seeds, and Ionosphere datasets. Experimental results show that the proposed HGA generates much higher clustering accuracy than the previously reported works.

Keywords: Data clustering; hybrid Genetic Algorithm; k- means clustering; k-medoids clustering

Decision Support System to Discover Route and Time Spent at Waypoints for Cultural Tourism and Community Lifestyles Through Participation of Communities

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Abstract: The main purpose of this research is to develop a web-based decision support system to discover cultural tourism routes in Khaosamokhon through the participation of communities. The system was developed by using a decision support system with rate and weight scoring rules. The development of the web-based system was done in HTML5 and used Leaflet, JQuery and the Google Map JavaScript API to provide friendly interactive maps. The community can input tourist information, which are the attractions with the communities in the system. In the system, tourists can specify preferred destinations with their desired departure and arrival times. The system calculates the route including destinations satisfying tourists' requirements with navigation instructions. The created maps are flexible in discovering routes. Five experts rated the overall performance of the system as high. Moreover, the overall satisfaction of 48 respondents was at a high level as well.

Keywords: Decision Support System; Discover Route; Cultural Tourism

Design and Implementation of Connected DataLake System for Reliable Data Transmission

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Abstract: Currently, the edge cloud for efficient management of IoT and various devices is increasing, so there is a growing need to safely and flexibly manage the stored data in the Edge Cloud. One of the most effective ways to efficiently manage the growing edge cloud is to store the data of each distributed edge cloud to the cloud. In this paper, we design and implement a connected DataLake system based on distributed cloud storage that delivers data stored in multiple Edge Clouds securely to micro cloud storage. In addition, the system performs real-time error recovery such that the transferred data can be restored to the abnormal point when an abnormality occurs during transmission. The developed Connected DataLake system was proved to show the efficiency of the system in the KOREN/TEIN network.

Keywords: Cloud storage; Edge cloud; Cloud; DataLake

Detecting Student Engagement in Classrooms for Intelligent Tutoring Systems

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Abstract: Detecting and tracking student engagement in a large classroom can help tutors or automatic learning systems easily control or summarize the situation. To come up with the advanced technique in machine learning, especially deep learning, nowadays, many schools can build an efficient system for supporting teachers or tutoring systems. In this paper, we propose a transfer learning method applying to a small dataset to classify student actions in the classroom. Another contribution is building a lightweight dataset with a limited number of images for each category for classification work. The experiments show the acceptable result in action recognition with high accuracy compared to other researches.

Keywords: Action recognition; student engagement; student actions classification

Determination of Experimental Blood Pressure by Appllying an Engineering Model to Medical Diagnostic Equipment

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[1]Tokyo University of Science, Japan

Abstract: Currently, dialysis patients in Japan alone have more than 300,000 people[1]. Most of them can do dialysis without any problems, but some patients are likely to lose their lives as consciousness disappears during treatment. As far as coping with this phenomenon has relied on physician and nurse's intuition, machine judgment can`t be made. In this research, it is to simulate the sound by making various stenosis in the blood vessels of a pseudo by using an engineering model imitating a human arm. It also aims at early discovery of precursors of patient's consciousness by comparing the data with actual patient data.

Keywords: dialysis; blood; blood vessel

Developing a Mobile Application for an Abdominal Exercise Machine Using an Accelerometer

Rong Phoophuangpairoj[1]

[1]Rangsit University, Thailand

Abstract: This paper proposes a method of developing a mobile application for an abdominal exercise machine. Currently, inexpensive exercise machines, which are sold internationally, do not give feedback to users about the workout they engage in. Therefore, it would be useful to develop an app that could monitor physical activity on low-cost exercise machines. An additional benefit of using smartphones is that the exercise data can be cast to larger TV screens and monitors. Leg raise and lower cycles, as well as the number of back raise and lower cycles, were determined from angles measured by smartphones equipped with accelerometers connected to the bars of an abdominal exercise machine. In addition, an Android application for abdominal exercise machines was created based on the method. The app allows users to monitor their abdominal exercises by setting parameters related to raising and lowering their legs and the backs of their bodies. The results of physical activity were displayed on a smartphone screen and spoken using Text to Speech technology.

Keywords: abdominal exercise machine; accelerometer; Android; leg exercise; back exercise

Dynamic Frequency Allocation for D2D Communications in Multicell Environment Using Modified GADIA Algorithm

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Abstract: It is anticipated that the devices connecting to each others would extend up to billions in number in the near future. The demands, namely higher data rate, higher throughput, lower latency and extended limits, etc., are expected even though there are limited available resources. Therefore, the efficient utilization of the available resources would play a vital role. Implementing D2D (Device-to-Device) communication on existing infrastructure would have many challenges; Interference management is one among them. To reduce this interference among D2D users, the frequency allocation must be done dynamically. In this work, the algorithm called GADIA (Greedy Asynchronous Distributed Interference Avoidance) is modified and used for dynamic allocation of frequency. The performance is evaluated in terms of mean interference by simulation using MATLAB. According to the simulation results, it is obvious that our proposed modified GADIA provides the lowest mean interference comparing to the predefined frequency allocation and random allocation methods in mitigating interference by allocating frequency for D2D users.

Keywords: Device-to-Device Communication; GADIA; Frequency Allocation; Mobile Communication

Edge Computing for Road Safety Applications

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Abstract: Modern technologies are being developed to address the alarming rise in road accidents caused by drivers' errors. We leverage computer vision and deep learning at the edge (i.e, in a car) to detect vehicles and pedestrian that are in the surroundings. This information can then be employed to direct driver's attention to relevant information, minimizing the effects of human errors. This work explores various deep learning pre-trained models: Intel open model zoo and TensorFlow detection model zoo to run inference on Intel Movidius to employ edge computing. We analyze the performance to determine the practicality of using the pre-trained model for road safety purposes. The experiments conducted examines the various SSD-based network models. The accuracy that we obtained by the harmonic average of the precision and recall on the models, the inference time and low demand in computing power determined that TensorFlow detection model zoo is a practical object detector that we can implement to tackle road safety issue.

Keywords: edge computing; openvino; object detection; deep learning models; tensorflow

Effectiveness of Ptex Method in the Field of Texture Mapping and Polygon Topology

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Abstract: This paper presents several texturing problems that occur in complex polygon topology where the model is based on tris and ngons. It also shows an experiment and describes the application of the Ptex system for mapping textures onto a 3D model. The topology parameterization using 3D Coat and its auto-retopology tools are shown as well. A new topology model was tested using a texture checker inside Mudbox and VRay. Additionally, a comparison was made between Mantra and VRay rendering systems, where specific difficulties had occurred when applying Ptex mapping. The aim of this experiment is to present how cache memory directly interferes with texture filtering and rendering speeds. This paper concludes with the advantages and disadvantages observed in relevant literature and through an empirical approach to this technology.

Keywords: per-face-texturing; ngons; retopology; VRay; Catmullrom filter

Efficiency Comparison of Data Analysis for Inverter System

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Abstract: In this paper, we presented the data analysis of performance for each inverter with similar study area. We found that the energy yield of all inverter is related with placement representing in comparative analysis. Furthermore, we can generalized the linear regression equation of energy consumption with respect to energy yield. And we can summarize the results that the 4th inverter can get the best power when comparing with the graph and equations from all inverters.

Keywords: Solar Cell; Linear Regression; Energy Yield; Energy Efficiency

Enhancement Agile for a Cyber-Physical Systems (CPS) Development with Cloud Computing

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Abstract: This paper applied cloud platform as a tool to study agile software development process for developing CPS. The outcome of this study is to demonstrate that cloud computing can enhance the agile principles for CPS development in three limitations including, 1) lack of tools for deploy, simulation and continues improvement(CI), 2)limited visibility of customer environment, and 3) lack of repository and version control management. This paper applied the Azure cloud platform as a tool to study agile software development process for developing four cases of CPS are blink, Temperature, sound and OLED. All cases produced with two methods are Agile development with cloud platform and Agile with the non-cloud platform. From a study found that cloud platform can more improve an agile usage for CPS than non-cloud platform development. Especially, Continues Integration, simulation, deployment, repository management, production and operation, and Usage and visualisation of data. However, some aspects that can study in the future. For example, HW/SW dependency may solve with Containers such as microservice, docker and

IaaS Platform. Besides, an integration between Simulink and cloud platform is a challenge for modelling specification.

Keywords: Agile; Cyber-Physical Systems; Cloud Computing

Enhancing Software Testing with Ontology Engineering Approach

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Abstract: This paper presents a novel hybrid framework, Software Requirement Ontologies based Test Case Generation (ReqOntoTestGen) to increase the confidence in the reliability of existing verification and validation (V&V) techniques. This framework integrates the benefits of ontology modelling with the test case generation approaches based on use case-based requirement specifications. ROO (Rabbit to OWL Ontologies Authoring) tool is used in this work to eliminate the ambiguous requirement in natural language by using Controlled Natural Language (CNL). The ontology result from this tool, then, is translated into OWL before this OWL model is mapped into the XML file of data dictionary. Test cases are generated from this XML file by using CCTM (Combination of Equivalence and Classification Tree). This testing technique enables the redundant test cases to be eliminated and the coverage of testing to be increased. The contribution of this work has been explored by using the real case study. The result shows how the requirement ontology enhances the testing technique as we expected.

Keywords: test case; requirement ontology; software requirement specification; software testing; black-box testing

Evaluating Biometrics Fingerprint Template Protection for an Emergency Situation

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Abstract: Biometric template protection approaches have been developed to secure the biometric templates against image reconstruction from the stored templates. In the fingerprint authentication system with template protection, the matching is performed in the transformation domain. The alignment of the queried and enrolled template is difficult. There can be variation between the enrolled fingerprint and the queried fingerprint. In this work, the original fingerprint images in FVC2002DB1_B and FVC2002DB2_B are modified in order to make variations. Six modified fingerprint data sets are derived by conducting the rotation and changing the quality of original fingerprint images according to the environment conditions during an emergency situation such as wet or dry fingers and disoriented angle of fingerprint images. Two cancelable fingerprint template approaches are selected to be evaluated on the created data sets. Both approaches include the geometric information of the fingerprint into the minutiae. The experimental results show that the modified minutiae-based bit-strings cancelable fingerprint template approaches performs well on all conditions during an emergency situation by achieving the matching accuracy between 83% and 100% on FVC2002DB1_B data set and between 99% and 100% on FVC2002DB2_B data set.

Keywords: biometric-based user authentication; cancelable biometrics; biometric cryptosystem

Exploiting Dependency-based Pre-ordering for English-Myanmar Statistical Machine Translation

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Abstract: Word reordering is one of the challenging problems for statistical machine translation (SMT) when translating between different word order languages, such as English and Myanmar. In this paper, we employed a pre-ordering approach to learn reordering rules that aims to arrange the word order of the source sentence to that of the target sentence prior to translation. The rules are automatically learned with a source-side dependency parse trees and bilingual word alignments to obtain a monotonic parallel corpus. Experiments on English-Myanmar translation show that the pre-ordering approach yields statistically improvement by up to 1.8 BLEU points on Asian Language Tree-bank (ALT) data, compared to state-of-the-art phrase-based statistical machine translation (PBSMT).

Keywords: pre-ordering; dependency parse trees; word alignments; phrase-based statistical machine translation

EyeMath: Increasing Accessibility of Mathematics to Visually Impaired Readers

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Abstract: Mathematics education for visually impaired students is challenging because their learning materials are generally limited to braille books, and audiobooks. In order to increase the chance of learning mathematical content for people with visual impairment, this paper presents the design and development of a cloud-based mobile application called EyeMath, using serverless microservices in Amazon AWS. Users can provide images of page snippets for the application to process and read their content to the users. EyeMath segments an input image into smaller pieces and separates pieces that have only plain text from pieces with mathematical symbols. The mathematical-related pieces are further processed into an Abstract Syntax Tree (AST) and then parsed into Thai sentences. For plain text pieces, EyeMath relies on Tesseract OCR to convert them into text. Finally, results for all pieces are combined together systematically for the device's screen reader program to read aloud. The performance evaluation of the application shows high correctness in reading math content within test images and our usability testing confirms the potential usefulness of the application to visually impaired readers.

Keywords: Learning accessibility; Image processing; Language Parsing; Optical Character Recognition; Serverless Microservices

Failure Prediction in Open-hole Wireline Logging of Oil and Gas Drilling Operation

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Abstract: The failure of open-hole wireline logging leads to an unexpected cost and time that add to drilling operation. The research proposes methods to predict the failure of an open hole wireline logging prior to run the log on actual situation. Three machine learning techniques are used to predict the result of the open-

hole wireline logging from drilling process. The success class is the normal well that can run logging to target depth without tool sit down or stuck. Support Vector Machine (SVM), Naive Bayes and Decision Tree are chosen as proposed machine learning techniques for this task. The comparison between each method is discussed. The result of the experiment with the data shows that SVM has the highest accuracy.

Keywords: open-hole wireline logging; data analysis; support vector machine

Finding the Risk Factors and the Risk Areas for NCDs Using Data Mining Techniques

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Abstract: This research aims to identify the risk factors and the risk areas that cause chronic non-communicable diseases (NCDs) using data mining techniques. The sample data of NCDs is collected and delivered by the standard structure of the Health Information Bureau, Ministry of Public Health of Trang province, Huaiyot district in three sub-districts; Tha Ngio, Khao Poon, and Nai Tao. In the experiment, the various data mining techniques have been applied. However, we found that the decision tree technique is the best method for classifying the data which has 78.04% of accuracy. The experimental results show that age, weight, and height are the three main risk factors of NCDs. Furthermore, the highest risk area for high blood pressure is Khon Pun sub-district; while the highest risk area for both high blood pressure and diabetes is Tha Ngio sub-district. Finally, the minimal risk area for NCDs is Nai Tao sub-district. In addition, a prototyping application for the prediction of NCDs using decision tree model has been developed.

Keywords: NCDs; data mining; decision tree

Fog - Cloud Computing Traffic Model and Performance Evaluation for Ubiquitous Sensor Network Infrastructure

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Abstract: We presented a possible method of data transmission via characteristics traffic model by emphasizing the ones of systems. We used a microcontroller board for measuring and manipulating in wireless type through the implementation on the fog - cloud computing traffic model architecture design consisting of Ubiquitous Sensor Network layer, Fog computing layer, and Cloud computing layer. The fog - cloud computing is the important role to system requirements for operations on the USN in the form that is appropriate ones. In this paper, we analyzed the situation that can occur in the measuring and manipulating through the microcontroller board by the traffic model which can be divided into 7 USNs and use latency measurement to demonstrate the efficiency of data transmission in each traffic model. Latency test has divided two tests consisting of testing to compare the overall data transmission for 7 USNs and comparing the number of connected devices. It was concluded that the latency obtained depends on the number of connected devices in the USNs.

Keywords: Ubiquitous Sensor Network; Fog Computing; Cloud Computing; Traffic Model; Latency

Forecasting Bowel Sound Occurrence Frequency by SARIMA Model

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Abstract: People eat food and their intestines digest and absorb the nutrients from it. The intestine moves and stirs the intestinal contents by peristaltic movements, thus generating bowel sounds. The number of bowel sound occurrences represent the amount of activity in the bowel, which is generally used for evaluating the time for medication. Currently, it is a short auscultatory because the doctor directly checks it with a stethoscope; however, a technology that can monitor patients for such sounds for a long time was developed in a previous study. Not only the bowel sound frequency but also the generation of bowel sounds should be used in the future as an indicator of medication timing. In this study, the bowel sound frequency was predicted by the SARIMA model. The Box-Jenkins method is adopted as a procedure of model building. In addition, with reference to autocorrelation and partial autocorrelation, the determination degree is finally achieved by AIC. This work reveals that the bowel sound frequency is periodic and that it can be modeled using SARIMA. The results indicate that it is possible to obtain a more optimal time of medication by predicting the bowel sound occurrence frequency. Moreover, it is possible to quantitatively assess the intestine condition by SARIMA modeling.

Keywords: Bowel sound; SARIMA model; Forecasting

Grape Disease Identification Using Convolution Neural Network

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Abstract: In this paper, we present a CNN model to identify the disease in grapes plant in early stage by analyzing the leaf images. The model is illustrated on publicly available PlantVillage dataset and the performance compared with traditional machine learning models and pre-trained convolution neural network models. The performance of algorithms has been compared on various evaluation metrics i.e. accuracy, precision recall, running time of model, storage space and AUC-RoC. From the experimental results, it has been observed that the performance of proposed model is better than traditional machine learning algorithms as well as pre-trained models by achieving an accuracy of 99%.

Keywords: convolution_neural_network; traditional_machine_learning_methods; pre-trained_models; augmentation

Impact Analysis Framework of Test Cases Based on Changes of Use Case Based Requirements

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Abstract: Software testing activities are an important process in the software testing life cycle. Therefore, test case generation has become one of the essential steps of testing for software to obtain accuracy guarantee and quality of software. However, the changing of requirements often occurs in the development

phase, which causes an effect on the software testing. To solve this problem, this paper proposes a framework for impact analysis of test cases based on changes of use case based requirement specification. The proposed approach verifies and validates the difference of requirement specification which is described in use case pattern on two versions of requirement specification document. Consequently, the patterns of the variable requirements changing to be classified and analysed. These results enable the existing test cases to be completely reused partly updated as well as additionally generated. In addition, generating new test case completely supports testing coverage and eliminates test case redundancy by using the effective CCTM method.

Keywords: Test case; Impact analysis; Equivalence Class Partitioning; Classification Tree Method; Black-Box testing

Improvement of Software Productivity by the Integrated Software Test Management System

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Abstract: Development of derivative products and software in short term has been required in semiconductor apparatus. The integrated software test management system has developed to prevent regression and shorten development cycle. This paper discusses about the system. After that, it mentions the result of applying the system to software development project of a semiconductor inspection apparatus. The effectiveness of reducing workload of integration testing and improvement of software quality have been found by this validation.

Keywords: Software development process; Software testing management; Auto software testing; embedded software; semiconductor apparatus

Influence, Principles and Good Practice of Computer Game Elements: Mechanics and Dynamics

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Abstract: This paper gives basic overview of computer game elements (mechanics and dynamics) that can be found in various applications. Game elements can be used as a method for improving online teaching in education in general. We are showing the beginning of the Gamification phenomenon as a concept through the Gartner analysis of new innovation technologies. An overview of the basic Gamification elements (mechanics, dynamics) that can be included in the gamified systems is also presented. The position of Gamification is explained in relation to similar approaches to education. The basic principles of learning by means of Gamification is presented, as well as the research of selected authors on the topic of the influence of Gamification on teachers in higher education. The results of this paper indicate positive progress in the inclusion of Gamification in education systems in higher education. Article is concluded with the example of good practice in terms of commercial product DuoLingo, which is listed as one of the most successful Gamification systems for learning foreign languages.

Keywords: Computer Game Elements; Mechanics; Dynamics; Gamification; Hype Cycle

Intelligent Power Charging Strategy in Wireless Rechargeable Sensor Network

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Abstract: This paper focuses on charging planning problem in the indoor environment through wireless rechargeable technology to extend the lifetime of Wireless Sensor Networks (WSN). This study proposes a novel charging method that the directional antenna and motor can combine to extend the charging coverage area, and it will be set on the ceiling to reduce interference from the obstacle. Finally, we proposed an intelligent power charging strategy method to design the charging schedule. Simulation result represents that the proposed machine-learning based method is useful in charging scheduling problem and enhances the lifetime of WSN and stability of the Internet of Things (IoT).

Keywords: Power Charging Strategy; Wireless Rechargeable; Sensor Network (WRSN); Machine Learning; Internet of Things (IoT)

Investigation of Adoption of Smartphone Technology for Learning

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Abstract: In this study, we will investigate the adoption of smartphones for learning. The 160 respondents are fulfill the questionnaires to test the proposed model. UTAUT and ECM (Expectation-confirmation model) models was employed to predict the Behavioral Intention. The findings reveal that Social Influence, Innovativeness, Effort Expectancy, Performance Expectancy, Perceived Performance, and Satisfaction have significantly relation to Behavioral Intention. Behavioral variables naming Age and Experience have important role in the relationship of variables in the study. The older and experienced users of smartphone for learning have highly concern with performance of smartphone and more satisfy with their learning application on smartphone.

Keywords: Adoption; Technology; Smartphone; Learning

JSP Digital Asset Trading System

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Abstract: This research presents a novel mechanism of digital asset trading system on blockchain called JSP-DATS. The JSP-DATS includes (1) the novel mechanism of trading, and (2) a novel mechanism of blockchain which will be the infrastructure of the system. The proposed novel mechanism of blockchain uses the "Random-Checker Proof of Stake" consensus model which can provide a lower delay transactions. The blockchain of the JSP-DATS has been designed to multiple layers. This design brings an ease of development, and can be used for further research. The internal mechanism of the proposed system including steps of encoding / decoding, key management, and the storage of encrypted digital assets on the blockchain has will be discussed in this paper. In addition, we have implemented the designed model using

Microsoft Visual C ++ and the Encryption Library from the MSDN web-site to make a prototype software. The prototype is used to study and measure the speed of the proposed scheme. The results show that transaction delay of the proposed scheme is lower than that in BitCoin and Ethereum blockchain. With the proposed scheme, the seller (digital asset owners) can see the transactions of the trading system transparently, and they can receive their percentage share immediately. In addition, we expect that buyers will indirectly benefit from purchasing digital assets at a lower price.

Keywords: JSP; DigitalAsset; TradingSystem; Blockchain; Cryptocurrency

Learning Using LTE RSRP and NARNET in the Same Indoor Area

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Abstract: Rapidly rising demand for radio communication and the explosion in the number of mobile communications service subscribers have led to the need for optimization in the development of fifth-generation (5G) mobile communication systems. The development of AI (artificial intelligence) such as machine learning and deep learning is being studied rapidly in the fourth industrial era. The development of wireless telecommunication technology is taking place to the 5G. In this paper, RSRP signals of Long Term Evolution (LTE) are measured at same indoor areas. A measured RSRP data are analyzed with a statistic amplitude probability distribution (APD). We learn an artificial intelligence neural networks using measurement RSRP data and the results are analyzed. As a result, we confirmed the possibility of using AI in radio wave field.

Keywords: fifth-generation (5G) mobile communication; Long Term Evolution (LTE); artificial intelligence neural networks

Logic-Based Answer Set Creation for Question Answering System

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Abstract: Question-Answering system is a system to collect the possible answers in each question to suitable response. In the instance of a highly competitive era, whether it be in life, education, including work. The popularity effects on life, causing competition in all matters. However, people are not equal due to their different abilities or opportunities. These are effects to career choices. This research, therefore, offers a framework that focuses on creating a set of answers using the logic to matches hard and soft skills. In order to give the most appropriate answer for both entrepreneurs and applicants in finding the most suitable thing for themselves.

Keywords: answer set creation; logic-based creation; question answering system

Lukthung Classification Using Neural Networks on Lyrics and Audios

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Abstract: Music genre classification is a widely researched topic in music information retrieval (MIR). Being able to automatically tag genres will benefit music streaming service providers such as JOOX, Apple Music, and Spotify for their content-based recommendation. However, most studies on music classification have been done on western songs which differ from Thai songs. Lukthung, a distinctive and long-established type of Thai music, is one of the most popular music genres in Thailand and has a specific group of listeners. In this paper, we develop neural networks to classify such Lukthung genre from others using both lyrics and audios. Words used in Lukthung songs are particularly poetical, and their musical styles are uniquely composed of traditional Thai instruments. We leverage these two main characteristics by building a lyric model based on bag-of-words (BoW), and an audio model using a convolutional neural network (CNN) architecture. We then aggregate the intermediate features learned from both models to build a final classifier. Our results show that the proposed three models outperform all of the standard classifiers where the combined model yields the best F1 score of 0.86, allowing Lukthung classification to be applicable to personalized recommendation for Thai audience.

Keywords: Music genre classifcation; neural networks; CNNs; NLP; Music Informational Retrieval

Massive Open Online Courses (MOOCs) Recommendation Modeling Using Deep Learning

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Abstract: Since knowledge in the world of internet has always been developed with updated information. Recommendation system for a Massive Open Online Courses (MOOCs) can help create endless learning opportunities. This study presents a Massive Open Online Courses Recommendation Modeling using Deep Learning with Multilayer Perceptron architecture which is suitable for enormous data analysis. The research methodology begins with the process used for the data analysis process, using the data mining technique according to the Cross-industry standard process for data mining (CRISP-DM), consisting of six steps: business understanding, understanding of data, data preparation, modeling, evaluation and deployment. We received a set of data from Harvard and MIT, published for edX learning data in 2012-2013, consisting of 16 programs, 18 features and 641138 sample items. The research found that the most appropriate model is a model with 7 hidden layers and 1e-3 learning rate, processed by GPU acceleration for 250 Epochs. The evaluation of the model's performance is evaluated by calculating the precision value using 542784 testing samples.

Keywords: Course Recommendation; Deep Learning; MOOCs; Multilayer Perceptron

Mobility-based Performance Comparison of MBQA-OLSRv2 and MBMA-OLSRv2 Routing Protocols

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Abstract: This paper investigates the performance of proposed multipath routing protocols for energy-efficient and QoS awareness depending on nodes mobility in MANETs. In particular, multipath battery and queue aware routing (MBQA-OLSRv2) and multipath battery and mobility aware routing (MBMA-OLSRv2) were evaluated. EXata network simulator is used to conducts extensive simulations to compare various energy and QoS-related metrics for the proposed schemes. Simulation results prove that the MBMA-OLSRv2 scheme outperformed MBQA-OLSRv2 routing scheme in terms of several metrics such as; throughput, energy cost per packet, total packets dropped, consumed energy and delay especially in high mobility scenarios.

Keywords: MANET; MBQA-OLSRv2; MBMA-OLSRv2; Pause time; Energy-efficient

Modeling of Wireless Sensor Nodes Airdrop in Wind Field

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Abstract: In recent years, more and more research and applications use Unmanned Aerial Vehicle (UAV) airdrop sensor nodes to deploy and maintain large-scale wireless sensor networks (WSN). However, the energy consumption increasing of the node communication and position deviation from the monitoring range caused by the airdrop node deviation cannot be ignored. In this paper, by studying the variation of the wind field characteristic parameters with height and geomorphology, the wind force related to the node airdrop at different height of landform is studied. And the model of the motion process of the airdrop node in the horizontal and vertical directions is established. The sensor node airdrop based on UAV at different altitudes in wind field is simulated. The influences of the error in nodes airdrop are discussed, and an executable solution is proposed too.

Keywords: Wireless sensor network; Unmanned Aerial Vehicle; Wind; Node energy consumption; Weibull distribution

Modest Android Application Development for the Entrepreneurship in Art and Culture Organization

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Abstract: Currently, several platforms to develop an Android Application are available freely at the internet. People who do not have any major in computer science are able to create the mobile application by themselves. The technical aspects on creating the application have been successfully minimized and the creators do not need to type any programming code to create the application. However, most of them need to understand the pattern to create the menu and its function to work. The simplicity in making the Android application could help the managers of art and culture performances to spread the information and knowledge of their business to the modern users. This paper explores the possibility and technical aspects in developing a simple Android application for the entrepreneurship in art and culture organization. The approach in developing the Android application should be able to help the organization that manages art and culture in spreading the information to the people simultaneously.

Keywords: art and culture; limited budget; mobile application; simple application; technology entrepreneurship

Multiplication of Medium-density Matrices Using TensorFlow on Multicore CPUs

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Abstract: Matrix multiplication is an essential part of many applications, such as linear algebra, image processing and machine learning. One platform used in such applications is TensorFlow, which is a machine learning library whose structure is based on dataflow programming paradigm. In this work, a method for multiplication of medium-density matrices on multicore CPUs using TensorFlow platform is proposed. This method, called tbt_matmul, utilizes TensorFlow built-in methods tf.matmul and tf.sparse_matmul. By partitioning each input matrix into four smaller sub-matrices, called tiles, and applying an appropriate multiplication method to each pair depending on their density, the proposed method outperforms the built-in methods for matrices of medium density and matrices of significantly uneven distribution of non-zeros.

Keywords: Sparse matrix; Matrix multiplication; TensorFlow

Online Classroom Attendance System Based on RFID Technology and Cloud Computing

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Abstract: Students attendance in the classroom is one of instrument for marking in the end of class, several students are cheating they attendance while manual system used which is signed the sheet. This research proposed on online attendance system for students and lecturers, every student before entering the classroom have to tap their student card on RFID reader available in front of classroom. Attendance for time in and out set to complete of attendance in a lecture. Time tolerance for late and early out is set 10

minutes before and after the schedule. Similar to students, every lecture required to tap as well before and after teaching in the classroom, besides that lecturer required to hold his card on RFID reader to on electricity in the classroom else no electricity and no power supply provided. The data of students and lecturer attendance with room number is set and send to a database for student's attendance record and honorarium for lecturer. This system tested in a classroom and data collected passed to the cloud server through Arduino Microcontroller for filtering in case student double tapped in RFID scanner. In order to match and avoid cheating by students who tap double students card thus a camera installed in the classroom for record and match student face by image recognition system to picture on the card. The system makes effective and efficiency in administration, paperless and efficiency for staff to control and check in manual attendance is one of the advantages of this system.

Keywords: Classroom attendance; RFID reader; Cloud computing; Database

Optimizing RocksDB for Better Read Throughput in Blockchain Systems

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Abstract: Blockchain technology has recently gained a great attention from industry as well as academia because of its potential as transaction transparency. However, one of its pitfalls is the transaction throughput - the current transaction throughput available in contemporary Blockchain systems is criticized to be quite lower than that required in many real world applications. Many Blockchain systems are known to employ RocksDB as its storage engine for scale-out architecture and cost effectiveness, but use the RocksDB in its default configuration. While many tuning knobs are available in RocksDB, it is unfortunate that Blockchain systems cannot leverage them, thus resulting in low transaction throughput. In this vein, to develop a set of practical tuning techniques of RocksDB for higher transaction throughput in Blockchain systems. In this paper, we present an experience on tuning RocksDB read operations for Blockchain workloads. First, we make an observation about the characteristics of Blockchain workload and review RocksDB architecture. Then, based on the observation, we suggest two tuning techniques of parallel reads and read avoidance. In particular, the first tuning technique is very effective on the flash storage because it can exploit the abundant parallelism in the device. Our experimental results show that these tuning techniques, when used in combination, can increase the read throughput of a Blockchain benchmark, compared to the default setting of RocksDB, by more than 30 folds.

Keywords: RocksDB; Blockchain; Optimization

Parameters Learning of BPS M7 Banknote Processing Machine for Banknote Fitness Classification

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Abstract: This paper presents a method to adjust banknote processing machine parameters so that it performance is comparable to the banknote specialist. Using Support Vector Machine to find important factors and select those factors to be adjusted and then find each threshold from individual histogram of each parameters. The result shows that the proposed method can boost classification accuracy to the banknote processing machine.

Keywords: banknote; fitness classification; banknote processing machine; support vector machine

Pattern-based Wordiness Reduction System for Thai Texts

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Abstract: In this paper, we propose a method and web application to reduce wordiness in Thai by adapting pattern-based analysis with wordiness initial corpus. The small amount of Thai text is gathered to create the initial corpus for grammatically analyzing the patterns of Thai wordiness. 18 wordiness have been decided to intensely analyze the co-occurrence, patterns contexts and construction rules. And 99 wordiness patterns are discovered for the experiments. The experiment has been done with 100 documents from Thai National Corpus by 15 students. For the user satisfaction which is analyzed from the questionnaire, users are highly satisfied with the use of the proposed system. And the wordiness reduction result of the experiment shows the effectiveness of the wordiness identification and reduction which the accuracy is 85.61%. The 13.49% of errors come from word segmentation and unknown words. Wordiness automatically corpus will be developed for further experiment in the future.

Keywords: Wordiness; Thai language; Web application; Information extraction

Personal Verification System Using Thai ID Card and Face Photo for Cross-Age Face

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Abstract: Nowadays, the main personal verification system uses the photo in Thai ID card. However, the card can be used up to nine year. Consequently, there could be difference between the face on ID card and the current face of the cardholder. This article demonstrates the use of ArcFace + Face aging with IPCGAN to solve the problem of cross-age face comparison. Based on the experimental results, the proposed algorithm outperforms other algorithms. Moreover, to automatically extract text information from the ID card, the developed system applies OCR of Google document text detection. It was found that Thai text information obtained from the proposed system yielded 93.97% accuracy, which is higher than others.

Keywords: Face aging; Face comparison; OCR

Real-Time Analysis of Heart Rate Variability Patterns During Hemodialysis

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Abstract: This paper provides an analysis method for heart rate variability (HRV) that uses the information theory as a tool to predict sudden decreases in blood pressure during dialysis. Sympathetic and parasympathetic activities are closely related to blood pressure. Moreover, these indexes are obtained by calculating the integral of low- and high-frequency in the power spectrum of HRV components. Any study has not reported that these indexes contributed to the prediction of Intradialytic hypotension in real-time. In this paper, we focused on HRV patterns instead of the autonomic nervous system activity index. Confirmation of HRV-specific pattern changes before and after rapid decreases in blood pressure leads to predictors of dialysis hypotension. We used the variation of the probability distribution in HRV as the variation of HRV patterns. Moreover, we used Jensen-Shannon divergence (JSD) to investigate the change

in probability distribution. The purpose of the HRV analysis method using JSD is to detect signs of sudden decreases in blood pressure in real-time during hemodialysis that cannot be obtained using the autonomic nervous system activity index.

Keywords: Hemodialysis; HRV; Jensen-Shannon divergence; Intradialytic hypotension

Rubber Tapping Position and Harvesting Cup Detection Using Faster-RCNN with MobileNetV2

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Abstract: This paper presents the detection of rubber tree (Hevea brasiliensis) tapping position (tapping-path) and trunk-mounted harvesting cup on RGB-D images, which is the machine vision part of automatic rubber farming system. RGB-D images are collected in real tapping environment. Camera is placed about 1.00-meter distance to the trunk which is feasible for robot platform. Faster-RCNN (Region-based Convolutional Neural Network) object detector is proposed with ImageNet pretrained Mobilenet-v2 as the feature extraction layers to detect multiple object's class - tapping path and harvesting cup. Our experiments show that cup detection achieve higher average precision on grayscale depth image detector than only RGB image detector. We also propose 3-channel combinations from 4 grayscales (RGB-D) then, put into specific detectors. Detector's performances are computed using 0.5 and 0.75 intersection over union thresholds (IoU). The results show that Faster-RCNN with Mobilenet-v2 tapping position and cup detection can reach highest 0.95 mAP@0.5 IoU estimated with k-fold cross validation (k=5). Our main contribution is that detection of harvesting cup using preprocessed grayscale depth with color images are more well-localized than only color image, observed at 0.75 IoU but tapping position detection is highly depended on color images and this can be impacted to practical application since cup detection are not required lighting.

Keywords: Rubber Tapping; object detection; agricultural

ScrambleSQL: A Novel Drag-and-drop SQL Learning Tool

Chanapat Phewkum[1], Jittakan Kaewchaiya[1], Kazuki Kobayashi[2], Kanokwan Atchariyachanvanich[1]

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Abstract: Structured Query Language (SQL) is a standard language for forming queries to access relational database systems, e.g. create table, as well as read, update, and delete data from the database. Thus, it is commonly taught in computer science classes. Technology growth helps developers to create many SQL tools which encourage students to learn effectively. Although many SQL tools have been developed, they are not suitable for some users who prefer to use a tablet for learning SQL, because the existing tools were not developed for a touchscreen device. Thus, we developed prototype ScrambleSQL, optimized for tablets. The purpose was to enhance learning, speed up SQL command writing and allow users to practice SQL commands anywhere and anytime, with the internet. We tested undergraduate students from an Information Technology program. They wrote SQL commands by ScrambleSQL and then completed a questionnaire. The participants were satisfied with its screen, learning and system capabilities. ScrambleSQL reduced typing errors and helped novice users to learn SQL commands with the provided keywords. In addition, the participants enjoyed learning with ScrambleSQL.

Keywords: drag-and-drop interface; SQL learning; computer-aided instruction

Sleep Apnea Detection Using Deep Learning

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Abstract: Sleep apnea is the type of breathing disorder in which breathing stops at the time of sleeping. Generally, there are four types of sleep apnea detection such as Type 1 sleep studies, type 2 sleep studies, type 3 sleep studies and type 4 sleep studies. The proposed model uses type 4 sleep study which focus more on portability and the reduction of the signals. In addition, the benchmarking standard for the detection of various kind of sleep disorders is type 1 sleep studies which provides highly accurate result and it includes polysomnography recording. The main limitations of type 1 full night polysomnography are time consuming and it requires much space for sleep recording such as sleep lab comparing to type 4 sleep studies. The detection of sleep apnea using deep convolutional neural network model based on SPO2 sensor is the valid alternative for efficient polysomnography and it is portable and cost effective. The total samples from SPO2 sensors of 50 patients that is used in this study are 190,000 samples. The analysis of SPO2 signal provide the crucial information for the detection of sleep apnea. The main objective of the paper is to detect sleep apnea using deep learning based deep convolutional neural network and the performance of the overall accuracy of sleep apnea detection is 91.3085%. The proposed convolutional neural network model using the subject specific scenario validation with the split rate of 0.2 in each empirical study outperformed than the other classifiers.

Keywords: sleep apnea detection; deep learning; type 4 sleep study; deep convolutional neural network; continuous single bio-parameter recording

Speech Emotion Recognition Using 1D CNN with No Attention

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Abstract: Speech emotion recognition (SER) has gained much attention in recent years. SER system may be efficient depending on how much useful information contained in the extracted emotional features. Many research works have achieved state-of-the-art results using Convolutional Neural Network with different extracted speech features. These kinds of models don't involve feature extraction and can't collect relative emotional salient features from speech signal. In this paper, we present a novel complementary feature extraction method to extract salient emotional features. We compute Melspectrogram and MFCC to capture time-frequency domain information, aimed at converting raw speech into emotional informative features from speech signals. Moreover, we adopt complementary property strategy to extract features and construct 1D CNN model which selects emotional features effectively and evaluate the model's performance on IEMOCAP, RAVDESS and Emo-DB speech corpus. The model achieves better performance than baselines and competitive results using complementary features as input.

Keywords: Speech emotion recognition; 1D CNN; Complementary features; Speech emotion corpus

Text Localization and Extraction from Background with Texture and Noise in Digital Images Using Adaptive Thresholding and Convolutional Neural Network

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Abstract: Recently, the task of text localization attracts many attentions. In this paper, we propose a method to localize individual characters of text from background with texture and noise in digital images using adaptive thresholding, width-to-height ratio, and convolutional neural network. The proposed method consists of three main steps: preprocessing, text candidate localization and classification, and character candidate localization and classification. In preprocessing step, images are enhanced by average filter in order to reduce noise and make the texture background harmonious. Then text candidates in an image are localized and classified using adaptive thresholding and width-to-height ratio of bounding boxes. Finally, character candidates of each text are localized and a convolutional neural network is used to classify character candidates as either character or non-character. The experiments were conducted on a dataset obtained from ICDAR2013 containing the training set of 229 images and the testing set of 233 images. From the experimental results, the proposed method can correctly localize text with the accuracy of 71.87%

Keywords: text localization; text extraction; adaptive thresholding; CNN; machine learning

Thai Scene Graph Generation from Images and Applications

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Abstract: The scene graph is used to represent the semantic of images or visual understanding. It has been used frequently for the image retrieval and image generation tasks. We develop a scene graph generator tool from a single image in JPEG format. This tool creates a scene graph in Thai language. One can especially use this tool for creating a scene graph data set in a local language. The methodology contains 3 steps: image captioning, scene graph parser, machine translation. We propose an application of chatbot demonstrating the use of the generated scene graph data. The experiments show the measurement of machine translator and caption generator using Spice, GLEU, WER and TER scores. Those values are 0.0480, 0.2096, 4.0000 and 0.8122 respectively. We also measure Meteor, Rouge, Cider and Spice scores where those are 0.258, 0.538, 0.996 and 0.183 respectively.

Keywords: Scene graph; image understanding; image captioning

The Difference Adoption of E-Commerce Technology Among Z and Y Generations

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Abstract: The rapid growth of e-commerce transactions among Y and Z generations in Indonesia goes along with the large number of internet users on both of the generations. Indonesia has become a potential market for the digital creative industry, especially to applications of online payments, online shopping, online

booking, and online banking. In-depth investigations into these two generations in the form of developing e-commerce technology adoption models will provide valuable contributions in the development of models and implementation of e-commerce industries in Indonesia. This study aims to obtain factors that influence the acceptance of generation Z and Y against e-commerce technology and reveal the differences in their acceptance of it. Investigation was done by collecting 343 questionnaires in age range of Y and Z generations. The results of this study reveal that all variables employing in the model naming Satisfaction, Trust, Perceived Information Quality, Perceived Service Quality, Performance Expectancy, Perceived Ease of Use, Hedonic Motivation, Social Influence, Price Value, Habit, and Facilitating Conditions have statistically significantly correlation to Behavioral Intention and to each other. The significantly difference of adoption of e-commerce technology among Z and Y generations are only found on Hedonic Motivation and Social Influence. The other difference on gender is found on Age, Education, Satisfaction, Perceive Ease of Use, and Perceive Information Quality. This study can contribute to who have concern on enhance adopting of e-commerce technology especially to the two generations and to developers of e-commerce application considering the factors that have correlation to intention to use e-commerce.

Keywords: adoption technology; e-commerce; Z generation; Y generation

The Empirical Study: Encouraging Students' Interest in Software Development Using Test-Driven Development

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Abstract: The supply is not matching the demand on the market for software developers. While the enrollment in undergraduate computer science courses is increasing, few students are interested in and committed to becoming software developers. It could be that students are overwhelmed by the software development methodology that they are taught. We are consequently looking for a constructivist approach to software engineering able to effectively engage learners. We empirically evaluated whether test-driven development (TDD) is able to improve the quality of both learning and of software development in the classroom. Although numerous studies have outlined the benefits and effects of TDD in the classroom, none of those studies have focused on measuring students' interest in and attitudes toward using TDD in the classroom. We present a study evaluating the impact of TDD on the engagement and focus of learners of software development in the classroom. The results illustrate that the use of TDD in the classroom encourages learners to engage and focus.

Keywords: Empirical software engineering; Test-driven development; Software engineering education

The Measurement of Software Size Based on Generation Model Using COSMIC FSM

Than Dar Zaw[1]

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Abstract: The software size measurement plays essential roles in developing a software project to estimate costs, efforts and other resources. It provides the necessary input to estimate the effort at the early stage of design phase in the software development process. Thus, COSMIC FSM (Common Software Measurement International Consortium Functional Size Measurement) is one of the well-known methods of FSM which

is suitable to estimate the size of software project at the early stage of development process. The industries use not only the standardized methods but also the well-defined modeling notations to measure the functional size of software. Some research has focused on the specific design notations to facilitate the design of the system. Therefore, this paper proposes a new model which is named as a generation model that can be accepted from various types of modeling notations and then these types converted into common general model for calculating the functional size of COSMIC concept. The generation model can help many researchers and estimators to understand the concepts of complex diagram notations easily. Then, the mapping rules defines between the COSMIC FSM and generation model to measure the size of software. Finally, the results of the actual size of the system are calculated by using COSMIC method.

Keywords: Meta model; UML sequence diagram; SysML sequence diagram; Petri net; COSMIC Functional Size Measurement (FSM)

Towards Nature-Inspired Intelligence Search for Optimization of Multi-Dimensional Feature Selection

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Abstract: Since news document includes complex and high dimensional feature, the conventional feature selection scheme becomes inefficient and ineffective for feature engineering in text mining field. Meanwhile, the nature-inspired intelligence (NII) is advanced significantly for solving the complex problem such as multi-dimensional feature selection. NII is the category of non-deterministic that is used the meta-heuristic search capability which consists of a group of search agents for exploring the feasible region based on both randomization and some rules. In this paper, Wolf intelligence-based optimization of multi-dimensional feature selection approach (WI-OMFS) is proposed for news document classification and compared the results of performance to conventional search-based feature selection approach. The performance (accuracy) is used as fitness function and computation complexity (feature reduction size and time take for building model) is also used to evaluate the proposed system. According to the experimental results, WI-OMFS can provide robustness for performance and computation complexity according to the objective function.

Keywords: stochastic algorithms; heuristic search; filter; wrapper; NP-hard problem

UI/UX-centric Design of In-the-Field Agricultural Data Acquisition System

Kasidid Songsupakit[1], Nalina Phisanbut[1], Punpiti Piamsa-nga[1], Pirawat Watanapongse[1], Skorn Koonawootrittriron[1], Thanathip Suwanasopee[1], Danai Jattawa[1]

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Abstract: In countries that rely on agricultural business, data collection is usually one of the key performance factor. There were lots of efforts in building IT systems for data analysis; however, those systems were frequently fail because data collection process was not efficient. In this paper, we propose the concept of agricultural data acquisition system with focuses on user interface (UI) and user experience (UX) from all stakeholders. This also demonstrates a prototype system called Cowlog, which combines both

mobile and web apps for dairy cow industry. After a year of experiment, the result shows that Cowlog can improve performance. Since the design can be generalized, it can be extended to other agricultural applications.

Keywords: UI; UX; mobile application; dairy farm

Using Image Features to Investigate Accuracy of Classification Techniques in Categorizing Visual Defect Types of Defective Yellow Soybean Seeds

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Abstract: The visual defect of yellow soybean seeds is the one of many reasons which effect on the soybean price. If those defects were found and classified correctly, the farmers or sellers would be able to cope with those problems immediately. Therefore, the accuracy investigation of classification techniques, in this study, were performed using the fourteen image features. Those features were extracted by utilizing the image processing techniques. The obtained feature values were used for classification in four ways. From the classification processes using ten techniques, the C5.0 with boosting method (trials = 80) provided the accuracy up to 93.53%, which were achieved the highest accuracy of six defect types (i.e., type 1, 3, 4, 5, 8, and 10). The results can be used to be an alternative to clue the causes of damage in soybean seeds.

Keywords: image features; defective yellow soybean; soybean defect classification; classification techniques; performance investigation

Voluntariness Difference in Adoption of ELearning Technology Among University Students

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Abstract: The study aims to investigate the variables influencing the adoption of eLearning among university student and examine the voluntariness effect on the adoption. The study employs Perceive Ease of Use, Perceive Usefulness, Facilitating Condition, Social Influent, Task Technology Fit, Attitude, behavior intention (BI), and actual use. The 230 questionnaires were collected to test the proposed model and voluntariness difference is investigated to get the comprehension of the adoption. The finding reveals that the variables have fully statistically direct effect among Task Technology Fit to Perceive Ease of Use, Perceive Ease of Use to Perceive Usefulness, Perceive Ease of Use to Attitude, Attitude to Behavioral Intention, and Behavioral Intention to Use Behavior. The other variables have partially statistically direct effect among Perceive Usefulness to Attitude, Perceive Usefulness to Behavioral Intention, Social Influence to Behavioral Intention, and Facilitating Condition to Behavioral Intention. Surprisingly, the Innovation difference prevail on the all variables on the proposed model and the behavioral factor including Experience and the day per week students using eLearning.

Keywords: adoption technology; eLearning; voluntariness; university students

WiseMed: Medication Reminder for Seniors

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Abstract: Today, many people are very busy with their daily lives, so they may forget to take their medications on schedule, and their medication treatments may not be as effective as they are supposed to be. Several medication reminder applications for smartphones are already available in Thailand, but most of them share a general limitation that users need to enter their medication information and schedule by themselves. This limitation causes a new problem: users inputting erroneous medication information or schedules into their smartphones, especially elderly users. This paper proposes a medication reminder application that overcomes this problem. To eliminate this kind of critical data entry error, we retrieves information on the user's medication and schedule by scanning the QR code on the medication package. This application is not only able to automatically remind users to take their medication on schedule but also provides the user with basic and crucial medication information such as directions for use, precautions, and side effects. Moreover, the application also keeps track of a user's medication-taking history over time, so the physician can modify the medication schedule or the user behavior in his or her follow-up visit in order for the treatment to be as effective as possible. The evaluations demonstrate that QR code mitigate the seniors' errors by 42%. Additionally, our pipeline can identify the user's medication-taking behavior that violate the time-critical scheduled medications with almost perfect correlation with a standard guideline. Finally, all medical professionals confirm that our medication-taking report is crucial and very helpful.

Keywords: Data visualization; Biomedical informatics; Rank correlation; Euclidean distance; QR code

Special Session on Advanced Digital Media

A Classification of Visual Style for 3D Games

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Abstract: Graphic styles for 3D games can be designed in any direction as the designer desires. Graphic styles range from an abstract composing with a degree of independence from visual references to a realistic rendition of the real world. Cel shaded, voxel graphics, and photo-realism are terms that widely used to characterize the graphic style. Nevertheless, these designates are not systematically set and well prescribed since development techniques change rapidly due to hardware and software innovations. In order to visualize a chosen graphic style, numerous compositions, materials, and execution are required. The purpose of a game, as defined by developers, can be game experience goal, player enjoyment, market capitalization, or specific objectives such as cognitive improvement. Different graphic styles can be used to reach the same goal, but some of graphic styles may have longer production time than others. In this study, we survey a hundred and forty of popular 3D games in the mobile platform with a focus on their basic construction including forms, proportions, texture, and lighting, in order to propose an alternative classification of graphic styles for today's technology.

Development of 4K Binocular Video See-through Display with Haptic Device for Task Training

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Abstract: This paper describes a high-resolution binocular video see-through display that can also present haptic sense for task training in manufacturing support. In recent years, the shortage of skilled people due to aging in the field of manufacturing has become a problem. Therefore, researches are being conducted on technology that can perform tasks requiring skills even if a worker is not an expert, by providing appropriate manufacturing support according to the work situation. Most such information presentation systems focus on visual information. It is because vision can present a lot of information. However, when manufacturing support such as assembly task is assumed, haptic information is also important. If a system capable of simultaneously presenting visual and haptic information is developed, task training can be performed while confirming contact between assembly parts even if the parts are drawn in computer graphics. In order to realize that, 4K UHD binocular video see-through display with haptic presentation function was developed. In this paper, the structure of the prototype system are introduced, and the results of evaluation experiments with operators to confirm their effectiveness are reported.

Performance Evaluation of Dynamic and Static WordPress-based Websites

Mario Tomisa[1], Marin Milković[2], Marko Čačić[1]

[1]University North, Croatia, [2]University North, Thailand

Abstract: WordPress is a popular website Content Management System (CMS) based on the PHP programming language and MySQL or MariaDB Relational Database Management System (RDBMS). Since PHP is not compiled but interpreted programming language, every time a WordPress-based web page is requested from the server, it needs to load core CMS files and custom theme files, read related content from associated database and generate final HTML output that will be sent to the user's web browser. This significantly prolongs a website's loading time because a user's web browser is normally not able to display any part of web page's interface until the server sends the complete front-end code. In this paper, we have setup a standard WordPress-based website and its static version on a virtual machine. Using the Apache Bench program, we have tested their performances by observing chosen metrics. The experiment results indicate that usage of a static version of a normally dynamic WordPress-based website can have great benefits for both server-side and client-side website operation processes.

Towards Personalized Content Replacements in Hybrid Broadcast Broadband Environments

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Abstract: Nowadays web-based over-the-top streaming and traditional broadcast merges along the digital and online path enabling new hybrid use cases and services. In addition, content orchestration services and its distribution as individual content to a fragmented set of end devices evolves rapidly. Favored by those developments, new services and solutions for dynamic content replacements have arised and partially already been introduced - Client-Side AD-Insertion (CSAI), Server-Side Ad-Insertion (SSAI), Dynamic Ad-Insertion (DAI) Dynamic Ad-Substitution (DAS), targeted advertising, addressable TV, Playout-Side Ad-Insertion (PSAI) are just some of those terms used for similar use cases but with different techniques and meaning. Standards like HbbTV and MPEG-DASH are available but address the new requirements only partially and require enhancements to be adoptable by the industry. HbbTV 2.0.2 is the newest version of the HbbTV specification but still has limitations to provide a seamless and personalized content and ad experience in hybrid broadcast broadband environments. This work analyses those technologies regarding their implementation of different Dynamic Ad Insertion (DAI) use cases and describes opportunities as well as application limitations. It also evaluates the feasibility for individual content replacements and gives recommendations for future enhancements.

Special Session on Future SDN: Security, Virtualization, Systems and Architectures

Architecture for SDN-Independent GateWay

SungChol Cho[1], SeungHun Lee[1], Wasimon Panichpattanaku[2], Chakadkit Thaenchaikun[2], Sunyoung Han[1]

[1]Konkuk University, Korea, [2]Prince of Songkla University, Thailand

Abstract: SDN is a centralized network in which one SDN-controller manages the entire network. Because of the centralized nature of SDN, the wider DATA-Plane range prevents the SDN-controller from simultaneously sending control messages to the farthest SDN Switches. Thus, SDN has a limited range of DATA PLANE depending on the performance of the SDN-controller. To solve the problem of scalability, there is a way to connect and extend existing multiple SDNs into a single SDN. The SDN-cluster and various SDNs are connected to operate as one SDN. However, each SDN is synchronized, which creates a problem that cannot be operated independently. SDN-ATOMIX is a way to store the information on SDN in real time to secure independence but to secure synchronization of SDN, the amount of messages using synchronization and control will be higher than the normal SDN cluster. In this paper, SDN-ATOMIX independence is maintained to enhance the scalability of SDN and communicate with all SDN hosts when necessary, such as SDN-cluster. In addition, there is no need to synchronize in real time, such as SDN-cluster and ATMMIX, which significantly reduces control messages.

Keywords: SDN-Cluster; SDN-ATOMIX; VXLAN; BGPDB; Booding

SDN Based Fast Handover over IP Mobility

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[1]Prince of Songkla University & PSU, Thailand, [2]Prince of Songkla University, Thailand

Abstract: SDN (Software Defined Networking) has been promised as a next information transport infrastructure. Some SDN solutions have been deployed due to their benefits of features and functions. Recently, mobility management in SDN has been being studied and proposed to expand SDN functionalities. However, some limitations of those proposed schemes were reported, for example, they demonstrated with few of SDN switches and flows. IP mobility is a key of mobility management in SDN. In this paper, we propose fast hand over IP mobility for SDN. We present how the signal flow works, to make a better data flow for mobile devices. Our solution eliminates tunneling procedure and takes the advantage from a centralized controller that helps to decrease a protocol complexity. We give the evaluate result of our solution in terms of handover delay, overhead cost and packet loss. We have evaluated in both Intra- domain and Inter-domain mobility. We have shown that our scheme performs better than others.

Keywords: SDN; MIP; MIPv6; PMIPv6; SDN Mobility

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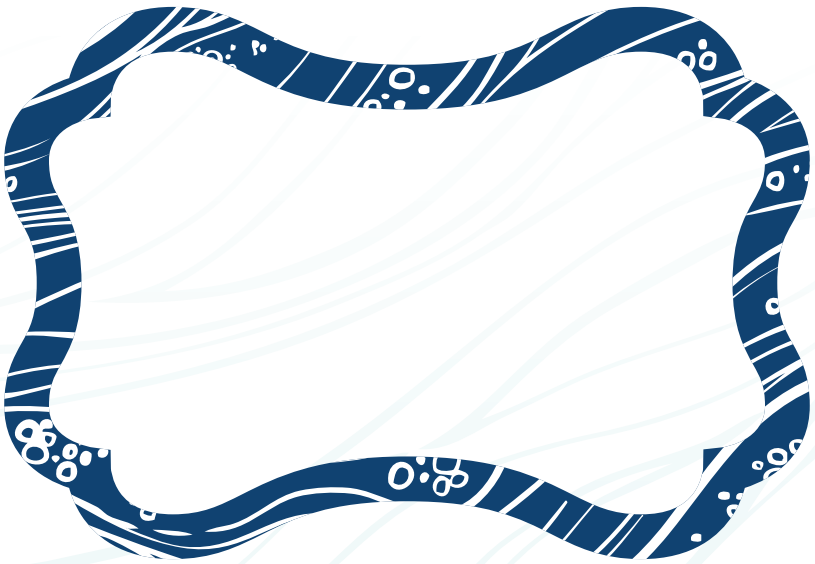

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Online Classroom Attendance System Based on RFID Technology and Cloud Computing

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***Abstract* —Students attendance in the classroom is one of instrument for marking in the end of class, several students are cheating they attendance while manual system used which is signed the form or sheet. Furthermore, manual sheet attendance is ineffective way while digital technology available and widely used in today. This research proposed on online attendance system for students and lecturers, where every student before entering the classroom have to tap their student card on RFID reader available in front of classroom. Attendance for time in and out set to complete of attendance in a lecture. Time tolerance for late and early out is set 10 minutes before and after the schedule time. Similar to students, every lecture required to tap as well before and after teaching in the classroom, besides that lecturer required to hold his card on RFID reader to on electricity in the classroom else no electricity and no power supply provided. The data of students and lecturer attendance with room number is set and send to a database for student's attendance record and honorarium for lecturer. This system tested in a classroom of Faculty of Engineering, Islamic University of Riau with the number of students is 40. Data collected by RFID reader passed to the cloud server through Arduino Microcontroller for filtering in case student double tapped in RFID scanner. In order to match and avoid cheating by students who tap double students card thus a camera installed in the classroom for record and match student face by image recognition system to picture taken as in the card. The system gives effective and efficiency in administration, paperless and efficiency for staff to control and check in manual attendance is one of the advantages of this system.**

Keywords— Classroom attendance, RFID reader, Cloud computing, Database

I. INTRODUCTION

Classroom teaching is a common method that currently applying by most the academic institution including in school and colleges. The conventional method by having manually signed the attendance in a sheet of paper then passed around the classroom while lecturer conducts the teaching in the classroom is wide implements nowadays. This method could undoubtedly allow the students to do cheating about their attendance in the classroom, where a student may sign for an absent student. Besides that, the attendance form can be easily misplaced or lost during circulate it. A stricter approach specially to prevent students to do cheating about their attendance is additionally tedious have to do, where a lecturer calls out the individual names of every student based on student name list and validate the presence of every single student. This way of manual methods of taking students attendance has been proven but to be difficult and time-consuming to check every student. Uncontrolled, whether the authenticated student is responding or not, calculation of consolidated attendance is another major task which may cause manual errors. In some other cases, the attendance sheet may become lost or stolen by some of the students. The consequences of such issues with paper-based attendance register have made it stressful and non-effective, most especially in large classes. As a result, there is a need to come up with a new and modern way of tracking and managing attendance records of students in higher institutions of academic learning more efficiently and effectively.

Therefore, it is very important to develop a system for attendance equipped with an online database, especially to prevent data loss as well as to promote paperless and green technology and environmental campaign. Besides that, the application will help to reduce time being wasted, leading to higher learning productivity in class. There are a few paperless attendance systems that have been developed but such systems need to be equipped with either a computer or RFID reader, resulting in an additional cost for hardware and its maintenance may incur. With that in mind, we have aimed to address this issue by having a system with minimal hardware requirement and at the same time, enhancing the mobility aspect of the existing attendance systems. Furthermore, to overcome such troubles as mention in the above discussion, we are in need of an automated attendance management system. There are many methods available in which the basic concept is the same. In this system proposed an automatic student and staff (lecturer) attendance system, where RFID reader installed in every classroom and assign with an identity for identification of what classroom used.

II. RELATED WORKS

This section discussed on several works have been done on previous research conducted. In previous works review related systems and student different for the methods in record student's attendance. The use of android based system for students attendance as discussed in [1] where the application installed then can be download the students list from a designated web server. Refer to students attend in the classroom after their scan the card to Radio Frequency Identification (RFID) reader [2]. Additional of device such as cameras used to support the system information and student's attendance confirmation. Another research discussed on this attendance system which elaborate in [3, 4] describe the students attendance without human interference. The used of camera as a method to fix in the classroom and will capture the image of student going into room, the faces of students are detected and then recognized and match to the database and finally attendance of student is marked.

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The others research is developed student attendance system used a fraction of the classroom for participation points and lead the students' attendance list into a preset teaching system such as attendance by checking every student, random questioning based on the list, and quiz. Similar to the ladder ranking system that widely used in current online computer games, students can check their ranking of accumulated absence and points in the end of class as a long term stimulus for study. [5-7].

The traditional student attendance system required physically sign the attendance sheet every time conduct lecture in the classroom. This method is unnecessarily time consuming to notice and mark student's name on the attendance sheet. This is happening that some students may accidentally mark the others student name or willingly to do it. Normally, the hard copy of attendance sheet after a few weeks may get lost or easily get messy. Used of smartphone such android technology will help teacher to get student attendance easily by online system then be able to check percentage student attend the class as well to copy or print it. By using the stored information, teacher easily to mark student attendance, attendance percentage calculations, marking intruders' entry, send emails or send message to the parent to keep them updated about their child's attendance at the school or college [8, 9].

Online Biometric-enabled Class Attendance Register System (OBCARS) prototype elaborate by [10] develop and design to change of misplaced and torn attendance register form in various classroom in school or college. System used biometric fingerprint reader for every student before entry the classroom. While the [11] discuss on student attendance system used Near Field Communication (NFC) system. The solution be able to provide a convenient and portable classroom learning system to the school or college and university to improve the interaction in the learning process among students and reduce the workload of lecturers in processing the attendance statistics [12, 13]. All over previous research used normal online system then in this research proposed a new method of online system for student and lecturer pairing to make sure lecturer attend in the classroom as well. Beside that the use of cloud computing is one of additional feature in this system to make sure data of student's attendee can be access staff in everywhere. Student attendance information is very important is not only for classroom marking but for finance department to pay lecturer honorarium.

Image recognition system has been developed in many kind of research, such as facial recognition and finger or thumb print recognition. Some research discussed on this image recognition using neural network and video recognition system as elaborated in [14-16]. An algorithm base image recognition system and implementation of students attendance using video camera with convolutional system as discuss in [17], while a crowded class attendance be able to recognize as elaborate in [18], finally a paper discuss on facial image recognition based on students behavior as in [19].

III. Proposed Online Attendance System

The proposed solution for online student attendance system uses several components and integration to become a system that is able to manage student's attendance. Difference to the current system that developed by other researchers, in this cloud computing has been used for data management system beside local server in an academic institution. Fig. 1 shows a block diagram of the student attendance system, where Arduino and RFID reader is the main unit for this system to control student and staff attendance.

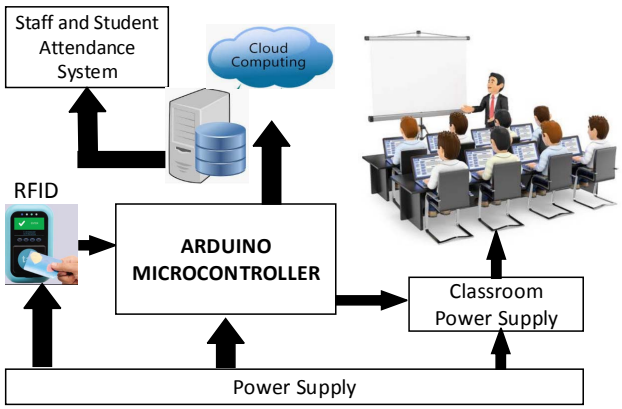

Fig. 1. Block diagram of student attendance system.

Student and staff card occupied with RFID chip which is Mifare 13.56 MHz and memory 1kB thus in this case users of the RFID reader to retrieve student or staff information by using an RFID system. Information stored in student card is limited, only the identity (ID) data stored with some information, this system designed to retrieve student ID information which is 9 characters same as to student matric number, as well as for the staff ID with 9 characters.

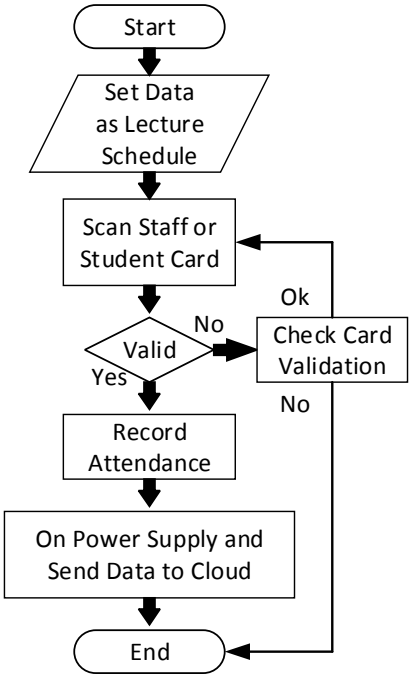

Fig. 2. Flowchart of the student attendance system to process the information.

Once ID of student or staff received by RFID reader then the information received in Arduino Microcontroller to compare to student or staff ID in database, this case student information linked to student academic management system, where every student as they are accountable for academic purpose, since the data and information available then attendance system only connected to the database without to set up a new database management system. Similar to student database, information of student classroom and schedule linked to the academic management system which every faculty have to manage lecture classroom, schedule, subject, time, and student registration the subject. Fig. 2 shows a flowchart of the attendance system that flows of the process in the system. All the information start from student scanning the card then system decide whether valid or information to process or not then make the decision of student attendance.

A. RFID

A set of sensing system with all the sensors to detect Radio Frequency Identification (RFID) is a technology based on wireless communication and Non-Line of Sight (NLOS) to retrieve information. Radio wave concept in RFID is able to collect information from the transponder (tag) to RFID reader, with advantages of this technology and more convenience for student attendance system thus apply in this system. Fig. 3 shows a sample of student ID card used in this system with an emended RFID chip.

Fig. 3. Sample of student ID card.

Similar to the student ID card, every lecturer and staff occupied with RFID chip in ID card as well, thus the process of data retrieve same as to student ID card. Fig. 4 shows a sample of lecturer and staff ID card with an embedded RFID chip.

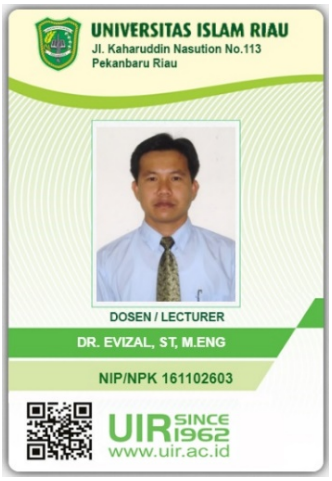

Fig. 4. : Sample of Lecturer and staff ID card.

B. Arduino

Arduino is a project based on an open source system that easy to use by the developer, hardware and software integrated system developed in a package. Currently, the Arduino module widely used in many application, thus in this attendance system used Arduino for microcontroller system. Fig. 5 shows a picture of the Arduino module connected to an RFID reader to read and retrieve card information. All the information analysis and to be matched to the database as well as class schedule and verification then final information stored in the database. In order to be accessed by any party that required this information thus a cloud database setup to keep all the information.

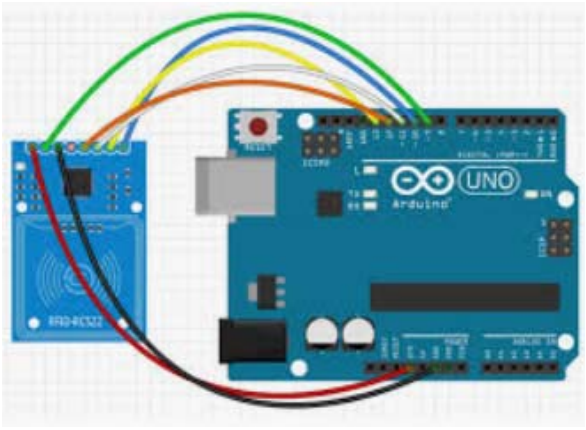

Fig. 5. An Arduino module with RFID reader.

C. Cloud Computing

Cloud computing is a technology in computer science recently become an alternative to change from the local server to the cloud. The demand for availability in a computer system resources and especially for the data storage and computing power system without direct to a local server that manages by the user. The term cloud computing is generally used to describe data centers available to many users over internet access. Fig. 6 shows a configuration of a cloud computing to be accessed by any user and the management system.

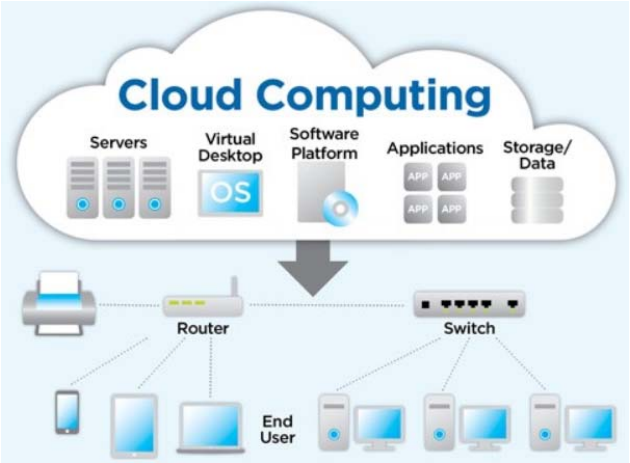

Fig. 6. Configuration of cloud computing.

D. Video Based Attendance Recognition

Student attendance system used RFID technology has been discussing in previous section, in order to match number of students tapped they are card on RFID reader to actual students attend in the classroom then face recognition system used. Fig. 7 shows a lecture conducted in a classroom and camera captured student facial image, take some time to complete number of students inside the classroom because various behavior of student.

Fig. 7. Lecture conducted in the classroom.

Simple process of students recognition because only to get confirmation and match the image of students in the classroom. Fig. 8 shows the process that consist of 3 steps, which is face detetction done by camera inside the classroom, next is extraction of image captured and final process is recognition of image which facial through our image segmentation by eigen vector implement in this research.

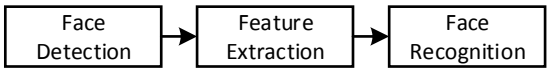

Fig. 8. Image recognition process.

The basic component to analysis th image started with initialize face image of students capture by camera, then changing to the convariant matrix of face capture by camera. Fig. 9 sample of image capture by camera to be analyse step by step for every student and match to picture on the card as recorded in the system.

Fig. 9. Samlple of image capture by camera.

Processing of images capture for extraction which is matix number 3x3 as shows in Fig. 10.

$$\begin{bmatrix}0&4&3\\1&4&2\\0&0&0\end{bmatrix} \quad \begin{bmatrix}2&2&1\\3&2&4\\0&0&0\end{bmatrix} \quad \begin{bmatrix}1&4&2\\2&3&0\\0&0&0\end{bmatrix}$$

(a) (b) (c)

Fig. 10. Convariance matrix image capture by camera (a) first image (b) second image (c) third image.

Next process is to calculate value of mean of the covariance matrix of images as shows in (1).

$$\Psi = \frac{1}{3}\sum_{n=1}^{3}\Gamma_n = \frac{1}{3}\left(\begin{bmatrix}0&4&3\\1&4&2\\0&0&0\end{bmatrix}+\begin{bmatrix}2&2&1\\3&2&4\\0&0&0\end{bmatrix}+\begin{bmatrix}1&4&2\\2&3&0\\0&0&0\end{bmatrix}\right)$$

$$\Psi = \frac{1}{3}\begin{bmatrix}1&3&2\\2&3&2\\0&0&0\end{bmatrix} \tag{1}$$

In order to reduced the covariance matrix of segmentation facial image of students against mean to get or normal data, then (2), (3) and (4) shows the used.

$$\Phi_1 = \Gamma_1 - \Psi = \begin{bmatrix}0&4&3\\1&4&2\\0&0&0\end{bmatrix} - \begin{bmatrix}1&3&2\\2&3&2\\0&0&0\end{bmatrix} = \begin{bmatrix}0&1&1\\0&1&0\\0&0&0\end{bmatrix}$$

$$\Phi_2 = \Gamma_2 - \Psi = \begin{bmatrix}2&2&1\\3&2&4\\0&0&0\end{bmatrix} - \begin{bmatrix}1&3&2\\2&3&2\\0&0&0\end{bmatrix} = \begin{bmatrix}1&0&0\\1&0&1\\0&0&0\end{bmatrix}$$

$$\Phi_3 = \Gamma_3 - \Psi = \begin{bmatrix}1&4&2\\2&3&0\\0&0&0\end{bmatrix} - \begin{bmatrix}1&3&2\\2&3&2\\0&0&0\end{bmatrix} = \begin{bmatrix}0&1&0\\0&0&0\\0&0&0\end{bmatrix}$$

$$C = \frac{1}{M}\sum_{n=1}^{M}\Phi_n\Phi_n^T \tag{2}$$

$$C = AA^T \qquad A = [\Phi_1, \Phi_2, \ldots, \Phi_M] \tag{3}$$

$$L = AA^T, \text{ where } L_{m,n} = \Phi_n\Phi_m^T \tag{4}$$

Final result image segmentation as show below,

$$L = \begin{pmatrix}\begin{bmatrix}0&1&1&1&0&0&0&1&0\\0&1&0&1&0&1&0&0&0\\0&0&0&0&0&0&0&0&0\end{bmatrix}\begin{bmatrix}0&0&0\\1&1&0\\1&0&0\\1&1&1\\0&0&0\\0&1&0\\0&0&0\\1&0&0\\0&0&0\end{bmatrix}\end{pmatrix}$$

$$L = \begin{bmatrix}4&2&1\\2&3&1\\1&1&1\end{bmatrix}$$

In summary all the step of facial image recognition can be wirte as:

- Once image decomposition of data obtained used eigenvalue and adjust;
- Then, to get eigenvector of eigen value decomposition of image data;

- Follow by sorting the image of eigenvectors;
- Finally, the data obtained as whos the final results of eigenvectors data adjusted.

Table 1 shows several expression of facial image of students during attenting the class or lecture, this image categories classified in order to record and help system in matching process, all the data recorded in the system as data for training of system.

TABLE I. EXPRESSION OF STUDENTS FACIAL STYLES

Step	Expression type
1	Normal
2	Smile
3	Sad
4	Upset / Angry
5	Normal with Glasses
6	Smile with Glasses
7	Sad with Glasses
8	Upset / Angry with Glasses

IV. RESULTS AND DISCUSSION

Application of student attendance system has been developed and tested in the real classroom, some class of lecture tested with this system. Fig. 11 shows a screenshot of student and lecturer attendance system in the classroom.

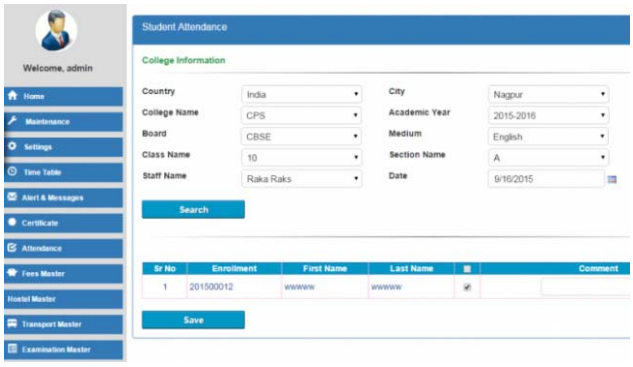

Fig. 11. Application student attendance system.

In this case, an average of students in a classroom is 40 students, in the previous student used manual sheet form that must sign to proof attendance in classroom, this application student just wipe the ID card to RFID reader installed in front of a classroom, if the status of the student is matched to class schedule then the information recorded and send to the data center, in this case, cloud computing used to store all the information. Maximum tolerance for the late in the classroom is 15 minute, so after late duration student consider absence although they wipe the ID card then no record keeps in the database. Similar to late toleration duration, the student must wipe ID card to RFID reader before the class finish to record the attendance, in this case, the duration is 10 minutes before and after time schedule after the schedule that every student must wipe the card else no out class recorded and student consider attendance not complete. Fig. 12 shows a system for management before class start have to set by the officer.

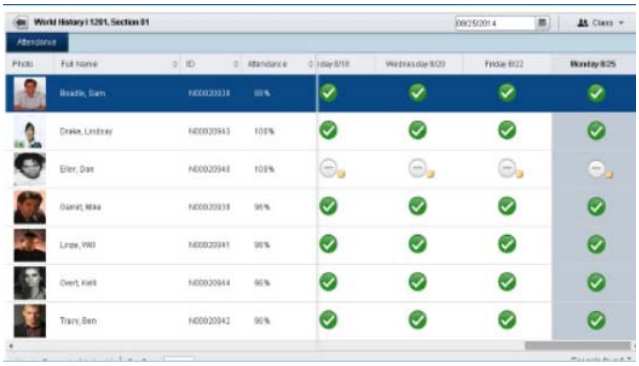

Fig. 12. Attendance schedule system.

A report of student attendance system generated once lecture class finished, the report shows for every student in a classroom that attends the subject conducted by the lecturer. The report also recorded attendance for all the weeks, in this case, 16 weeks to complete a subject in a semester. Fig. 13 shows a report sheet generated by this system.

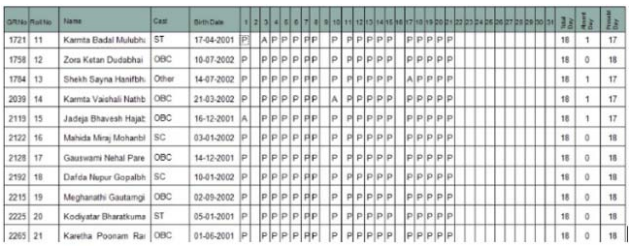

Fig. 13. Student attendance report sheet.

All the information for every student and classroom including staff or lecturer conducted the lecture in classroom sent to the integrated database management system, the central database manages for a student account and payroll system for lecturer, this system assists in management to calculate hour of every lecturer in a month and amount to pay the honorarium. The information on student attendance record in cloud computing, then further development is to create a mobile system for the report to parent or guardian.

V. CONCLUSION

Student attendance system will benefit for an academic institution, instead of using a manual system that raises many issues and uncontrolled for student cheating. The system tested in several of lecture classroom, out of 38 students listed in the classroom where 36 students attend in the class and 2 students' absence recorded for the first testing, continue by 4 weeks. The system success to records all student and lecture attendance then record in a database. While facial recognition system by video camera installed in the classroom be able to match student face (image) to picture recorded in student card. The system helps the officer and efficient to management and staff with only verify the lecture in the classroom then confirmation before the final record. Cloud computing used as a database to make easy data retrieval from other parties.

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REFERENCES

[1] S. A. M. Noor, N. Zaini, M. F. A. Latip, and N. Hamzah, "Android-based attendance management system," in *2015 IEEE Conference on Systems, Process and Control (ICSPC)*, 2015, pp. 118-122.

[2] Evizal, T. A. Rahman, and S. K. A. A. Rahim, "Active RFID Technology for Asset Tracking and Management System," *TELKOMNIKA,* vol. 11, no. 1, pp. 137-146, 2013.

[3] E. Varadharajan, R. Dharani, S. Jeevitha, B. Kavinmathi, and S. Hemalatha, "Automatic attendance management system using face detection," in *2016 Online International Conference on Green Engineering and Technologies (IC-GET)*, 2016, pp. 1-3.

[4] H. E. Mrabet and A. A. Moussa, "Research and design of smart management system in classroom," in *Proceedings of the Mediterranean Symposium on Smart City Application*, Tangier, Morocco, 2017, pp. 1-4: ACM.

[5] S. Xiao, W. Liang, and Y. Tang, "Classroom Attention Restoration Using Computer Game Rewarding Mechanism," in *2018 13th International Conference on Computer Science & Education (ICCSE)*, 2018, pp. 1-6.

[6] H. Gunawan and E. A. Kadir, "Integration protocol student academic information to campus RFID gate pass system," in *2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*, 2017, pp. 1-6.

[7] P. Dębiec, "Effective Learner-Centered Approach for Teaching an Introductory Digital Systems Course," *IEEE Transactions on Education,* vol. 61, no. 1, pp. 38-45, 2018.

[8] M. M. Islam, M. K. Hasan, M. M. Billah, and M. M. Uddin, "Development of smartphone-based student attendance system," in *2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC)*, 2017, pp. 230-233.

[9] W. T. Tarimo and T. J. Hickey, "Fully integrating remote students into a traditional classroom using live-streaming and TeachBack," in *2016 IEEE Frontiers in Education Conference (FIE)*, 2016, pp. 1-8.

[10] K. C. Wei, M. M. Singh, and H. M. B. Osman, "Near Field Communication Interactive Learning System (NILES) for Blended Learning: A Pervasive Social Networking Services," in *2017 Palestinian International Conference on Information and Communication Technology (PICICT)*, 2017, pp. 71-77.

[11] C. Hoskins, T. Morgan, and A. Johansson, "Student Employee Attendance Point System," in *Proceedings of the 2015 ACM Annual Conference on SIGUCCS*, St. Petersburg, Russia, 2015, pp. 137-139: ACM.

[12] E. A. Kadir, S. L. Rosa, and H. Gunawan, "Application of RFID technology and e-seal in container terminal process," in *2016 4th International Conference on Information and Communication Technology (ICoICT)*, 2016, pp. 1-6.

[13] B. Rahnama, A. Elci, and S. Celik, "Securing RFID-based authentication systems using ParseKey+," in *Proceedings of the 3rd international conference on Security of information and networks*, Taganrog, Rostov-on-Don, Russian Federation, 2010, pp. 212-217: ACM.

[14] N. K. Jayant and S. Borra, "Attendance management system using hybrid face recognition techniques," in *2016 Conference on Advances in Signal Processing (CASP)*, 2016, pp. 412-417.

[15] Z. Pei, H. Shang, Y. Su, M. Ma, and Y. Peng, "Convolutional neural networks for class attendance," in *2017 13th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD)*, 2017, pp. 809-814.

[16] A. Raghuwanshi and P. D. Swami, "An automated classroom attendance system using video based face recognition," in *2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT)*, 2017, pp. 719-724.

[17] P. Wagh, R. Thakare, J. Chaudhari, and S. Patil, "Attendance system based on face recognition using eigen face and PCA algorithms," in *2015 International Conference on Green Computing and Internet of Things (ICGCIoT)*, 2015, pp. 303-308.

[18] D. Mery, I. Mackenney, and E. Villalobos, "Student Attendance System in Crowded Classrooms Using a Smartphone Camera," in *2019 IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2019, pp. 857-866.

[19] S. T. M. Siregar, M. F. Syahputra, and R. F. Rahmat, "Human Face Recognition Using Eigenface in Cloud Computing Environment," in *10th International Conference Numerical Analysis in Engineering*, Banda Aceh, 2017, p. 108: IOP.

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