MESSAGE FROM ECTI PRESIDENT

On behalf of the ECTI Association, it is our great honor to welcome you to the 37th International Technical Conference on Circuits/Systems, Computers, and Communications (ITC-CSCC 2022) in Phuket, Thailand.

Founded in 2002, the Electrical Engineering/Electronics, Computer, Telecommunication, and Information Technology Association (ECTI Association) has gathered researchers in the field of electrical engineering and computer science in Thailand for two decades. In cooperation with the IEIE, Korea, and the IEICE, Japan, we have joined and hosted the ITC-CSCC every four years; 2006, 2010, 2014, and 2018. This year, we are pleased to organize the 37th ITC-CSCC 2022 in Phuket, Thailand. The ITC-CSCC is a major international conference featuring a rich technical program on the various topics of circuits, systems, computers, and communications. Each year the conference attracts several hundred papers, and only a fraction of these quality papers are selected for presentation. Therefore, the ITC-CSCC is an essential forum for researchers to discuss the state-of-the-art and future trends of related technology and exchange experiences. Hence, we encourage delegates to participate actively in the sessions and discussions ahead during the conference days.

On behalf of the ECTI Association, we would like to thank the international coordinators, advisory committees, organizing committees, program chairs, and reviewers who voluntarily invested their time in selecting papers and arranging such a successful conference. Furthermore, we are grateful for the technical support from the Institute of Electronics and Information Engineers (IEIE), Korea, and the Institute of Electronics, Information and Communication Engineers (IEICE), Japan. Finally, after struggling with the COVID-19 pandemic for more than two years, we wish everyone a happy time with this successful and fruitful conference and enjoy their stay in Phuket, Thailand.

Prof. Dr. Vutipong Areekul
(Kasetsart University)
President of ECTI Association
MESSAGE FROM GENERAL CHAIR

On behalf of the Organizing Committee, we are grateful and welcome you all to the 37th International Technical Conference on Circuits/Systems, Computers, and Communications (ITC-CSCC 2022).

Currently, the ITC-CSCC conference is sponsored by the IEIE (The Institute of Electronics and Information Engineers), IEICE (Engineering Sciences Society and Electronics Society), and the ECTI (Electrical Engineering/Electronics, Computer, Telecommunications and Information Association, Thailand). This conference has been set and rotated in three countries: Korea, Japan and Thailand.

In 2002 and 2014, Thailand's Phuket province, the pearl of the Andaman Sea, hosted the ITC-CSCC conference. We are extremely delighted to host the ITC-CSCC 2022 conference in Phuket for the third time on July 5–8, 2022. We hope that all participants of ITC-CSCC 2022 will enjoy not only the research discussion but also the wonderful beaches and attractions.

We would like to express our gratitude to all committee members for their devotion and hard work to make this truly successful conference. Finally, we wish you all the inspiring discussions and enjoy your time along with cordial and sincere friendship at ITC-CSCC 2022 in Phuket, Thailand.

Thank you very much.

General Chair
Piya Kovintavewat
Nakhon Pathom
Rajabhat University
Thailand

General Co-Chairs
Jong-Ok Kim
Korea University
Korea

General Co-Chairs
Yusuke Matsunaga
Kyushu University
Japan

Organizing Chair
Datchakorn Tancharoen
Panyapiwat Institute of Management
Thailand
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# WELCOME TO ITC-CSCC 2022

With the great success of the International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC) as the world leading conference devoted to the advancement of high technologies in Circuits, Systems, Computers, and Communications, we would like to invite all the scholars and experts around the world to attend the 37th ITC-CSCC 2022 to be hosted in Phuket, Thailand.

The conference is open to researchers from all regions of the world. Participation from Asia Pacific region is particularly encouraged. Proposals for special sessions are welcome. Papers with original work in all aspects of Circuits, Systems, Computers, and Communications are invited. Topics include, but not limited to, the followings

## Circuit & System Areas
- Analog Circuits
- Computer Aided Design
- Intelligent Transportation Systems & Technology
- Linear / Nonlinear Systems
- Medical Electronics & Circuits
- Modern Control
- Neural Networks
- Power Electronics & Circuits
- RF Circuits
- Semiconductor Devices & Technology
- Sensors & Related Circuits
- Verification & Testing
- VLSI Design

## Computer Areas
- Artificial Intelligence
- Biocomputing
- Computer Systems & Applications
- Computer Vision
- Face Detection & Recognition
- Image Coding & Analysis
- Image Processing
- Internet Technology & Applications
- Motion Analysis
- Multimedia Service & Technology
- Object Extraction & Technology
- Security
Watermarking
Blockchain
Data Analytics
Internet of Things
Virtual Reality

Communication Areas
Antenna & Wave Propagation
Audio / Speech Signal Processing
Circuits & Components for Communications
IP Networks & QoS
MIMO & Space-Time Codes
Multimedia Communications
Mobile & Wireless Communications
Network Management & Design
Optical Communications & Components
Radar / Remote Sensing
Communication Signal Processing
Ubiquitous Networks
UWB
Visual Communications
Wireless Sensor Networks
Underwater Communications

We are looking forward to seeing you all at the ITC-CSCC 2022.

ITC-CSCC 2022 Organizing Committee
THE HISTORY OF ITC-CSCC

The ITC-CSCC has been originated from the JTC-CAS (Joint Technical Conference on Circuits and Systems) 1986 which was jointly organized by the KIEE (Korea Institute of Electronics Engineers) and the IECEJ (Institute of Electronics and Communication Engineers of Japan) and held at Hanyang University, Seoul, Korea, Oct. 23-24, 1986.

It started as an annual bilateral conference between the KIEE which was renamed to IEIE (The Institute of Electronics and Information Engineers) and the IECEJ which was renamed to IEICE (Institute of Electronics, Information and Communication Engineers) later. In 1988, the JTC-CAS had its title changed to JTC-CSCC (Joint Technical Conference on Circuits/Systems, Computers and Communications).

In 1996, the JTC-CSCC had its title changed to ITC-CSCC (International Technical Conference on Circuits/Systems, Computers and Communications). In 2002, the ITC-CSCC was held in Phuket, Thailand which was the first time to be held in a place other than Korea and Japan.

Currently the ITC-CSCC is sponsored by the IEIE (The Institute of Electronics and Information Engineers), IEICE (Engineering Sciences Society and Electronics Society), and the ECTI (Electrical Engineering/Electronics, Computer, Telecommunication and Information Association, Thailand).

This conference has been set and rotated in three countries: Korea, Japan and Thailand as shown below.

**ITC-CSCC 1986-2021**

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<thead>
<tr>
<th>No.</th>
<th>Conference</th>
<th>Date</th>
<th>Location</th>
<th>General Chair</th>
<th>TPC Chair</th>
</tr>
</thead>
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<tr>
<td>1st</td>
<td>JTC-CAS 1986</td>
<td>Oct 23-24</td>
<td>Seoul, Korea</td>
<td>Kyu Tae Park</td>
<td>In Chil Lim</td>
</tr>
<tr>
<td>2nd</td>
<td>JTC-CAS 1987</td>
<td>July 21-22</td>
<td>Tokyo, Japan</td>
<td>Masao Iri</td>
<td>Isao Shirakawa</td>
</tr>
<tr>
<td>3rd</td>
<td>JTC-CSCC 1988</td>
<td>Nov 4-5</td>
<td>Seoul, Korea</td>
<td>In Chil Lim</td>
<td>Keun Choong Kin</td>
</tr>
<tr>
<td>4th</td>
<td>JTC-CSCC 1989</td>
<td>June 25-26</td>
<td>Sapporo, Japan</td>
<td>Isao Shirakawa</td>
<td>Yoji Kajitani</td>
</tr>
<tr>
<td>5th</td>
<td>JTC-CSCC 1990</td>
<td>Dec 10-11</td>
<td>Jeju, Korea</td>
<td>Tae Won Rhee</td>
<td>Seung Hong Hong</td>
</tr>
<tr>
<td>6th</td>
<td>JTC-CSCC 1991</td>
<td>July 22-23</td>
<td>Hiroshima, Japan</td>
<td>Kenji Onaga</td>
<td>Tatsuo Nishi</td>
</tr>
<tr>
<td>7th</td>
<td>JTC-CSCC 1992</td>
<td>July 27-28</td>
<td>Gyeongju, Korea</td>
<td>Tae Won Rhee</td>
<td>Moon Key Lee</td>
</tr>
<tr>
<td>8th</td>
<td>JTC-CSCC 1993</td>
<td>July 26-28</td>
<td>Nara, Japan</td>
<td>Kenji Onaga</td>
<td>Tatsuo Nishi</td>
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<tr>
<td>9th</td>
<td>JTC-CSCC 1994</td>
<td>July 11-13</td>
<td>Gongju, Korea</td>
<td>In Chil Lim</td>
<td>Sung Han Park</td>
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<tr>
<td>Year</td>
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<td>Dates</td>
<td>Location</td>
<td>Chair</td>
<td>Co-Chair</td>
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<td>1995</td>
<td>JTC-CSCC</td>
<td>July 18-20</td>
<td>Kumamoto, Japan</td>
<td>Kenji Onaga</td>
<td>Hisashi Yamada</td>
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<tr>
<td>1996</td>
<td>ITC-CSCC</td>
<td>July 15-17</td>
<td>Seoul, Korea</td>
<td>Moon Key Lee</td>
<td>Hyung Lea Kim</td>
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<td>1997</td>
<td>ITC-CSCC</td>
<td>July 14-16</td>
<td>Okinawa, Japan</td>
<td>Kenji Onaga</td>
<td>Zensho Nakao</td>
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<tr>
<td>1998</td>
<td>ITC-CSCC</td>
<td>July 13-15</td>
<td>Sokcho, Korea</td>
<td>Jung Woong Ra</td>
<td>Sang Uk Lee</td>
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<tr>
<td>1999</td>
<td>ITC-CSCC</td>
<td>July 11-13</td>
<td>Busan, Korea</td>
<td>Jung Yong Yun</td>
<td>Noh-Hoom Myung</td>
</tr>
<tr>
<td>2000</td>
<td>ITC-CSCC</td>
<td>July 10-12</td>
<td>Tokushima, Japan</td>
<td>Akio Ushida</td>
<td>Hiroshi Kawakami</td>
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<tr>
<td>2001</td>
<td>ITC-CSCC</td>
<td>July 16-19</td>
<td>Phuket, Thailand</td>
<td>Sawasd Tantaratan</td>
<td>Wanlop Surakampontorn</td>
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<tr>
<td>2002</td>
<td>ITC-CSCC</td>
<td>July 7-9</td>
<td>Pyeongchang, Korea</td>
<td>Hang Gu Bahk</td>
<td>Young Shik Moon</td>
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<tr>
<td>2003</td>
<td>ITC-CSCC</td>
<td>July 6-8</td>
<td>Matusima, Japan</td>
<td>Masayuki Kawamata</td>
<td>Hisakazu Kikuchi</td>
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<td>2004</td>
<td>ITC-CSCC</td>
<td>July 4-7</td>
<td>Jeju, Korea</td>
<td>Soo Joong Kim</td>
<td>Kukjin Chun</td>
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<tr>
<td>2005</td>
<td>ITC-CSCC</td>
<td>July 10-13</td>
<td>Chiang Mai, Thailand</td>
<td>Booncharoen Sirinomvakul</td>
<td>Kosin Chammongthai</td>
</tr>
<tr>
<td>2006</td>
<td>ITC-CSCC</td>
<td>July 8-11</td>
<td>Busan, Korea</td>
<td>Hyukjae Lee</td>
<td>Byung-Gook Park</td>
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<tr>
<td>2007</td>
<td>ITC-CSCC</td>
<td>July 6-9</td>
<td>Shimonoseki, Japan</td>
<td>Qi-Wei Ge</td>
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<td>2008</td>
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<td>2009</td>
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<td>Pattaya, Thailand</td>
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<td>June 4-7</td>
<td>Gyeongju, Korea</td>
<td>Byung-Gook Park</td>
<td>Joonki Paik</td>
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<tr>
<td>2011</td>
<td>ITC-CSCC</td>
<td>July 15-18</td>
<td>Sapporo, Japan</td>
<td>Yoshikazu Miyanaga</td>
<td>Takayuki Nakachi</td>
</tr>
<tr>
<td>2012</td>
<td>ITC-CSCC</td>
<td>June 30 – July 3</td>
<td>Yeosu, Korea</td>
<td>Joonki Paik</td>
<td>Cheon Won Choi</td>
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<td>2013</td>
<td>ITC-CSCC</td>
<td>July 1-4</td>
<td>Phuket, Thailand</td>
<td>Chiranut Sa-ngiamsak</td>
<td>Lunchakorn Wuttiwittikulki</td>
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<td>2014</td>
<td>ITC-CSCC</td>
<td>June 29 – July 2</td>
<td>Seoul, Korea</td>
<td>Daesik Hong</td>
<td>Jong Il Park</td>
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<tr>
<td>2015</td>
<td>ITC-CSCC</td>
<td>July 10-13</td>
<td>Okinawa, Japan</td>
<td>Mohamad Reza Sharif</td>
<td>Tomohisa Wada</td>
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<tr>
<td>2016</td>
<td>ITC-CSCC</td>
<td>July 2-5</td>
<td>Busan, Korea</td>
<td>Hyesook Lim</td>
<td>Jong-Moon Chung</td>
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<tr>
<td>2017</td>
<td>ITC-CSCC</td>
<td>July 4-7</td>
<td>Bangkok, Thailand</td>
<td>Lunchakorn Wuttiwittikulki</td>
<td>Pisit Vanichchanunt</td>
</tr>
<tr>
<td>2018</td>
<td>ITC-CSCC</td>
<td>June 23-26</td>
<td>Jeju, Korea</td>
<td>Chung Yong Lee</td>
<td>Kwang-Hyun Baek</td>
</tr>
<tr>
<td>2019</td>
<td>ITC-CSCC</td>
<td>June 11-13</td>
<td>Busan, Korea</td>
<td>Jong Yong Yun</td>
<td>Noh-Hoom Myung</td>
</tr>
<tr>
<td>Year</td>
<td>Conference Name</td>
<td>Date</td>
<td>Location</td>
<td>Chair</td>
<td>Co-Chair</td>
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<tr>
<td>35th</td>
<td>ITC-CSCC 2020</td>
<td>July 3-6</td>
<td>Nagoya, Japan</td>
<td>Kohkichi Tsuji</td>
<td>Norihiko Shinomiya</td>
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<tr>
<td>36th</td>
<td>ITC-CSCC 2021</td>
<td>June 28-30</td>
<td>Jeju, Korea</td>
<td>Seon Wook Kim</td>
<td>Suk-Ju Kang</td>
</tr>
</tbody>
</table>

The JTC-CAS had its title changed to JTC-CS CC in 1988.
The JTC-CS CC had its title changed to ITC-CS CC in 1996.

JTC-CAS: Joint Technical Conference on Circuits and Systems
JTC-CS CC: Joint Technical Conference on Circuits/Systems, Computers and Communications
ITC-CS CC: International Technical Conference on Circuits/Systems, Computers and Communications
MESSAGE FROM TECHNICAL PROGRAM CHAIRS

On behalf of the technical program committee (TPC), we would like to deeply thank all participants and it is our great pleasure to welcome you to the 37th International Technical Conference on Circuits/Systems, Computers, and Communications (ITC-CSCC 2022).

We are very excited about the technical program that brings together many high-quality papers from 10 countries, 309 contributed papers that were totally submitted to our conference for this year. Our team which consists of TPCs and more than 216 reviewers has worked hard to complete the process of peer review and selection. Each paper received at least two reviewers from the respective research community. Finally, an outstanding program of 257 contributed papers is comprehensively offered at the conference with an acceptance rate of 83.2%. In addition, there are 3 keynote speeches. Consequently, the conference program has 33 online and 19 on-site sessions.

Finally, we would also like to express our deepest gratitude to all committee members and chairs who voluntarily invest their own time in selecting papers and arranging such a successful and memorable conference. We hope you enjoy the technical program and that while at the conference you can take advantage of the excellent chance to exchange ideas with other researchers and practitioners, and also initiate some fruitful collaboration between universities or institutions. Welcome you all to Phuket, Thailand.

Best regards

Technical Program Committee Chair
Chanon Warisarn
(King Mongkut’s Institute of Technology Ladkrabang)

Technical Program Committee Co-Chairs

Byung Cheol Song
(Inha University, Korea)

Shigemasa Takai
(Osaka University, Japan)
TPC Co-Chairs (Local)

Kampol Woradit  
(Chiang Mai University, Thailand)

Poompat Saengudomlert  
(Bangkok University, Thailand)

Santi Koonkarnkhai  
(Nakhon Pathom Rajabhat University, Thailand)

Krisana Chinnasarn  
(Burapha University, Thailand)
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.............................................. Wiparat Busyatras  
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(Prince of Songkla University)

.................................................. Watid Phakphisut  
(King Mongkut’s Institute of Technology Ladkrabang)

.................................................. Sirawit Khittiwitchayakul  
(King Mongkut’s Institute of Technology Ladkrabang)

Registration Chair ............................................. Nattapong Tongtep  
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............................................. Panisa Treepong  
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Industrial Relation Chairs ..................................... Roong Sivaratan  
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.................................................. Pisit Charnkeitkong  
(Panyapiwat Institute of Management)

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    Ambar Bajpai
    (Atria Institute of Technology)

    Muhammad Saadi
    (University of Central Punjab)

Finance Chair & Treasurer ...................................... Nonchanutt Chudpooti
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    Yaowapa Nalampoon
    (ECTI)
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   (Seoul National University, Korea)
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4. Chiranut Sa-ngiamsak  
   (Khon Kaen University, Thailand)
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   (Yonsei University, Korea)
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   (National Museum of Nature and Science, Japan)
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   (Tokyo Metropolitan University, Japan)
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    (Ewha Womans University, Korea)
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    (Samsung Electronics Co., Ltd, Korea)
14. Joonki Paik  
    (Chung-Ang University, Korea)
15. Jun Jin Kong  
    (Samsung, Korea)
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    (KAIST, Korea)
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    (King Mongkut's University of Technology Thonburi, Thailand)
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19. Kyu Tae Park
   (Yonsei University, Korea)
20. Lunchakorn Wuttisittikulkij
   (Chulalongkorn University, Thailand)
21. Masakazu Sengoku
   (Niigata University, Japan)
22. Masayuki Kawamata
   (Tohoku University, Japan)
23. Mitsunori Makino
   (Chuo University, Japan)
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   (King Mongkut’s Institute of Technology Ladkrabang, Thailand)
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   (Yonsei University, Korea)
26. Morikazu Nakamura
   (University of the Ryukyus, Japan)
27. Prabhas Chongsatifswattana
   (Chulalongkorn University, Thailand)
28. Prayoot Akkaraekthalin
   (King Mongkut’s University of Technology North Bangkok, Thailand)
29. Qi-Wei GE
   (Yamaguchi University, Japan)
30. Satoshi Goto
   (Waseda University, Japan)
31. Sawasd Tantaratana
   (The Thailand Research Fund, Thailand)
32. Seon Wook Kim
   (Korea University, Korea)
33. Seung Hong Hong
   (Inha University, Korea)
34. Shinichi Oishi
   (Waseda University, Japan)
35. Shoji Shinoda
   (Chuo University, Japan)
36. Sinchai Kamolphiwong
   (Prince of Songkla University, Thailand)
37. Soo Joong Kim
   (Kyungpook National University, Korea)
38. Sung Han Park
   (Hanyang University, Korea)
39. Tae Won Rhee  
(Korea University, Korea)
40. Toshimasa Watanabe  
(Hiroshima University, Japan)
41. Wanlop Surakampontorn  
(King Mongkut's Institute of Technology Ladkrabang, Thailand)
42. Young Shik Moon  
(Hanyang University, Korea)
INTERNATIONAL COORDINATION COMMITTEE

1. Atsuo Ozaki  
   (Osaka Institute of Technology, Japan)
2. Byung Cheol Song  
   (Inha University, Korea)
3. Chanon Warisarn  
   (King Mongkut’s Institute of Technology Ladkrabang, Thailand)
4. Datchakorn Tancharoent  
   (Panyapiwat Institute of Management, Thailand)
5. Hyuk-Jae Lee  
   (Seoul National University, Korea)
6. Jong-Ok Kim  
   (Korea University, Korea)
7. Kampol Woradit  
   (Chiang Mai University, Thailand)
8. Koichi Ichige  
   (Yokohama National University, Japan)
9. Kyoko Yamori  
   (Asahi University, Japan)
10. Nobutaka Kito  
    (Chukyo University, Japan)
11. Norihiko Shinomiya  
    (Soka University, Japan)
12. Pisit Vanichchanunt  
    (King Mongkut’s University of Technology North Bangkok, Thailand)
13. Piya Kovintavewat  
    (Nakhon Pathom Rajabhat University, Thailand)
14. Satoshi Yamane  
    (Kanazawa University, Japan)
15. Shogo Muramatsu  
    (Niigata University, Japan)
16. Suavit Poomrittigul  
    (Pathumwan Institute of Technology, Thailand)
17. Taizo Yamawaki  
    (Hitachi, Japan)
18. Vitawat Sittakul  
    (King Mongkut’s University of Technology North Bangkok, Thailand)
19. Vutipong Areekul  
    (Kasetsart University, Thailand)
20. Wannaree Wongtrairat  
    (Rajamangala University of Technology Isan, Thailand)
21. Watid Phakphisut  
    (King Mongkut’s Institute of Technology Ladkrabang, Thailand)
22. Won Woo Ro  
    (Yonsei University, Korea)
23. Youngcheol Chae  
    (Yonsei University, Korea)
# LIST OF REVIEWERS

<table>
<thead>
<tr>
<th>A K M Sharoor Jahan Choyon</th>
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Winai Jaikla
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Wiroonsak Santipach
Wiyada Kumam
Worapong Tangsrirat
Worasak Rueangsrirak
Worawut Makcharoen
Wutthikrai Busayaporn
Wuttipong Kumwilaisak
Yohei Morishita
Yupin Suppakhun
GENERAL INFORMATION

ABOUT THE CONFERENCE
With the great success of the International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC) as the world leading conference devoted to the advancement of high technologies in Circuits/Systems, Computers and Communications, we would like to invite all the scholars and experts around the world to attend the 37th ITC-CSCC 2022 to be hosted in Phuket, Thailand.

The conference is open to researchers from all regions of the world. Participation from Asia Pacific region is particularly encouraged. Proposals for special sessions are welcome. Papers with original work in all aspects of Circuits/Systems, Computers and Communications are invited.

ABOUT PHUKET
Phuket province is located in southern Thailand. It is the biggest Island of Thailand and sits on the Andaman sea. The nearest province to the north is Phang-nga and the nearest provinces to the east are Phang-nga and Krabi.

Phuket has a large Chinese influence, so you will see many Chinese shrines and Chinese Restaurants around the city. A Chinese Vegetarian Festival is held there every year. While the Chinese community is quite big, there are many other ethnicities bringing all their traditions and festivals from all over the world to Phuket.

Being a big island, Phuket is surrounded by many magnificent Beaches such as Rawai, Patong, Karon, Kamala, Kata Yai, Kata Noi, and Mai Khao. Laem Phromthep viewpoint is said to feature the most beautiful sunsets in Thailand.

It is not all just beaches though, there is also fantastic classical architecture. That and the very welcome atmosphere and the famous Phuket NIGHTLIFE, you can see why the island is a hotspot for tourists in Thailand.

Visiting Phuket is easy as there are many travel options.

Key Tips
- The beaches of the south coast are typically crowded, while the north is far more tranquil.
- All the major beaches (such as Patong beach, Kata beach, Karon Beach, Nai Han beach, Mai Khao beach, Nai Yang beach) offer instruction and equipment for diving, snorkelling, windsurfing and sailing. Don't forget to notice the red flag! before swim.
OFFICIAL LANGUAGE
The official language of the conference is English.

REGISTRATION DESK
The registration desk is available in Duangrada Reception Hall and details are as follows:

Tuesday, July 5, 2022.................................................................15:00 – 18:00
Wednesday, July 6, 2022............................................................08:00 – 15:00
Thursday, July 7, 2022...............................................................08.00 – 12.00

ORAL PRESENTATION GUIDELINES
It is requested to all the presenters to reach the assigned meeting room at least 15 minutes before the session to meet the Session Chair and receive last minute instructions. Please submit your presentation to the Organizing Committee secretariat room at least 30 minutes before the presentation. Microsoft Power Point and Portable Document File (PDF) are the ONLY acceptable formats for presentation. Here are some guidelines for oral presenters which will help you to have high-standard uniform presentations.

1. Prepare electronic presentation using approx. 28 points or even higher letters. Avoid presenting long proofs or detailed derivations in the visual material.
2. It is highly discouraged to read electronic presentation word by word. It is preferable to point out only the basic ideas and/or heuristic explanations.
3. Your short biography including your affiliation and research interest as provided by the presenter will be read by the chairman.
4. During the oral presentation inform your audience with a few introductory sentences about the broader significance of your paper. Speak as slowly and simply as possible. Keep a check on your presentation time. Approx. 12 minutes will be reserved for your oral presentation, but if you can present your contribution in a shorter time, please do so. Your presentation will be followed by a short 3-minute discussion. Allow sufficient time for slides and projections. Explain each figure and give the audience enough time to understand a figure before going on to other topics. When summarizing your presentation, talk about the practical benefits of the results of your work. Please respect your chairman’s instructions during the presentation, particularly in keeping your time limit.
CONFERENCE REGISTRATION

REGISTRATION RATE

<table>
<thead>
<tr>
<th>Category</th>
<th>Early-Bird registration (until June 10, 2022)</th>
<th>Late registration (until June 20, 2022)</th>
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<td>6,000 THB / 180 USD</td>
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<td>Welcome reception party ticket</td>
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<tr>
<td>Banquet ticket</td>
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Remark:
- The registration fees are non-refundable.
- The confirmation e-mail should be sent out within 48 hr after payment is made.
- The Welcome reception party ticket and the Banquet ticket can be bought at the registration desk during July 5 - 7, 2022.

REGISTRATION FEES COVER
- All types of “onsite” registration include access to all sessions, coffee breaks, lunches, a conference package, and a conference program.
- Welcome Reception Party and Banquet are free for registered participants with “onsite” regular or student registration only.
- All types of “online” registration include only the conference program.
- The registered authors will automatically receive a 1-year ECTI Membership or 1-year ECTI Membership Extension if they have already been ECTI members.
- Everyone who registers for the ITC-CSCC 2022 conference will receive a discount on a room at the Duangjitt Resort and spa.
REGULATION INFORMATION

1. Every accepted paper must have one author registered for presentation and publication in the proceedings.

2. In case of several papers under the same author, at least one paper must register with regular registration (as shown in the table below)

<table>
<thead>
<tr>
<th>Accepted papers (by the same Author)</th>
<th>The 1st Paper</th>
<th>The 2nd Paper</th>
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<td>Four Papers or More</td>
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<td>Student registration</td>
<td>Student registration</td>
<td>Free</td>
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Remark:
- At least one author of every accepted paper should register no later than June 20, 2022, to be presented at the conference and included in the proceedings.
- If the payment is later than June 20, 2022, your manuscript may not appear in the proceedings in time, but you are still eligible to present your work at the conference.
VENUE

Duangjitt Resort & Spa, Patong

The Duangjitt Hotel, as the venue for ITC-CSCC 2022 conference, is set in 36 acres of beautiful gardens and can be found in Patong Beach on the west coast of Phuket.

Phuket is the largest island in Thailand. It is located in the Andaman Sea in southern Thailand. Being a big island, Phuket is surrounded by many magnificent beaches such as Rawai, Patong, Karon, Kamala, Kata Yai, Kata Noi, and Mai Khao. Laem Phromthep Viewpoint is said to feature the most beautiful sunsets in Thailand.
DUANGJITT RESORT & SPA (VENUE)

18 Prachanukroh Road Patong Beach, Phuket, Thailand | 1.3 km from Bangla Road Patong. The hotel is accessible within a 50-minute drive (49.5 km) from Phuket International Airport. The 36-acre grounds are home to many tropical trees and flowering plants, creating a peaceful and tranquil environment in which to enjoy your holiday. Close proximity to the Patong beach, wonderful natural surroundings, and friendly service make Duangjitt Resort and Spa a popular choice for both couples and families alike.

LOCATION & ATTRACTION

Airports
- Phuket International Airport 49.5 km.

Pier
- Ratsada Pier 19.7 km.

Most Popular Landmarks
- Patong Beach 240 m.
- Kata and Karon Beach 11.1 km.
- Phromthep Cape 10.3 km.
- Chalong Temple 9.5 km.
- Phuket Fantasea 20.5 km.
- Big Buddha 13.3 km.
- Phuket Night Market 15.4 km.

TRANSPORTATION

There are 5 ways to get from Phuket Airport (HKT) to Patong by

Bus
- Take the bus from Phuket Airport to Patong: 1h 25m ฿100 - ฿190

Taxi
- Take a taxi from Phuket Airport (HKT) to Patong: 35 min ฿950 - ฿1200

Drive
- Drive from Phuket Airport (HKT) to Patong: 35 min ฿110 - ฿170

Shuttle
- Take a shuttle bus from Phuket Airport to Patong: 35 min ฿360 - ฿400

Town car
- Take a town car from Phuket Airport to Patong: 35 min ฿950 - ฿1400

Airport Express Bus
- We don’t recommend the standard city bus, since it only goes to Phuket city center. The Express Bus, on the other hand, goes all the way to Patong Beach for 120 Baht per person. The trip to Patong Beach takes almost two
hours and is available every day from 8 a.m. to 8 p.m. The Express Bus is clean, comfortable and air-conditioned. Although certainly not the fastest way to get to Patong, this is the best option if you’re looking to save money.

**Phuket Smart Bus**

The blue and white Phuket Smart Bus, waiting in front of the airport terminal, goes to Patong and beyond, all the way to Rawai Beach in Southern Phuket. The best part of this option is that it takes the route along the scenic west coast. The bus runs from 6 a.m. to 9 p.m. and you can check the live location of the buses on their website. Each trip costs only 50-170 Baht per person, and there are multiple payment methods available including cash, mobile banking money deposit, or Phuket Rabbit Card. The bus arrives at the parking spot 15 minutes before departure time, so we recommend you get there a bit early to make sure you don’t miss it.

**Minibus**

There are two minibus companies at the airport, and you can find their ticket offices near Entrance 3 in the terminal building. The journey to Patong via minibus takes about one hour and costs 180 Baht per person. The seats are comfortable, and the ride will be quicker than the regular bus. But you will have to wait for all 11 seats to be filled before the driver takes off.

**Taxi**

Taxi is the fastest, most private and most comfortable way to commute to Patong. Your driver can stop anytime and anywhere you like, and will drop you off right at your hotel. Of course, you do have to pay more for this convenience. A taxi ride from the airport to Patong costs 800 Baht. Taxi tickets can be purchased at the same offices near Entrance 3 where minibus tickets are sold.

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**Duangjitt Resort & Spa Phuket, Patong**

Address 18 Prachanukroh Road, Patong Beach, Kathu, Phuket 83150

Thailand

TELEPHONE : 076 366 333

MOBILE : +66 (0) 62 243 5353, +66 (0) 62 243 6622,
+66 (0) 62 243 5959, +66 (0) 61 174 6116

Email. info@duangjittresort-spa.com

www.duangjittresort-spa.com
PHUKET DAY TRIP

Phuket is located in southern Thailand. It is the biggest island in Thailand and sits on the Andaman sea. The nearest province to the north is Phang-nga and the nearest provinces to the east are Phang-nga and Krabi.

Phuket has a large Chinese influence, so you will see many Chinese shrines and Chinese Restaurants around the city. A Chinese Vegetarian Festival is held there every year. While the Chinese community is quite big, there are many other ethnicities bringing all their traditions and festivals from all over the world to Phuket.

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KEY TIPS

The beaches of the south coast are typically crowded, while the north is far more tranquil.

All the major beaches (such as Patong beach, Kata beach, Karon Beach, Nai Han beach, Mai Khao beach, and Nai Yang beach) offer instruction and equipment for diving, Snorkelling, windsurfing, and sailing. Don't forget to notice the red flag! before swim.

Temples are always worth a visit, from the temple hidden inside a cave to the famous Wat Chalong, a visit to Thailand would not be complete without exploring a few of these magnificent and beautifully ornamented buildings (‘Wat’ means ‘Temple’, you guessed it).
FLOOR PLAN

REGISTRATION (Duangrada Reception Hall)

WELCOME PARTY (Poolside)
OPENING CEREMONY AND CONFERENCE BANQUET

- Duangchanok Convention Hall

Duangchanok convention hall is the biggest conference centre in patong beach. Surrounded by natural beauty and captivating thai style, duangchanok convention hall is patong beach’s largest conference centre, accommodating up to 2000 people.
PRESENTATION SESSIONS, SPECIAL SESSIONS, TUTORIAL SESSIONS, and INVITED TALKS
# PROGRAM AT A GLANCE

**Tuesday 5, 2022**

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<th>Time</th>
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**All online links for all online activities**

- **Main Room**
  - ID: 770 087 0207
  - PW: ITC2022

- **Room 3**
  - ID: 776 422 7036
  - PW: ITC2022

- **Room 1**
  - ID: 933 906 3180
  - PW: ITC2022

- **Room 4**
  - ID: 271 248 5466
  - PW: ITC2022

- **Room 2**
  - ID: 941 702 3917
  - PW: ITC2022

- **Room 5**
  - ID: 239 302 2130
  - PW: ITC2022
## Wednesday 6, 2022

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**Main Room**
ID: 770 087 0207
PW: ITC2022

**Room 1**
ID: 933 906 3180
PW: ITC2022
Thursday 7, 2022

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All online links for all online activities

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Room 2
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PW: ITC2022

Room 4
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PW: ITC2022

Room 3
ID: 776 422 7036
PW: ITC2022

Room 5
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All online links for all online activities

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Room 3
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PW: ITC2022

Room 4
ID: 271 248 5466
PW: ITC2022

Room 5
ID: 239 302 2130
PW: ITC2022
Friday 8, 2022

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- Room 3
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  - PW: ITC2022

- Room 4
  - ID: 271 248 5466
  - PW: ITC2022

- Room 5
  - ID: 239 302 2130
  - PW: ITC2022
TECHNICAL SESSIONS

Very important to note
- Sessions that were highlighted as yellow background are online activities.
- 15 minutes for presentation includes an answer-and-question time.
- Keynote speakers: There are 3 persons, Thai, Korean and Japanese.
- Take 45 minutes for each presentation.
- The Opening Ceremony may take around 15 minutes.
- The best paper award (2021) will be awarded at the banquet.

Special Session Remark:
OL SS 1: Data Science and Applied Mathematics
OL SS 2: Data Science and Applied Mathematics & Innovative Applications for Artificial Intelligence and Data
OS SS 1: Channel Coding for Digital Communication and Data Storage
OS SS 2: 5G and 6G Wireless Communication, Sensing, and Localization & Computer Simulation for Manufacturing Technology
OS SS 3: Intelligent Mobile Network for 5G and Beyond
OS SS 4: Innovative Applications for Artificial Intelligence and Data & Recent Advances in Deep Image Processing
OL SS 4: Recent Advances in Deep Image Processing
OS SS 5: Mathematical Systems Science and its Applications & Data Science and Applied Mathematics
OL SS 5: Recent Progress on Antennas and Propagation
OL SS 6: Recent Advances in Deep Image Processing
OL SS 7: Non-destructive Testing and Evaluation (NDT&E) & Computer Simulation for Manufacturing Technology
OL SS 8: Mathematical Systems Science and its Applications
OL SS 9: Innovative Applications for Artificial Intelligence and Data
OL SS 10: Innovative Applications for Artificial Intelligence and Data

Remark:
OL = Online
OS = Onsite
SS = Special Sessions
CS = Circuit & Systems Areas
CM = Communication Areas
CP = Computer Areas
Title: ELECTRIC VEHICLE CHARGING STATION INCORPORATING WITH AN ENERGY MANAGEMENT AND DEMAND RESPONSE TECHNIQUE

Time: Wednesday, 6 July 2022; 10.00-10.45

Room: Duangchanok 1 and Main Room (Hybrid-I)

ID: 770 087 0207
PW: ITC2022

Abstract:

A study of Demand Response (DR) function and Energy management for an electrical vehicle (EV) charger is presented in this paper. The proposed technique is to prevent the electrical system within the rated power by controlling electric vehicle chargers loads to the electrical system. A power management method for limiting the charging current and charging time by using state of charge (SOC) as a priority point index is developed. The power management method is also developed as a calculation algorithm for determining the charging current limit rating for electric vehicle chargers. The simulation model is also developed for validating a DR management function of the electric vehicle charger according to Provincial Electricity Authority of Thailand (PEA) load characteristic data. The results show that the proposed DR function can manage the charging current of each electric vehicle charger appropriately. Also, the proposed technique can prevent the rated power demand of the transformer distribution. The study illustrates that this method is an effective protection for the distribution transformer and can be able to apply as a DR function to manage electrical energy more efficiently.
Title:  ORDER LEARNING AND ITS APPLICATIONS TO COMPUTER VISION

Time:  Wednesday, 6 July 2022; 10.45-11.30

Room:  Duangchanok 1 and Main Room (Hybrid-II)

ID: 770 087 0207
PW: ITC2022

Abstract:

In this talk, we first discuss order learning to determine the order graph of classes, representing ranks or priorities, and classify an object instance into one of the classes. To this end, we design a pairwise comparator to categorize the relationship between two instances into one of three cases: one instance is ‘greater than,’ ‘similar to,’ or ‘smaller than’ the other. Then, by comparing an input instance with reference instances and maximizing the consistency among the comparison results, the class of the input can be estimated reliably.

Second, we present the deep repulsive clustering (DRC) algorithm of ordered data for effective order learning. To this end, we develop the order- identity decomposition (ORID) network to divide the information of an object instance into an order-related feature and an identity feature. Then, we group object instances into clusters according to their identity features using a repulsive term. Moreover, we estimate the rank of a test instance, by comparing it with references within the same cluster.

Experimental results on facial age estimation, aesthetic score regression, and historical color image classification show that the proposed algorithm can cluster ordered data effectively and also yield excellent rank estimation performance.
Title: **LOW LATENCY AND LIGHTWEIGHT VIDEO COMPUTING IN EDGE CLOUD**

Time: Wednesday, 6 July 2022; 11.30-12.15

Room: Duangchanok 1 and Main Room (Hybrid-III)

ID: 770 087 0207
PW: ITC2022

**Abstract:**

In this talk, I will give an overview of the edge-cloud-based “high-speed video computing technologies” in the Beyond 5G (B5G) era. In the future, the wideband and low latency data transfer function of the high-frequency band Beyond 5G will be linked with various computing resources in edge and cloud networks. The purpose is to realize low latency and lightweight video processing such as video editing and compression by using software in exceeding 10 Gbps edge cloud networks. I will mainly introduce two technologies. The first is high-speed processing technologies for real-time 8K ultra-high-definition (UHD) video. We have developed a system to store, process, and deliver uncompressed 8K UHD video in real-time using PC servers in edge cloud networks. The second is seamless video coding that takes privacy into consideration. I will talk about the basic concept. It enables video compression in edge cloud networks while the video data is scrambled. It also realizes low-delay transmission and lossless archiving in a unified architecture.
Tutirial-I
Daeyoung Park
Inha University, Korea

Title: NEURAL NETWORK DESIGN BASED ON ALGORITHM UNROLLING AND ITS APPLICATIONS

Time  Wednesday, 6 July 2022; 13.30-14.30
Room: Duangkamol and Room 1 (Hybrid-V)

ID: 933 906 3180
PW: ITC2022

Abstract:
This tutorial introduces algorithm unrolling methods to design neural networks with iterative algorithms. Algorithm unrolling methods have received a lot of attention because they provide interpretable neural network architectures that exhibit high performance. As examples applied to communication/signal processing problems, we present how to design neural networks to solve the sparse signal recovery problems and MIMO detection problems.
Title: WHEN DEEP UNFOLDING MEETS CONTROL ENGINEERING

Time: Wednesday, 6 July 2022; 14.30-15.30

Room: Duangkamol and Room 1 (Hybrid-V)

ID: 941 702 3917
PW: ITC2022

Abstract:

Deep unfolding is a technique for tuning parameters for accelerating the convergence of iterative algorithms, and has been actively studied in various fields including wireless communications. In this talk, we provide an overview of the speaker's work on the use of the deep unfolding technique in the field of control engineering. We specifically talk about some recent results on feedback control system design and model predictive control. Furthermore, we will review how the speaker came to know about deep unfolding technique from the perspective of interdisciplinary research, and also try to discuss the affinity between deep unfolding and control theory research.
Title: ON OPTIMIZING RESOURCE ALLOCATION FOR MIMO-NOMA DOWNLINK

Time: Wednesday, 6 July 2022; 15:30-16:30

Room: Duangkamol and Room 1 (Hybrid-V)

ID: 941 702 3917
PW: ITC2022

Abstract:

We consider multiple-input multiple-output (MIMO) non-orthogonal multiple access (NOMA) downlink channels with zero-forcing beamforming transmission. The base station has multiple transmit antennas while all mobile devices have a single receive antenna. To increase spectral efficiency, 2 active users with highly correlated channels may be paired to share the same beamforming vector and thus, will interfere fully with each other. Superposition coding and successive interference cancellation are applied to decode messages for each user in a pair. The performance of the pair depends on the accuracy of the channel direction information (CDI) and increases with the CDI rate. With limited total transmit power and total CDI rate, we would like to optimize the transmit power and CDI rate for each user to achieve max-min fairness for all users in a cell. In this talk, we will discuss different allocation schemes that perform close to the optimum with varying complexity. Some numerical examples show that the resulting rate performance with the proposed allocation is increased by 100% over that with the uniform allocation.
SPECIAL SESSIONS

DATA SCIENCE AND APPLIED MATHEMATICS

Organizers: Chutima Prasartkaew
Rajamangala University of Technology Thanyaburi, Thailand

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Abstract: This session focuses on the novelty of research in the broad area of IT and its deep knowledge of computer science as well as applied Mathematics to the field. It includes the bottom knowledge from Mathematics to as high as cloud computing and data analytics, new thoughts, algorithms designing and testing, software and hardware invention, testing, and creation, and the application of computer systems. Topics of interest include but are not limited to:

- Information Technology
- Computer Science
- Internet of Things
- Mobile Application
- Big data and Data analytics
- Application Mathematics
INNOVATIVE APPLICATIONS FOR ARTIFICIAL INTELLIGENCE AND DATA

Organizers  Poompat Saengudomlert
Bangkok University, Thailand

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<td>Tuesday, 5 July 2022 14.30-16.00</td>
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<td>OL SS 9 (Online Room 5) ID: 239 302 2130 PW: ITC2022</td>
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<td>10.45-12.15 OL SS 10 (Online Room 4) ID: 271 248 5466 PW: ITC2022</td>
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Abstract: This special session focuses on using artificial intelligence and/or data science techniques in novel application scenarios. The range of applications includes both engineering and non-engineering systems. Authors are encouraged to discuss how artificial intelligence and/or data science can help improve the system performances compared to existing systems without their applications, and how different techniques perform in comparison to one another. Discussions regarding how to widen application scenarios would also be appreciated.
CHANNEL CODING FOR DIGITAL COMMUNICATION AND DATA STORAGE

Organizers

Kidsanapong Puntsri
Rajamangala University of Technology Isan, Khon Kaen Campus, Thailand

Watid Phakphisut
King Mongkut’s Institute of Technology Ladkrabang, Thailand

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<tr>
<td>Wednesday, 6 July 2022</td>
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Abstract: Channel coding is a key component of digital communication and data storage. For example, polar codes and LDPC codes for 5G, turbo codes, and LDPC codes for deep space communications, as well as LDPC codes for hard disk drives and solid-state drives. Currently, there are still many challenges and questions for channel coding in future standards. This section welcomes original and innovative techniques in all research and development related to channel coding, encouraging high-quality papers that report state-of-the-art advances in both industry and academia. Topics of interest include but are not limited to:

- Novel design principles and coding schemes toward 6G
- Efficient decoding algorithms for 5G standard
- Coded shaping and modulation
- Rate matching and HARQ schemes
- Joint source and channel coding
- Information Theory and Channel Capacity
- Hardware architecture and implementations
5G AND 6G WIRELESS COMMUNICATIONS, SENSING, AND LOCALIZATION

Organizers
Paramin Sangwongngam
The National Electronics and Computer Technology Center, Thailand
Son Chu
University of Glasgow, United Kingdom

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<td>Thursday, 7 July 2022 9.00-10.30</td>
<td>OL SS 3 (Online Room 4) ID: 271 248 5466 PW: ITC2022</td>
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Abstract: This special session encompasses research areas on 5G, mmWave, visible light communications, laser communications, underwater communications, and THz wireless communications, sensing, and localization. For 5G and 6G, it spans electromagnetic propagation, antenna design, devices, system integration, wireless communications, wireless networks, and information theory. It includes sub-topics on channel modeling and characterization, channel estimation, beamforming, beam steering, AI for wireless communications, sensing and localization, reconfigurable intelligent surfaces (RIS), RIS-assisted technology, metasurfaces, metamaterials, metasurface antennas, radio intelligent environment, smart radio environments, controls of RIS, and software-defined materials (SDM).
COMPUTER SIMULATION FOR MANUFACTURING TECHNOLOGY

Organizers  Jatuporn Thongsri

King Mongkut’s Institute of Technology Ladkrabang, Thailand

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<td>Thursday, 7 July 2022 13.30-15.00</td>
<td>OL SS 7 (Online Room 5) ID: 239 302 2130 PW: ITC2022</td>
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Abstract: Today's computer simulations based on finite element analysis and computational fluid dynamics are widely applied in industrial manufacturing processes. When there are problems in factories, they help solve problems quickly and save costs with accurate solutions covering many fields of physics in both steady and transient states such as heat transfer, vibration, aerodynamics, structural dynamics, fatigue analysis, etc. Therefore, this special session focuses on applying computer simulations to deal with various issues and develop manufacturing processes.
INTELLIGENT MOBILE NETWORK FOR 5G AND BEYOND

Organizers
Kritsada Mamat
King Mongkut s University of Technology North Bangkok, Thailand
Watid Phakphisut
King Mongkut’s Institute of Technology Ladkrabang, Thailand

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<tr>
<td>Wednesday, 6 July 2022</td>
<td>OS SS 3 (Onsite Duangthip)</td>
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Abstract: According to the 3GPP, 5G mobile network is expected to support a wide range of services, including eMBB (enhanced mobile broadband), uRLLC (ultra-reliable and low-latency communications), and mMTC (massive machine-type communications). Hence, it is paramount to develop an intelligent network comprising a radio access network and core network, such that the diversified services as established in 5G networks can be managed efficiently. This section welcomes original and innovative techniques in all research and development related to intelligent mobile networks, encouraging high-quality papers that report state-of-the-art advances in both industry and academia. Topics of interest include but are not limited to:

- Radio Resource Management
- Network Access and Rate Control
- Caching and Offloading
- QoS/QoE Management
- Open Radio Access Network (O-RAN)
- Mobile Edge Computing (MEC)
- Network Slicing
- AI in Mobile and Wireless Networks
RECENT ADVANCES IN DEEP IMAGE PROCESSING
Organizers  Jong-Ok Kim
Korea University, Korea
Byung Cheol Song
Inha University, Korea

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<td>10.45-12.15 ID: 239 302 2130 PW: ITC2022</td>
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Abstract: In recent years, deep learning techniques have been popularly adopted for traditional image processing tasks, and their performances have been significantly enhanced due to their intelligent learning capability.

In this special session, we invite technical papers which are in the diverse fields of image processing and are going to discuss the pros and cons of deep learning-based image processing.
RECENT PROGRESS ON ANTENNAS AND PROPAGATION

Organizers  Noraset Wichaipanich
Rajamangala University of Technology Thanyaburi, Thailand

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<tr>
<td>Thursday, 7 July 2022 10.45-12.15</td>
<td>OL SS 5 (Online Room 4) ID: 271 248 5466 PW: ITC2022</td>
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</table>

Abstract: This session focuses on the novelty of research in the broad area of Antennas and propagation in Telecommunication systems. The antenna topic includes antenna theory, design, measurements, and applications as well as wireless communications, IoT, and networking. The propagation topic consists of propagation fundamentals, measurement techniques, and applications as well as remote sensing, terrestrial, Earth-space, and Ionospheric propagations.

- Antennas
- Propagation
- Internet of Things
- Wireless communications
- Big data and Data analytics
- Mobile Application
- Satellite Application
NON-DESTRUCTIVE TESTING AND EVALUATION (NDT&E)

Organizers

Ruslee Sutthaweekul  
King Mongkut’s University of Technology North Bangkok, Thailand

Chaoqing Tang  
Huazhong University of Science and Technology, China

Adi Mahmud Marindra  
Kalimantan Institute of Technology Balikpapan, Indonesia

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**Abstract**: Non-destructive Testing and Evaluation (NDT&E) is one of the emerging research areas in electronics and electrical engineering. To a large extent, this strong interest in NDT&E is in response to needs for better quality assurance in both materials and components, for monitoring reliability and serviceability, for operation and life extension of manufacturing products. New researches in this field have strategic and essential roles in order to reduce the NDT&E costs and improve the test performance. Topics for this special session include but are not limited to:

- Conventional, Advanced, and emerging NDT&E technologies
- Materials Characterization by NDT&E
- NDT&E in Aerospace, Railways, Defence, Space, Automotive, Fabrication, Civil and Structural Engineering, Nuclear, Petrochemical, Bio-Medical engineering, etc.
- NDT&E Modeling and Simulation
- Signal and Image Processing in NDT&E
- NDT&E Sensors, Instrumentation, Software and Systems
- NDT&E in Robotics and Automation
- Artificial intelligence and machine learning in NDT&E
- Structural Health Monitoring and Aging Management
- Reliability and Effectiveness of NDT&E
- Multi-NDE, IoT, Data Fusion, NDE Data Analytics, Computer Vision
- Novel NDT&E Methods
MATHEMATICAL SYSTEMS SCIENCE AND ITS APPLICATIONS

Organizers
Atsuo Ozaki
Osaka Institute of Technology, Japan
Koichi Kobayashi
Hokkaido University, Japan

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<td>OL SS 8 (Online Room 5) ID: 239 302 2130   PW: ITC2022</td>
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<td>15.15-16.45</td>
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Abstract: Mathematical systems science is a mathematical approach to the design, analysis, and control of systems that are characterized as being concurrent, distributed, and/or autonomous. Such systems are typically manufacturing systems, communication systems, and computer software/hardware/networks, but so are also emergent systems such as cyber-physical systems, man-machine systems, open systems science, and systems biology. The purpose of this special session is to share the state of art on mathematical systems science and promote future research. The topics of interest within the scope of this special session include, but are not limited to, the following areas:

- System theory: Petri net, concurrent systems, discrete event systems, hybrid systems
- Formal methods for verification and design: model checking, proof system, scheduling, supervisory control
- Cyberphysical systems: embedded systems, real-time systems
- Novel mathematical approach: machine learning, open systems science, modeling and analysis of human behaviors, business process, service science
- Applications and case studies: applications and case studies from engineering, biology, agriculture, or sociology

Potential Contributors:
Qi-Wei Ge (Yamaguchi University, Japan)
Takafumi Kanazawa (Setsunan University, Japan)
Yoshihiro Kaneko (Gifu University, Japan)
Atsushi Ohta (Aichi Prefectural University, Japan)
Norihiko Shinomiya (Soka University, Japan)
Shingo Yamaguchi (Yamaguchi University, Japan)
PAPER INFORMATION (ORAL SESSIONS ONSITE & ONLINE)

COMPUTER

OL CP 1 (Room 1)
Tuesday, 5 July 2022: 13.00-14.30

1570799512 Design and Implementation of a Practical Control System for an Air-Conditioner with IoT Sensor Nodes
Mengfang Duan, Yuta Kodera, Nobuya Ishihara, Yasuyuki Nogami, and Takuya Kusaka
Okayama University, Japan

1570799592 Assessment of Drought Forecasting Model for Northeastern, Thailand
Naphatsawat Rachpibool and Siriwan Kajornkasirat
Prince of Songkla University Songkhla, Thailand

1570800079 A Comparative Empirical Evaluation of Neural Language Models for Thai Question-Answering
Fangyi Zhu¹, Nasith Laosen², Kanjana Laosen³, Kannikar Paripremkul⁴, Aziz Nanthamornphong⁵, See-Kiong Ng¹, and Stéphane Bressan¹
¹National University of Singapore
²Phuket Rajabhat University
³Prince of Songkla University, Phuket Campus
⁴Prince of Songkla University

1570800099 Unet based Image Segmentation of Sweat Droplets for Assisting Assessment of Atopic Dermatitis
Yuma Miyaji¹, Ryuichi Michida¹, Tetsushi Koide¹, Yuki Hayashida², and Yumi Aoyama²
¹Hiroshima University, Japan
²Kawasaki Medical School, Japan

1570800244 Rendering for 3D Light Field Composed of 360° Images
Du Yeol Lee¹, Hyunmin Jung², and Chae Eun Rhee¹
¹Inha University, Korea
²Seoul National University, Korea
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<td>Find out the Influence of Financial Factors on Trading Prices in QE Era: A Case of SET</td>
<td>Teanjit Sutthaluang</td>
<td>Mae Fah Luang University, Thailand</td>
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<td>14.30-16.00</td>
<td>A Cell Image Classification Method for Quality Control of Chimeric Mice with Humanized Livers</td>
<td>Takumi Fujisawa, Tetsushi Koide, Masaki Takahashi, Mutsumi Inamatsu, and Chise Tateno</td>
<td>Hiroshima University, Japan, PhoenixBio Co., Ltd., Japan</td>
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<td>Deep Clustering for Mixed-type Data with Frequency Encoding and Doubly Weighted Cross Entropy Loss</td>
<td>Deogho Choi, Daniel Chae, Wooyeon Kim, Jihong Kim, Janghoon Yang, and Jitae Shin</td>
<td>Sungkyunkwan University, Korea, Infra OSS Tech. Lab SK Telecom, Korea, Seoul Media Institute of Technology, Korea</td>
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<td>Effectiveness of a Method to Eliminate Fruitless Cycles for Pollard’s Rho Method</td>
<td>Shota Kanzawa, Hiromasa Miura, Yuta Kodera, Yasuyuki Nogami, and Takuya Kusaka</td>
<td>Okayama University, Japan</td>
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<td>LET: Vision Transformer Based Refinement Network for Light Field Editing</td>
<td>Seong-uk Jo, Gwon-Jung Kim, and Chae Eun Rhee</td>
<td>Inha University, Korea</td>
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<td>14.30-16.00</td>
<td>Optimal Layout of Purchased Delivery Drones at an Outlet Mall</td>
<td>Ishii Keita and Harashima Katsumi</td>
<td>Osaka Institute of Technology, Japan</td>
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1570800704 An SoC-Oriented Coprocessor for Bilinear Pairing in Affine Coordinates
Junichi Sakamoto¹, Naoki Yoshida¹, Ryosuke Saitou², Takashi Kitagawa², Kazuhiko Fukushima², Shigenori Miyauchi², and Tsutomu Matsumoto¹
¹Yokohama National University, Japan
²Renesas Electronics Corporation, Japan

1570801012 Robust Image Hashing Based on Wavelet Decomposition
Shota Moriguchi and Toshiyuki Uto
Ehime University, Japan

1570801013 GraphWavelet Convolutional Network with Graph Clustering
Hiroki Inatsuki and Toshiyuki Uto
Ehime University, Japan

OL CP 4 (Room 2)
Tuesday, 5 July 2022: 14.30-16.00

1570802724 Novelty Detection of a Rolling Bearing using Long Short-Term Memory Autoencoder
Sunithi Asavalertpalakorn¹, Pairod Singhatanadgid¹, and Tutpol Ardsomang²
¹Chulalongkorn University, Thailand
²Digital Asset Solution Rayong Engineering and Plant Services Rayong, Thailand

1570802857 A Study of Factors for the Adoption of International Standards in Digital Forensic
Chonwat Ngamlertprasert and Pongsarun Boonyopakorn
King Mongkut’s University of Technology North Bangkok, Thailand

1570802862 Threat Hunting for Digital Forensic using GRR Rapid Response with NIST Framework
Chalerm Klinkhamhom and Pongsarun Boonyopakorn
King Mongkut’s University of Technology North Bangkok, Thailand

1570802903 A Semi-Automated Annotation for Boar Sperm Classification using Deep Convolution Neuron Network
Duangjai Noolek, Orawan Chunhapran, and Tongjai Yampaka
Rajamangala University of Technology Tawan-Ok, Thailand
1570802988  Camera Pose Estimation using Voxel-Based Features for Autonomous Vehicle Localization Tracking
Sangyun Lee and Yeon-Kug Moon
Korea Electronics Technology Institute, Korea

OS CP 1 (Duangchanok 1)
Wednesday, 6 July 2022: 8.30-9.30

1570789790  Performance Evaluation of Visual Object Tracking using YOLO Deep SORT with LCF
Khin Ohnmar Maung and Theingi Myint
Michigan Technological University, USA

1570796633  An Approach to Classify Thumbnail Images on Video Sites by the Number of Accesses
Yukinobu Miyamoto
Kobe Gakuin University, Japan

1570799567  Drift-Aware Edge Intelligence for Remaining Useful Life Prediction in Industrial Internet of Things
Kevin Shen Hoong Ong¹, Dusit Niyato¹, and Thomas Friedrichs²
¹Nanyang Technological University, Singapore
²Robert Bosch (SEA) Pte Ltd., Singapore

1570800004  Parametric Modeling for Indirect Flat-Panel Detectors in Radiography Imaging
Dong Sik Kim
Hankuk University of Foreign Studies, Korea

OS CP 2 (Duangchanok 1)
Wednesday, 6 July 2022: 13.15-14.45

1570800147  Improvement of Final Exponentiation for a Pairing on FK12 Curve and its Implementation
Kazuma Ikesaka, Yuki Nanjo, Yuta Kodera, Takuya Kusaka, and Yasuyuki Nogami
Okayama University, Japan

1570800707  A Pinch Operated Input Interface of Japanese Syllabary Table for an Optical See-through HMD
Hikaru Adachi and Mitsunori Makino
Chuo University, Japan
1570802077  Lag Correction Factor Measurement Based on the Temporal Power Spectral Density and Its Size  
Eunae Lee and Dong Sik Kim  
Hankuk University of Foreign Studies, Korea

1570802221  An AR-based Support System of Postcard Handwriting through Superimposing Drafts with Text Frames  
Kazuma Kobayashi and Mitsunori Makino  
Chuo University, Japan

1570802937  A Consideration on Change the Transition Probability of SHAKE256 with Different Initial Values  
Tetsuro Ishida¹, Ryoichi Sato¹, Md. Arshad Ali², Takuya Kusaka³, Yasuyuki Nogami³, and Yuta Kodera³  
¹Okayama University, Japan  
²Hajee Mohammad Danesh Science and Technology University, Bangladesh

1570805412  Simplified Set-Membership Affine Projection Least Mean Fourth Algorithm  
Suchada Sitjongsataporn¹, Sethakarn Prongnuch², and Theerayod Wiangtong³  
¹Mahanakorn University of Technology, Thailand  
²Suan Sunandha Rajabhat University, Thailand  
³King Mongkut’s Institute of Technology Ladkrabang, Thailand

OS CP 3 (Duangchanok 1)  
Wednesday, 6 July 2022: 15.00-16.30

1570802972  Training Deep CNN’s to Detect Prostate Cancer Lesion with Small Training Data  
Kannika Wiratchawa, Yupaporn Wanna, Sirarat Cha-in, Chalida Aphinives, Potchavit Aphinives, and Thanapong Intharah  
Khon Kaen University, Thailand

1570803027  Eigenfunction Expansion Surface Mesh Smoothing of 3D Pleural Plaques’ Model from CT Data  
Kraisorn Chaisaowong¹ and Chaicharn Akkawutvanich²  
¹King Mongkut’s University of Technology North Bangkok, Thailand  
²Vidyasirimedhi Institute of Science and Technology Rayong, Thailand
1570803122 The Comparison of Deep Learning Model Efficiency for Classification of Oral White Lesions
Kunchidsong Phosri\textsuperscript{1}, Treesukon Treebupachatsakul\textsuperscript{1}, Wanwalee Chomkwah\textsuperscript{1}, Tananan Tanpatanan\textsuperscript{1}, Bhornsawan Thanathornwong\textsuperscript{2}, Siribang-on Piboonniyom Khovidhunkit\textsuperscript{3}, and Suvit Poomrittigul\textsuperscript{4}
\textsuperscript{1}King Mongkut’s Institute of Technology Ladkrabang, Thailand
\textsuperscript{2}Srinakharinwirot University, Thailand
\textsuperscript{3}Mahidol University, Thailand
\textsuperscript{4}Pathumwan Institute of Technology, Thailand

1570803453 Analysis of DRAM-based Network of DRAM Swap Space Adopting Latency Hiding Technique
Hyoseong Choi, Jiwon Lee, Jeonghoon Choi, and Won Woo Ro
Yonsei University, Korea

1570803516 Unrolling Multi-Channel Weighted Nuclear Norm Minimization for Image Denoising
Thuy Thi Pham, Truong Thanh Nhat Mai, and Chul Lee
Dongguk University, Korea

1570802666 Smart Room Vacancy Status Checking and Booking System
Poom Somwong, Siriporn Jaipoonpol, Paskorn Champrasert, and Yuthapong Somchit
OASYS Research Group, Chiang Mai University, Thailand

OS CP 4 (Duangchanok 1)
Thursday, 7 July 2022: 9.00-10.30

1570803970 Comparison of Conversion Matrices for a Compact AES–CTR Defined over an Isomorphic Field
Tomoya Hikida\textsuperscript{1}, Yasuyuki Nogami\textsuperscript{1}, Md. Arshad Ali\textsuperscript{2}, and Yuta Kodera\textsuperscript{1}
\textsuperscript{1}Ookayama University, Japan
\textsuperscript{2}Hajee Mohammad Danesh Science and Technology University, Bangladesh

1570804397 Decomposition Analysis of Quantum Native Gates on Various Quantum Computers
Sengthai Heng, Dongmin Kim, Sovanmonynuth Heng, and Youngsun Han
Pukyong National University, Korea
1570805298  Partitioning Deep Learning Model to Reduce Memory Latency for Custom Hardware Accelerator
Leanghok Hour¹, Sanghyeon Lee¹, Hyoju Seo², Yongtae Kim², and Youngsun Han¹
Pukyong Nation University, Korea
Kyungpook National University, Korea

1570805337  Low-Overhead Harvest-Then-Transmit in TSCH-Based Wireless Powered Sensor Networks
Jung-H yok Kwon¹, Dongwan Kim², Yongseok Lim³, Yong-Seong Kim³, and Eui-Jik Kim¹
¹Hallym University, Korea
²Dong-A University, Korea
³Korea Electronics Technology Institute, Korea

OS CP 5 (Duangchanok 3)
Thursday, 7 July 2022: 9.00-10.30

1570806502  Shift-ViT: Siamese Vision Transformer using Shifted Branches
Dasom Ahn, Hyeong Jin Kim, Sangwon Kim, and Byoung Chul Ko
Keimyung University, Korea

1570807007  Secure and Robust Image Watermarking using Discrete Wavelet and Arnold Transforms
Jantana Panyavaraporn¹ and Paramate Horkaew²
¹Burapha University, Thailand
²Suranaree University of Technology, Thailand

1570807027  Clinical Sound Dataset for Covid-19 and Evaluation using ResNet
Won Hee Hwang, Chan Hee Jeong, Hyuck Ki Hong, and Young Chang Jo
Human IT Research Center, Korea Electronics Technology Institute, Korea

1570807382  Using of an Arithmetic Sequence to Estimate Undetected Existing Circle Choice Locations
Ananta Sinchai and Panwit Tuwanut
King Mongkut’s Institute of Technology Ladkrabang, Thailand
A screen of Slide Detection Method using Deep Learning-Based Segmentation and Hough Transform
Junyoung Hong, Sunguk Jung, Yongwoo Lee, Hyeonbeom Heo, Hyeri Yang, Hayeon Kim, and Kyungjae Lee
Yong In University, Korea

A Method for Converting an Image of a GO Game Record to Training Data
Hyeri Yang, Hyeonbeom Heo, Sunguk Jung, Yongwoo Lee, Junyong Hong, Ye Ju Kim, and Kyungjae Lee
Yong In University, Korea

COVID-19 Face Mask Detection and Identification Using FaceNet
Kachasak Intim, Apirat Wanichsombat, and Nathaphon Boonnam
Prince of Songkla University, Surat Thani Campus, Thailand

DentShadeAI: a Framework for Automatic Dental Shade Matching through Mobile Phone Camera
Yupaporn Wanna¹, Kannika Wiratchawa¹, Rattaporn Leenaracharoongruang¹, Waraporn Sittiwong¹, Piyaphong Panpisut², and Thaapong Intharah¹
¹Khon Kaen University, Thailand
²Thammasat University, Thailand

Hybrid Vectorization and Parallelization for Matrix-Matrix Multiplication on Multi-Core Platform
Thanit Keatkaew, Kampol Woradit, and Paskorn Champrasert
OASYS Research Group, Chiang Mai University, Thailand

A Comparison of Deep Learning CNN Architectures Model for Classifying Bacteria
Suvit Poomrittigul¹, Wanwalee Chomkwah², Tananan Tapataman², Sakda Sakorntanant¹, and Treesukon Treebupachatsakul²
¹Pathumwan Institute of Technology, Thailand
²King Mongkut's Institute of Technology Ladkrabang, Thailand
1570811270  An Image Segmentation Based on a Piecewise Smooth Model in Deep Learning
Hyun-Tae Choi¹, Bilel Derbel², and Byung-Woo Hong¹
¹Chung-Ang University, Korea
²University of Lille, France

1570807644  Wireless Sensor Networks (WSNs) based on the Existing Perception for Monitoring Rice-Paddy Health
Supachai Puengsungwan
King Mongkut’s University of Technology Thonburi, Thailand

1570809358  Practical Speed Control for an Autonomous Golf Cart
Benjamas Panomruttanarug, Lattapol Thurnim, Araya Kornwong, Sorrasak Promdum, and Pichakrit Tangwongsan
King Mongkut’s University of Technology Thonburi, Thailand

1570807012  Development of the Recommended Coffee Shops Application based Twitter Sentiment Analysis
Petipol Nilpao, Nitjaree Nanta, Nopparuj Suetrong, and Natthanan Promsuk
Chiang Mai University, Thailand

OL CP 5 (Room 1)
Thursday, 7 July 2022: 13.30-15.00

1570803096  Significant Neurophysiological Features for fNIRS-EEG Brain-Computer Interfacing of Imagined Speech
Sittha Preedapirat and Yodchanan Wongsawat
Mahidol University, Thailand

1570803328  The Comparison of Web History Forensic Tools with ISO and NIST Standards
Kiattisak Janloy and Pongsarun Boonypakorn
King Mongkut’s University of Technology North Bangkok, Thailand

1570803528  BLS12-381 Pairing Implementation with RAM Footprint Smaller than 4KB
Riku Anzai, Junichi Sakamoto, Naoki Yoshida, and Tsutomu Matsumoto
Yokohama National University, Japan
1570803595 High Efficiency Image Correction for Low Power Underwater Drone
Kazuto Shindo, Takafumi Katayama, Tian Song, and Takashi Shimamoto
Tokushima University, Japan

1570803949 Computer Laboratory Surveillance System: Robbery Scene Detection and Alerting
Chanawee Sae-ung, Pawika Nadeethae, Akara Prayote, and Porawat Visutsak
King Mongkut’s University of Technology North Bangkok, Thailand

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1570804173 A U-Net Based Lesion Segmentation Method for Computer-Aided Diagnosis in Colorectal NBI Endoscopy
Yongfei Wu¹, Daisuke Katayama¹, Ryuichi Michida¹, Tetsushi Koide¹, Toru Tamaki², Shigeto Yoshida³, Yuki Okamoto¹, Oka Shiro¹, and Shinji Tanaka¹
¹Hiroshima University, Japan
²Nagoya Institute of Technology, Japan
³Hiroshima Hospital, Japan

1570804200 An Endoscopic Image Classifier Using Deep Learning Considering Progression of Colorectal Cancer
Daisuke Katayama¹, Yongfei Wu¹, Ryuichi Michida¹, Tetsushi Koide¹, Toru Tamaki², Shigeto Yoshida³, Yuki Okamoto⁴, Shiro Oka⁴, and Shinji Tanaka⁴
¹Hiroshima University, Japan
²Nagoya Institute of Technology, Japan
³Hiroshima Hospital, Japan
⁴Hiroshima University Hospital, Japan

1570804286 Prediction of PM2.5 and PM10 in Chiang Mai Province: A Comparison Machine Learning Models
Thitaporn Thongrod, Apiradee Lim, Thammasin Ingviya, and Benjamin Atta Owusu
Prince of Songkla University, Thailand
1570804384  Detection of Atrial Fibrillation based on Synchronized Beats Image with Lightweight Neural Network
Khaing Su Thway, Pakpum Somboon, and Arporn Teeramongkonrasmeee
Chulalongkorn University, Thailand

1570804422  Autofocus Machine Vision System for Reading Serial Numbers of Hard Disk Drive Slider Bar
Bee-Ing Sae-Ang, Pradit Mittrapiyanurak, Pakorn Kaewtrakulponge, Wuttipong Kumwilaisak, and Sarun Laohavichien
1King Mongkut’s University of Technology Thonburi, Thailand
2Autodesk Asia, Singapore
3Tesla Inc. Texas, USA.
4Slider Fabrication Western Digital, Thailand

OL CP 7 (Room 1)
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1570804552  Optimum Prefetching Patterns Searching: A Case Study of Matrix-Matrix Multiplication
Varintorn Khomongkonudom and Panyayot Chaikarn
Prince of Songkla University

1570804590  Deep Learning-Based Quality Enhancement Algorithms for Background of Video
Kei Kobayashi, Takafumi Katayama, Tian Song, and Takashi Shimamoto
Tokushima University, Japan

1570804919  Investigation of Sensors Related 3D-Mapping Algorithm for Monocular Video based Underwater Vehicles
Shotaro Ikeda, Takafumi Katayama, Tian Song, and Takashi Shimamoto
Tokushima University, Japan

1570804926  High-Accuracy Object Detection Using Multi-view Video at Road Intersections
Urumu Ihara, Takafumi Katayama, Tian Song, and Takashi Shimamoto
Tokushima University, Japan
1570804969 Optimization of Edge Detection using AVX Intrinsics on Multi-Core Architectures
Thaufiq Peng-o and Panyayot Chaikan
Prince of Songkla University, Thailand

1570800654 Optimal Focal Plane Analysis Research using Noise Caused by Depth of Field of Objective Lens in Digital Holographic Microscopy (DHM)
Hyun-Woo Kim¹, Myungjin Cho², Jong-Hoon Huh¹, and Min-Chul Lee¹
¹Kyushu Institute of Technology, Japan
²Hankyong National University, Korea

OL CP 8 (Room 2)
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1570804972 High Efficiency Dataset Generation for Semantic Video Segmentation on Road Intersection
Wataru Nagai, Takafumi Katayama, Tian Song, and Takashi Shimamoto
Tokushima University, Japan

1570805519 NILM Home Appliance Monitoring Using Power Consumption Aggregation via IoT notification
Damrongsak Arunyagool and Kosin Chamnongthai
King Mongkut’s University of Technology Thonburi, Thailand

1570805645 A Dynamic Parking Space Allocation Based on Web Application
Jiwoo Park¹, Byeonggyu Kim¹, Jungkyun Woo¹, Andy Lin², Anthony Smith², and Minsun Lee¹
¹Chungnam National University, Korea
²Purdue University, USA

1570805671 Development and Visualization of PS-Dict: a Programmer Skills Dictionary
Jirawan Charoensuk, Thaninrat Phansiri, Jessada Abdulroman, and Chalothon Chootong
Kasetsart University, Thailand
The Developing of the Sensor System with IoT for Fertilizer Quality Monitoring: Case of Bio-organic Fertilizer from Palm Wastes
Parinya Jansengrat\textsuperscript{1}, Weena Janratchakool\textsuperscript{1}, Khongthep Boonmee\textsuperscript{1}, Nongluk Promthong\textsuperscript{1}, Waraphan Sarasureeporn\textsuperscript{1}, and Burasakorn Yoosooka\textsuperscript{2}
\textsuperscript{1}Rajamagala University of Technology Thanyaburi, Thailand
\textsuperscript{2}Rajamangala University of Technology Phra Nakhon, Thailand

Object Detection and Position using CLIP with Thai Voice Command for Thai Visually Impaired
Wasin Pirom
Pathumwan Institute of Technology, Thailand

Utilizing Image Processing Techniques to Develop a Novel Scoring System for Corn Ear Shape
Amika Yawichai\textsuperscript{1,2}, Eliot Cline\textsuperscript{2}, and Navadon Khunlertgiti\textsuperscript{1}
\textsuperscript{1}Chiang Mai University, Thailand
\textsuperscript{2}Hortigenetics Research (S.E. Asia) Limited, Thailand

AI-based Models for SARS-CoV-2 Severity Scores using Multiple Chest X-Ray Image Features
Hanna Ysabelle Nasol, Rolly Baguinon Jr, Aaron Lance Cabuenas, Nathan Paul Del Rosario, and Melchizedek Alipio
\textsuperscript{1}De La Salle University, Philippines

A Taxonomy of Intelligent Wearable Devices and Biosensors for Cattle Health Monitoring
Alysa Ellen Go, Beatrice Anne Reyes, Jennifer Sofia Lii, Melchizedek Alipio, Sydnie Strong Hall, and Jannah Cyril Evanoso
De La Salle University, Philippines

Comparison of Baseline Wander Correction Methods for Handheld ECG with Motion Artefacts
Tanawan Tearwattanarattikal, and Apiwat Lek-uthai
Chulalongkorn University, Thailand
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1570807154  Fake News Detection in Social Media using Two-Layers Ensemble Model
Hnin Ei Wynne¹, and Khaing Thanda Swe²
¹Technological University (Pathein), Myanmar
²Mandalay Technological University, Myanmar

1570807374  Comparison of Deep Learning-Based Semantic Segmentation Models for Unmanned Aerial Vehicle Images
Kan Tippayamontri and Navadon Khunlertgit
Chiang Mai University, Thailand

1570807447  Artificial Neural Network with Histogram Oriented Swerve Angle for Signature Verification
Suriya Soisang and Suvit Poomrittigul
Pathumwan Institute of Technology, Thailand

1570807517  Screening Risk of Dyslexia in Children through a Redesigned Game
Natsinee Tangsiripaiboon, Lachana Ramingwong, and Sakgasit Ramingwong
Chiang Mai University, Thailand

1570807581  Graph Structure Learning based on Mistakenly Predicted Edges from Reconstructed Graph Representation
Deogho Choi and Jitae Shin
Sungkyunkwan University, Korea

OL CP 11 (Room 1)
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1570807628  Fault Detection and Identification for Centrifugal Compressor by Ensemble Model
Titipat Sonthipo¹, Tutpol Ardsomang², and Ratchatin Chancharoen¹
¹Chulalongkorn University, Thailand
²Rayong Engineering & Plant Service, Thailand

1570807640  Message Classification for Breast Cancer Chatbot using Bidirectional LSTM
Pariwat Maktapwong¹, Pichathat Siriphornphokha¹, Supawadee Tubglm², and Aurawan Insombut¹
¹Kasetsart University, Thailand
²Thammasat University, Thailand
1570807679  DMS : An Architecture of a Decentralized-based Music Streaming Platform using Blockchain  
Suppakit Yamwaja and Chinnapong Angsuchotmetee  
Prince of Songkla University, Thailand

1570807686  A Classification Model for Road Traffic Incidents on Twitter Data  
Thawatchai Raksachat and Rathachai Chawuthai  
King Mongkut's Institute of Technology Ladkrabang, Thailand

1570807870  DP-Onto: A Semantic-based Approach for Governing Digital Provider Information  
Sareeya Ben-arlee and Chinnapong Angsuchotmetee  
Prince of Songkla University, Thailand

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1570800239  Mixed Reality-Based Outdoor Training System to Improve Football Player Performance  
Jihyung Kim, Wooksung Kim, and Jonghyeon Ka  
Pohang University of Science and Technology, Korea

1570802773  3D Human Reconstruction with Corresponding 3D Texture Model: A Comparison of Salient Approaches  
Hamid Habib Syed and Muhammad Mahmood  
Air University Islamabad, Pakistan

1570804420  A Novel Video Coding Framework with GAN-based Face Generation for Videoconferencing  
Soma Nagahara, Taka fumi Katayama, Tian Song, and Takashi Shimamoto  
Tokushima University, Japan

1570805071  Object Detection in Curved Mirror with Multi-Cameras from Single Viewpoint Video  
Chihaya Asai, Tian Song, Taka fumi Katayama, and Takashi Shimamoto  
Tokushima University, Japan

1570807888  FedVar : Federated Learning Algorithm with Weight Variation in Clients  
Wooseok Shin and Jitae Shin  
Sungkyunkwan University, Korea
## CIRCUIT AND SYSTEMS

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Tuesday, 5 July 2022: 13.00-14.30

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| 1570797644 | A Positive Type CC-Based Universal Biquadratic Circuit Configuration                       | Takao Tsukutani¹, Noboru Yabuki², and Kazuharu Hashitsume³  
1Matsue College, Japan  
2Tsuyama College, Japan  
3Shimane University, Japan |
| 1570800098 | Idle Period Frequency Scaling to Reduce Dynamic Power of Display Driver IC                 | Woojoo Kim, and Eui-Young Chung  
Yonsei University, Korea |
| 1570800414 | Low Power, Quick Settling time DLDO Architecture with Dynamic PID Gain Controller and Event Detector | Seung Hyeon Byun, Young Gun Pu, and Kang Yoon Lee  
Sungkyunkwan University, Korea |
| 1570800565 | Analysis of SSD with Logical to Physical Address Mapping of Hot Data to Single Level Cell Area | Gyuseok Choe¹, Youngmin Lee², and Won Woo Ro¹  
1Yonsei University, Korea  
2Samsung Electronics Company Limited, Korea |
| 1570800679 | Machine Learning Based Fault Diagnosis for Stuck-at Faults and Bridging Faults            | Yoshinobu Higami¹, Takaya Yamauchi¹, Tsutomu Inamoto¹, Senling Wang¹, Hiroshi Takahashi¹, and Kewal K. Saluja²  
1Ehime University, Japan  
2University of Wisconsin, USA |
OL CS 2 (Room 3)
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1570800796 Measurement of the Frequency Characteristics of an RC Polyphase Filter Using 4-phase Square Waves
Lina Sato¹, Kazuhiro Shouno¹, Hiroshi Tanimoto², Cosy Muto³, Michitaka Yoshino⁴, Seijiro Moriyama⁵, and Chikau Takahashi⁶
¹University of Tsukuba, Japan
²Kitami Institute of Technology, Japan
³Nagasaki University, Japan
⁴Hosei University, Japan
⁵Anagix Corporation, Japan
⁶Takamori Co., Ltd, Japan

1570800844 Linear Range Enhancement Circuit for LVDT based on Bipolar OTA with Relative Error Control
Sompong Wisetphanichkij
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570801022 An Implementation of an RCPF and Its Measurement of the Frequency Response Based on Superposition
Kanta Fukagawa¹, Kazuhiro Shouno¹, Hiroshi Tanimoto², Cosy Muto³, Michitaka Yoshino⁴, Seijiro Moriyama⁵ and Chikau Takahashi⁶
¹University of Tsukuba, Japan
²Kitami Institute of Technology, Japan
³Nagasaki University, Japan
⁴Hosei University, Japan
⁵Anagix Corporation, Japan
⁶Takamori Co., Ltd, Japan

1570801419 The Novel Correction Technique for PVT Variation of CMOS Operational Amplifier Using Digital Assist
Shotrarro Umemoto, Ryoichi Miyauchi, Yu Muramatsu, Genki Abe, and Yutaka Fukuchi
Tokyo University of Science, Japan

1570803097 Quick and Efficient Offset Compensation by Noise-Aware Operation of DRAM Bit Line Sense Amplifier
Tae-Bin Kim¹ and Kee-Won Kwon²
¹Samsung Electronics Co., LTD., Korea
²Sungkyunkwan University, Korea
**OS CS 1 (Duangchanok 2)**  
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1570796627  **Analysis of Cascaded Tomlinson-Harashima Precoding with Feedforward Equalizer for Pre-Cursor Removal**  
Byungjun Kang and Deog-Kyoon Jeong  
Seoul National University, Korea

1570799991  **A New CMOS Ultra Low Power Flip-Flop Circuit with a Minimization of Internal Node Transitions**  
Suhynn Lee, Gyuwon Kam, Seungjoo Yoon, Soo Youn Kim, and Minkyu Song  
Dongguk University, Korea

1570800458  **Feedforward Cherry-Hooper Continuous Time Linear Equalizer in 28-nm CMOS**  
Sanghee Lee, Jihee Kim, and Deog-Kyoon Jeong  
Seoul National University, Korea

1570800459  **A 64-Gb/s Ground-Referenced Signaling PAM-4 Transmitter with Switched-Capacitor Charge Pump Driver**  
Jung-Hun Park¹, Yongjae Lee², Kwang-Hoon Lee¹, Han-Gon Ko³, and Deog-Kyoon Jeong¹  
¹Seoul National University, Korea  
²Samsung Electronics, Korea  
³Center ONE Semiconductor, Korea

**OS CS 2 (Duangchanok 2)**  
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1570800720  **Thermal Environmental Control System in Airborne Infection Isolation Room**  
Thawin Matung¹, Thammanoon Sookchaiya², and Prasit Nangtin¹  
¹Pathumwan Institute of Technology, Thailand  
²Yala Technical College, Thailand

1570802004  **Time-Driven Python-based Simulator for Verification of High-Speed Link Circuits and Systems**  
Bongkyu Kim and Jung-Hoon Chun  
Sungkyunkwan University, Korea

1570802944  **DBTA-Based Voltage-Mode PID Controller Design**  
Pratya Mongkolwai¹ and Worapong Tangsrirat²  
¹Rajamangala University of Technology Rattanakosin, Thailand  
²King Mongkut’s Institute of Technology Ladkrabang, Thailand
1570802999 A Practical Circuit of Cyclic Chirp Spread Spectrum Modulation for Long Range Communication
Ananta Sinchai, Nopparut Saelim, Chotipat Pornavalai, Paramote Wardkein, and Panwit Tuwanut
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570803542 Respiration Rate Detection for Multi-Target using Elevation-Azimuth Map in FMCW Radar
Youngkeun Yoo, Ki-Won Rhee, Heemang Song, and Hyun-Chool Shin
Soongsil University, Korea

1570807240 Prototype a Food Processing Combination Heated Drying Cabinet
Prasit Phoosomma
Dhonburi Rajabhat University, Thailand

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1570803591 Visibility Evaluation of Invisible Information Display Lighting Device
Takumi Hayashi, Yuta Moritake, Yuki Hirota, Kong Xiangbo, and Takeshi Kumaki
Ritsumeikan University, Japan

1570803736 Verification of Plants Growth Promoting Effect using Natural Sunlight Spectrum LED
Tatsuki Yamagishi, Taiga Abe, Saitou Shugo, Kong Xiangbo, and Takeshi Kumaki
Ritsumeikan University, Japan

1570804073 Coil Design and De-Embedding for a Novel Cell Balancing Circuit using Near-Field Coupling
Juhyeon Jeon¹, Wulguk Park¹, Sungmin Pyo², and Dongho Lee¹
¹Mokpo National University, Korea
²Hanbat National University, Korea

1570804155 Temperature-Aware Over Current Protection in Smartphone PMIC for System Performance Enhancement
Seungduck Noh and Yoonmyung Lee
Sungkyunkwan University, Korea
1570804522 Fall Detection and Reducing Detection Error using FMCW Radar
Jaeyoung Baik, Chaewon Jung, Ari Nam, and Hyun-Chool Shin
Soongsil University, Korea

1570803699 Using the Field Survey Support Platform for Drainage Canal Obstruction Problem Management
Somrawee Aramkul¹, Chuchoke Aryupong¹, and Paskorn Champrasert²
¹Chiang Mai University, Thailand
²OASYS Research Group, Chiang Mai University, Thailand

OS CS 4 (Duangchanok 2)
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OS CS 4 (Duangchanok 2)
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1570804534 Enhanced Measurement of Human Activity using FMCW Radar
Hyunsoo Yoon, Jongwun Seul, Sumin Kim, and Hyun-Chool Shin
Soongsil University, Korea

1570806955 Self-Oscillating Double-balanced Mixer with Transformer Coupled Single-Ended LNA Input
Namjin Oh
Korea National University of Transportatation, Korea

1570807028 Event-Triggered Stabilization of Delayed Complex-Valued Neural Networks via Reachable Set Estimation
Vadivel Rajarathinam and Bundit Unyong
Phuket Rajabhat Univeristy, Thailand

1570807534 A 10-to-12-GHz Dual Loop Quadrature Clock Corrector in 28-nm CMOS Technology
Jung-Woo Sull, Sungyoung Lee, and Deog-Kyoon Jeong
Seoul National University, Korea

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1570803504 A Design of 5W High Voltage Low Drop Out Regulator in WPT System for Wearable device
Kyung Je Jeon, Young Gun Pu, and Kang Yoon Lee
Sungkyunkwan University, Korea
1570803507  Design of Compact Defected Ground Structure for Differential Signal  
SeungCheol Song, Giwon Kim, and SoYoung Kim  
Sungkyunkwan University, Korea

1570803609  A Design of Low High Performance Low Dropout Regulator with Voltage - Control and Stable Current  
Hyoung Jun Na, Young Gun Pu, and Kang Yoon Lee  
Sungkyunkwan University, Korea

1570803615  A Design of Boost Converter for Energy Harvesting with MPPT Technology  
Dae-Han Yu, Jong Wan Jo, Young Gun Pu, and Kang-Yoon Lee  
Sungkyunkwan University, Korea

1570803691  Design and Construction Circuit Drive System Electric Wireless Induction with Spiral Coil  
Channarong Noybangyang\(^1\), Santi Wangnipparnto\(^1\), and Thavorn Suwanakir\(^2\)  
\(^1\)Pathumwan Institute of Technology, Thailand  
\(^2\)Chulalongkorn University, Thailand

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1570803801  Charge-Trap based VMM Design Compensated for Non-Linearity through Reference Read  
Dong-seok Kang and Kee-Won Kwon  
Sungkyunkwan University, Korea

1570803924  Multi-Purpose Power Amplifier Board for Custom-Designed Electrical Stimulation System Development  
Thiwat Udomlertsirikul and Yodchanan Wongsawat  
Mahidol University, Thailand

1570803983  Low-Cost PM 2.5 Sensor and Cost-Effective Air Purification Study for Household Implementation  
Metini Janyasupab and Jaturun Yongwiwat  
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570804095  Nanoscale CMOS Modeling based on Artificial Neural Networks: Design of SRAM Circuit for Reliability  
Yeon-Seob Song, Young-Gun Pu, and Kang-Yoon Lee  
Sungkyunkwan University, South Korea
A 152 × 52 Scanning LiDAR Sensor using a Smart Accumulation Technique and Partial Histogram Memory
Seungik Jo, Hyeongseok Seo, and Jaehyuk Choi
Sungkyunkwan University, Korea

Automotive Interconnect PAM4 Behavioral Modelling using SymbaPy Framework
Siddharth Katare
Cyient Limited, India

Thermal Transient Analysis and Dynamic Temperature Control Algorithm for 3-D Stacked Chips
Songxiang Wang¹ and Kimiyoshi Usami¹,²
¹Shibaura Institute of Technology, Japan
²SIT Research labs. International Research Center for Green Electronics

Introduction of New Features in Writer Verification Based on Finger-writing of a Simple Symbol
Takahiro Horiuchi, Tomoyuki Inoue, and Isao Nakanishi
Tottori University, Japan

A 160 × 120 SPAD LiDAR Sensor with an Area-efficient Histogramming Memory for Mobile Devices
Songhyeon Kim, Minkyung Kim, and Jaehyuk Choi
Sungkyunkwan University, Korea

A Design of a Power-Up Circuit for Energy Harvesting Applications
Muhammad Basim¹, Qurat ul Ain¹, Khuram Shehzad²,
Syed Adil Ali Shah¹, Young Gun Pu¹, and Kang-Yoon Lee¹,²
¹Sungkyunkwan University
²SKAIChips Co., Ltd., Korea

Improve the Linearity of NOR Flash Memory Used for Vector Matrix Multiplication
Jung-Ho Song and Kee-Won Kwon
Sungkyunkwan University, Korea
1570804416 Analysis on Endurance Characteristics of Ferroelectric Memory Device
Munhyeon Kim1, Sihyun Kim1, Kitaee Lee1, Hyun-Min Kim1, Changha Kim1, Dong-Oh Kim1, Byung-Gook Park1, and Daewoong Kwon2
1Seoul National University, Korea
2Inha University, Korea

1570807431 Optimizing Design Power Integrity using IR-Aware Placement
Johannah Mae Abestano1, Olga Joy Gerasta1, Jefferson Hora1, and Melvin Joey de Guzman2
1Mindanaao State University – Iligan Institute of Technology, Philippines
2Physical Design Team Lattice Semiconductor Corporation, Philippines

1570807549 Ex-Vivo Design of pH Meter to Analyze Nutrients Feature Assessment for Economic Domestic Purpose
Fahim Faisal1, Mirza Muntasir Nishat1, Nusheera Tazreen1, Md Faiyed Bin Karim1, Afsana Hossain Bristy1, and Shafkat Haque2
1Islamic University of Technology, Bangladesh
2Brac University, Bangladesh

OL CS 7 (Room 3)
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1570807543 A Design of Low Power and Small Area 8 Bit 200KS/s Synchronous Single-Ended SAR ADC
Dongjin Kim and Kang-Yoon Lee
Sungkyunkwan University, Korea

1570807629 Fine Dust Mass Measurement System using oscillation frequency with SAW Sensor
Chang Hyeon Kim
Sungkyunkwan University, Korea
Improving Digital Design PPA (Performance, Power, Area) using iSpatial Physical Restructuring
Susie Maestre¹, Aileen Gumera¹, Jefferson Hora¹, and Melvin Joey de Guzman²
¹Mindanao State University-Iligan Institute of Technology, Philippines
²Physical Design Team Lattice Semiconductor (PH) Corporation, Philippines

Robust Stability Condition for Inverse Control of Uncertain Nonlinear Discrete-Time Systems
Pornchai Khlaeo-om
Rajamangala University of Technology Srivijaya, Thailand

COMMUNICATION

OL CM 1 (Room 4)
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Applying Human-Centered Design for Media development to promote the learning to Adapting to the Covid-19 Pandemic Situation
Ladapa Sripasuda and Phongsakorn Thongpan
Sakon Nakhon Rajabhat University, Thailand

Emergency Data Transmission with Block ACK of IEEE 802.15.6 CSMA/CA
Takahiro Suzuki
Nihon Fukushi University, Japan

Turbulence Resilient Free-Space Optical Communication Using Iterative Blind Equalization
Minsik Kim¹, Alan E. Willner², and Daeyoung Park¹
¹Inha University, Korea
²University of Southern California, USA

BLE-Based Indoor Positioning Using Extended Advertisement
Yunsik Bae and Dongkun Shin
Sungkyunkwan University, Korea

Direction Estimation of Sound Source by MUSIC Method and CNN Considering Overtone Structure
Kaho Yamamoto¹, Akio Ogihara¹, and Harumi Murata²
¹Kindai University, Japan
²Chukyo University, Japan
1570804401 Performance Evaluation of Routing Protocols iFROP-3DD for Drone Ad Hoc Network
Yuki Fujii and Koichi Gyoda
Shibaura Institute of Technology, Japan

OL CM 2 (Room 4)
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1570803668 Smart Agriculture Monitoring and Management System using IoT-enabled Devices based on LoRaWAN
Pittaya Supanirattisai, Kongpop U-Yen, Alongkorn Pimpin, Werayut Srituravanich, and Nattapol Damrongplasit
Chulalongkorn University, Thailand

1570804031 Progress Estimation of Mixing and Grinding Process using Sound Analysis in Ultrasonic Frequency
Ekkawit Wangkanklang¹, Tomoya Hayashi², and Yoshikazu Koike²
¹Nakhon Ratchasima Rajabhat University, Thailand
²Shibaura Institute of Technology, Japan

1570804169 Design and Experiment of FMCW Radar System for Drone Detection
Seksan Eiadkaew¹, Akkarat Boonpoonga¹, Kittisak Phaebua¹, Krit Athikulwongse², and Nattakarn Shumirungson³
¹King Mongkut’s University of Technology North Bangkok, Thailand
²National Science and Technology Development Agency, Thailand
³Mahasarakham University, Thailand

1570804234 Performance Evaluation of an Information Collection and Delivery System for Disaster Evacuation Guidance Using Message Ferries in Urban Areas
Riko Suzuki and Koichi Gyoda
Shibaura Institute of Technology, Japan

1570804237 Performance Evaluation of MANET Protocol PAR-AODV-SOS for Disaster Relief Communication Considering Terminal Battery Life and Number of Terminals
Ryu Yamada and Koichi Gyoda
Shibaura Institute of Technology, Japan
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1570796907  Equatorial Plasma Bubble Detection by Support Vector Machine at Chumphon Station, Thailand
Thananphat Thanakulketsarat¹, Pornchai Supnithi¹, Lin Min Min Myint¹, and Kornyanat Hozumi²
¹King Mongkut’s Institute of Technology Ladkrabang, Thailand
²National Institute of Information and Communications Technology Koganei, Japan

1570799768  Multi-criteria Clustering Algorithm for Cooperative Spectrum Sensing
Yutthna Sroulsrun¹, Kanabadee Srisomboon² and Wilaiporn Lee²
¹Rajamangala University of Technology Phra Nakhon, Bangkok, Thailand
²King Mongkut’s University of Technology North Bangkok, Bangkok, Thailand

1570800675  Performance Evaluation of Spectrum Sensing Under PU Random Access
Kanabadee Srisomboon and Wilaiporn Lee
King Mongkut’s University of Technology North Bangkok, Thailand

1570803858  A Density-based Clustering Approach to detect Colluding SSDF Attackers in Cognitive Radio Networks
Amar Taggu and Ningrinla Marchang
North Eastern Regional Institute of Science and Technology, India

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1570804303  Investigation of MCDM on Multi-Parent Selection for RPL Protocol
Tinnaphob Dindam¹, Kanabadee Srisomboon², and Wilaiporn Lee²
¹Panyapiwat Institute of Management, Thailand
²King Mongkut’s University of Technology North Bangkok, Thailand
1570806494  CNN-based Doppler Shift Estimation for Low Earth Orbit Satellites
Seokju Kim, Juhyun Park, and Chungyong Lee
Yonsei University, Korea

1570806833  Study on Effect of Equatorial Plasma Bubble over Real-Time Kinematic Positioning in Bangkok Thailand
Phyo C Thu¹, Pornchai Supnithi¹, Lin Min Min Myint¹, Jirapoom Budtho¹, Susumu Saito², Apitep Saekow³, and Nattapong Siansawasdi⁴
¹King Mongkut’s Institute of Technology Ladkrabang, Thailand
²Electronic Navigation Research Institute National Institute of Maritime, Port and Aviation Technology, Japan
³Stamford University, Thailand
⁴Air Navigation Radio Aids Department Aeronautical Radio of Thailand, Thailand

1570807023  Comparison study of amplitude scintillation between GNSS and satellite beacon receivers in Thailand
Khanitin Seechai¹, Lin Min Min Myint¹, Kornyanat Hozumi², and Pornchai Supnithi¹
¹King Mongkut’s Institute of Technology Ladkrabang, Thailand
²National Institute of Information and Communications Technology, Japan,

1570807134  An Experimental Study of RSSI for LoRa Technology in Different Bandwidths
Tanatpong Udomchaipitak, Nathaphon Boonnam, and Supattra Puttinaovarat
Prince of Songkla University, Surat Thani Campus, Thailand

1570807370  Measurement of Human Height by using the Convolution Neural Network and the Trigonometric Theory
Rungnirun Jindarat¹, Thanomsak Sopon¹, Kidsanapong Puntsri², Sasiphan Wongsuthavas³, and Wannaree Wongtrairat¹
¹Rajamangala University of Technology Isan, Thailand
²Rajamangala University of Technology Isan, Khon Kaen campus, Thailand
OS CM 3 (Duangchanok 3)
Wednesday, 6 July 2022: 15.00-16.30

1570807170 Precise Total Electron Content Map Monitoring in Low Latitude Region
Napat Tongkasem, Lin M. M. Myint, and Pornchai Supnithi
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570807212 Robust Beamforming for Multibeam Satellite Communication Systems with Outage Constraints
Jeong Joon Lee, Chaehun Im, and Chungyong Lee
Yonsei University, Korea

1570807221 Analysis of Energy Optimization Techniques in Underwater Internet of Things
Delphin Raj K M, Eunbi Ko, Soo-Young Shin, and Soo-Hyun Park
Kookmin University, Korea

1570807229 Preliminary Study to Enhance the Capability of Space Surveillance using Ground-based Radar at GISTDA
Ussanai Nithirochananont, Sittiporn Channumsin, Suwat Sreesawet, Keerati Puttasuwan, and Phasawee Saingyen
Geo-Informatics and Space Technology Development Agency, Thailand

1570807178 Analysis & Estimation of Soil for Crop Prediction using Decision Tree and Random Forest Regression Methods
Manoj Tolani¹, Ambar Bajpai¹, Arun Balodi¹, Sunny², Lunchakorn Wuttisittikulkij³, and Piya Kovintavewar⁴
¹Atria Institute of Technology, India
²Indian Institute of Information Technology, India
³Chulalongkorn University, Thailand
⁴Nakhon Pathom Rajabhat University, Thailand

1570807013 Strong-Motion Earthquake Prediction Model using Convolutional Extreme Learning Machine
Phiphat Chomchit¹ and Paskorn Champrasert²
¹Chiang Mai University, Thailand
²OASYS Research Group, Chiang Mai University, Thailand
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<td>Actual Traffic Based Load-Aware DPS CoMP for NOMA System</td>
<td>Phornthip Tarbut¹, Soamsiri Chantaraskul¹, and Kittipong Nuanyai²</td>
<td>¹King Mongkut’s University of Technology North Bangkok, Thailand²Phetchaburi Rajabhat University, Thailand</td>
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<td>Hybrid GNS3 and Mininet-WiFi Emulator for SDN Backbone Network Supporting Wireless IoT Traffic</td>
<td>May Pyone Han, Soe Ye Htet, and Lunchakorn Wuttisttikulkij</td>
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<td>Yoshihiro Kaneko</td>
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<td>¹Chiang Mai University, Thailand²OASYS Research Group, Chiang Mai University, Thailand</td>
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<td>Tran Thi Thao Nguyen¹ and Hiroshi Ochi²</td>
<td>¹Vietnam National University, Vietnam²Kyushu Institute of Technology, Japan</td>
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1570809165  A LoRaWAN based IoT Testbed for Performance Investigation
Hoang Thien Long Ho, Anh Tien Doan, Duy Tinh Nguyen, and Hoang-Anh Pham
Ho Chi Minh City University of Technology and Vietnam National University, Vietnam

1570799777  The Novel Three-Stage Outlier Disclosure Scheme for Fix Magnitude Impulsive Noise (FMIN)
Vorapoj Patanavijit¹, Darun Kesrarat¹, Wilaipom Lee², and Kornkamol Thakulsukanant¹
¹Assumption University of Thailand, Thailand
²King Mongkut's University of Technology North Bangkok, Bangkok, Thailand

1570804669  Comprehensive Study of Parent Selections with Trickle Timers for RPL Protocol in AMI Network
Boonpipob Napasiripakorn, Kananbadee Srisomboon, and Wilaiporn Lee
King Mongkut’s University of Technology North Bangkok, Thailand

1570805172  Binocular suppression analysis for efficient compression of UHD stereo images
Insu Son¹, SeungJun Lee¹, Sunghoon Kim², Seongwon Jung², Kyeonghoon Jung¹, and Dongwook Kang¹
¹Kookmin University, Korea
²Electronics & Telecommunications Research Institute, Korea

SPECIAL SESSION

OL SS 1 (Room 5)
Tuesday, 5 July 2022 : 13.00-14.30

1570807035  The Developing a Restaurant Management Platform for Entrepreneurs based on the Concept "NEW NORMAL"
Junalak Wattananon¹, Pollawat Chintanaporn², Chodiwat Poongern¹, and Thawatchai Pomchiengpin¹
¹Rajamangala University of Technology Thanyaburi, Thailand
²Portalpolis Company Limited, Thailand
1570807037 Parameter Identification of Stochastic Delay Differential Equations using Differential Evolution
Manlika Ratchagit and Honglei Xu
Curtin University, Australia

1570807635 Wearable-based Activity Recognition of Construction Workers using LSTM Neural Networks
Sakorn Mekruksavanich¹, Ponnipa Jantawong¹, Narit Hnoohom² and Anuchit Jitpattanakul³
¹School of Information and Communication Technology, University of Phayao, Thailand
²Mahidol University, Thailand
³King Mongkut’s University of Technology North Bangkok, Bangkok, Thailand

1570807639 Automatic Fall Detection using Deep Neural Networks with Aggregated Residual Transformation
Sakorn Mekruksavanich¹, Ponnipa Jantawong¹, Narit Hnoohom² and Anuchit Jitpattanakul³
¹School of Information and Communication Technology, University of Phayao, Thailand
²Mahidol University, Thailand
³King Mongkut’s University of Technology North Bangkok, Bangkok, Thailand

1570809398 IoT Approach in Preliminary Screening Process Avoiding a Risk of Infection During The COVID-19 Pandemic
Chutima Prasartkaew, Keeratiburt Kanchanasatian, and Kraimon Maneesilp
Rajamangala University of Technology Thanyaburi, Thailand

OL SS 2 (Room 5)
Tuesday, 5 July 2022 : 14.30-16.00

1570809399 A Robot Companion Algorithm for Side-by-Side Object Tracking and Following
Keeratiburt Kanchanasatian
Rajamangala University of Technology Thanyaburi, Thailand

1570810473 Memory Efficient Video Collection and Extraction Technique for Augmented Triplet Network’s Dataset
Yojiro Harie¹, Sangam Babu Neupane², and Bishnu Prasad Gautam¹
¹Kanazawa Gakuin University, Japan
²Muroran Institute of Technology, Japan
Thai Sentiment Analysis for Social Media Monitoring using Machine Learning Approach
Supawadee Srikamdee, Ureerat Suksawatchon, and Jakkarin Suksawatchon
Burapha University, Thailand

Dental Fluorosis Segmentation Using Enhanced Quantum-Inspired Fuzzy Clustering Algorithm
Natchapon Petaitiemthong, Sansanee Auephanwiriya, Nipon Theera-Umpon, and Chatpat Kongpun
1Chiang Mai University, Thailand
2Ministry of Public Health, Thailand

Development of Thai Sign Language Interpretation with MediaPipe
Jakkrapan Sudthipadh and Suree Pumrin
Chulalongkorn University Bangkok, Thailand

Design of Lookup-Table (LUT) Decoder for Protograph-Based Low-Density Parity-Check (LDPC) Codes
Chatuporn Duangthong and Watid Phakphisut
King Mongkut’s Institute of Technology Ladkrabang, Thailand

Reconfigurable AWGN Generator Using Box-Muller Method with CORDIC-Based Square Root Calculation
Kidsanapong Puntsri, Bussakorn Bunsri, Yaowarat Pittayang, Tanatip Bubpawan, Wuttichai Partipralam, and Watid Phakphisut
1Rajamangala University of Technology Isan, Khon Kaen Campus, Thailand
2King Mongkut’s Institute of Technology Ladkrabang, Thailand

Development of 5G Polar Experimental Kit
Anusorn Wongsa, Krittiyaporn Mueadkhuenthod, Watid Phakphisut, Chatuporn Duangthong, Kidsanapong Puntsri, and Thanomsak Sopon
1King Mongkut’s Institute of Technology Ladkrabang, Thailand
2Rajamangala University of Technology Isan, Khon Kaen Campus, Thailand
3Rajamangala University of Technology Isan, Thailand
1570807553 Development of 5G LDPC Experimental Kit
Thanat Srisupha¹, Krittiyaporn Mueadkhunthod¹, Watid Phakphisut¹, Sirawit Kittiwichayakul¹, kidsanapong Puntsri², and Thanomsak Sopen³
¹King Mongkut’s Institute of Technology Ladkrabang, Thailand
²Rajamangala University of Technology Isan, Khon Kaen Campus, Thailand
³Rajamangala University of Technology Isan, Thailand

OS SS 2 (Duangkamol)
Wednesday, 6 July 2022: 8.30-9.30

1570809242 Investigating the Role of Channel State Information for MIMO based Visible Light Communication System
Muhammad Saadi¹, Ambar Bajpai², Demostenes Zegarra Rodriguez³, and Lunchakorn Wuttisitikulkij⁴
¹University of Central Punjab
²Atria Institute of Technology, India
³Federal University of Lavras, Brazil
⁴Chulalongkorn University, Thailand

1570800246 A Simulation of Swage Process for Hard Disk Drive Factory based on Explicit Dynamics Analysis
Watchara Bubpatha and Jatuporn Thongsri
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570805163 Fitness-for-Use of As-Built Building Information Modeling for Digital Twin
Manop Kaewmoracharoen¹, Teewara Suwan¹, Pornpote Nusen², and Paskorn Champrasert³
¹Chiang Mai University, Thailand
²Rajamangala University of Technology Lanna, Thailand
³OASYS Research Group, Chiang Mai University, Thailand

1570802123 Downlink MISO-NOMA SWIPT Systems with Mini Time Slots
Kanjanapat Maneewan¹, Kampol Woradit¹, Paramin Sangwongngam², and Paskorn Champrasert¹
¹OASYS Research Group, Chiang Mai University, Thailand
²Spectroscopic and Sensing Devices Research Group (SSDRG) National Electronics and Computer Technology Center, Thailand
1570807454  Multi-Agent Q-Learning for Power Allocation in Interference Channel  
Tanutorn Wongphatcharatham¹, Watid Phakphisut¹,  
Thongchai Wijitpornchai², Poonlarp Areeprayoonki2,  
Tanun Jaruvitayakovit², and Pimkhuan Hannanta-anan¹  
¹King Mongkut's Institute of Technology Ladkrabang, Thailand  
²Advanced Wireless Network Company Limited, Thailand

1570807457  Design of Transmission Lengths for IR-HARQ Scheme using Q-Learning  
Krittiyaporn Mueadkhunthod, and Watid Phakphisut  
King Mongkut’s Institute of Technology Ladkrabang, Thailand

1570807484  Clustering Technique for Constructing Path Loss Model in Bangkok Metropolis  
Danupol Chomsuay¹, Watid Phakphisut¹,  
Thongchai Wijitpornchai², Poonlarp Areeprayoonki2,  
and Tanun Jaruvitayakovit²  
¹King Mongkut’s Institute of Technology, Ladkrabang, Thailand  
²Advanced Wireless Network Company Limited, Thailand

1570807728  Deep Learning-based Reference Signal Received Power Prediction for LTE Communication System  
Thearravit Ngenjaroennde¹, Watid Phakphisut¹,  
Thongchai Wijitpornchai², Poonlarp Areeprayoonki2,  
and Tanun Jaruvitayakovit²  
¹King Mongkut's Institute of Technology Ladkrabang, Thailand  
²Advanced Wireless Network Company Limited, Thailand

1570807880  NOMA Power Allocation Based on Q-Learning  
Phetnakorn Aermsa-Ard, Chonticha Wongsamad,  
and Kritsada Mamat  
King Mongkut's University of Technology North Bangkok, Thailand
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²Chiang Mai Rajabhat University, Thailand  
³Rajamangala University of Technology Lanna, Thailand |
| 1570803041  | Modulation Classification between DCO-OFDM and Flip-OFDM for Visible Light Communications | Poompat Saengudomlert and Sarbagya Buddhacharya                          | Bangkok University, Thailand                                                  |
| 1570806944  | The Complete Subtour Order Crossover in Genetic Algorithms for Traveling Salesman Problem Solving | Thanan Toathom and Paskorn Champrasert                                   | OASYS Research Group, Chiang Mai University, Thailand                       |
| 1570807493  | Towards Digital Twin Data Center Using Building Information Modeling and Real-Time Data Sensing | Phanu Pinmas¹, Pornnapa Panyadee¹, Manop Kaewmoracharoen¹, Suriya Khueankhan¹, and Paskorn Champrasert² | ¹Chiang Mai University, Thailand  
²OASYS Research Group, Chiang Mai University, Thailand |
| 1570807652  | A Fuzzy Logic-Based System of Abnormal Behavior Detection Using PoseNet for Smart Security System | Seree Khunchai, Adool Kruekaew, and Natthapong Getvongsa                  | Nakhon Phanom University, Thailand                                           |
| 1570801468  | CollageNet: Face Super-Resolution Using Reference Images            | Ji-Soo Kim and Chang-Su Kim                                              | Korea University, Korea                                                     |
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Thursday, 7 July 2022 : 9.00-10.30

1570805981 Maximal-Clique Problem Formulation for Common Structure Detection in Many Graphs
Wataru Nakasone and Morikazu Nakamura
University of the Ryukyus, Japan

1570807004 Cooperative Evacuation Guidance Method for Large-Scale Event
Chihiro Yamada and Atsuo Ozaki
Osaka institute of technology, Japan

1570807833 Irregular Pythagorean Neutrosophic Fuzzy Graphs
Grienggrai Rajchakit
Maejo University, Thailand

1570807840 Interval Valued Pythagorean Neutrosophic Graphs and their Application in Decision-Making Problem
Grienggrai Rajchakit
Maejo University, Thailand

1570807682 A Study of the Frequency Response of a Microwave Ring Resonator Circuit for Use as a Sensor
Fongnapha Wongsa, Nitjaree Sritan, Sirigiet Phunklang, and Piyaporn Krachodnok
Suranaree University of Technology, Thailand

OL SS 4 (Room 5)
Thursday, 7 July 2022 : 9.00-10.30

1570799935 GAN-Based Face Identity Feature Recovery for Image Inpainting
Yan Wang and Jitae Shin
Sungkyunkwan University, Korea

1570800645 Semi-Supervised Anomaly Detection with Reinforcement Learning
Changheon Lee, JoonKyu Kim, and Suk-ju Kang
Sogang University, Korea
1570800695  Continuous Engagement Estimation based on Gaze Estimation and Facial Expression Recognition
Seong Ho Kim, Dong Jun Lee, Dae Ha Kim, and Byung Cheol Song
Inha University, Korea

1570802152  Material Classification Based on Multi-Spectral NIR Band Image
Dong-Keun Han, Jeong-Won Ha, and Jong-Ok Kim
Korea University Seoul, Korea

1570803247  Fish Recognition Optimization in Various Backgrounds Using Landmarking Technique and YOLOv4
Ari Kuswantori, Taweepol Suesut, Worapong Tangsrirat, and Sutham Satthamsakul
King Mongkut’s Institute of Technology Ladkrabang, Thailand

OS SS 5 (Duangchanok 3)
Thursday, 7 July 2022 : 10.45-12.15

1570801027  Intern-Organization Interview Matching Framework: An Optimization Approach
Suttinee Sawadsitang¹, Dusit Niyato², Waranya Mahanan¹, Jirapipat Thanyaphongphat¹, and Rakpong Kaewpuang²
¹Chiang Mai University, Thailand
²Nanyang Technological University, Singapore

1570804634  Smart City Indicators in ASEAN Cities
Masaaki Sakuraba¹ and Naoshi Uchihira²
¹Business Strategy Headquarters, Nippon Koei Co., Ltd., Japan
²Japan Advanced Institute of Science and Technology, Japan

1570806285  The Chlorophyll-a Modelling over the Andaman Sea using Bi-Directional LSTM Neural Network
Pawalee Srisuksomwong and Porpattama Hammachukiattikul
Phuket Rajabhat University, Thailand

1570807480  Optimization Methods to Improve Efficiency and Fairness in Peer-to-Peer Energy Trading
Eiichi Kusatake and Norihiko Shinomiya
Soka University, Japan
The Bit Flipping Criteria models based on Supervised Learning in Magnetic Recording System
Wiparat Busyatras, Wuttipol Wannarsap, Anucha Tungkasthan, and Pitaya Poompuang
Rajamangala University of Technology Thanyaburi, Thailand

OL SS 5 (Room 4)
Thursday, 7 July 2022 : 10.45-12.15

Smart Retail Machine via Internet of Thing
Yupin Suppakhum and Wivach Rungshawang
King Mongkut's University of Technology North Bangkok, Thailand

High-Sensitivity Contactless Microwave Sensor Based on Rectangular Complementary Split Ring Resonator for Glucose Concentration Characterization
Tanaporn Pechrkool\(^1\), Pubet Sangmahamad\(^1\), Puttiporn Thiamsinsangwon\(^2\), Thanakorn Sutham\(^1\), Boonyarit Kumkhet\(^1\), and Virote Pirajnanchai\(^1\)
\(^1\)Rajamangala University of Technology Thanyaburi, Thailand
\(^2\)The Sirindhorn International Thai-German Graduate School of Engineering, Thailand

The Sporadic E Phenomenon as Measured by an Ionosonde Station over Chiang Mai, Thailand
Noraset Wichaipanich
Rajamangala University of Technology Thanyaburi, Thailand

Telehealth Monitoring System based on LPWAN
Tanaporn Pechrkool\(^1\), Boonyarit Kumkhet\(^1\), Pubet Sangmahamad\(^1\), Paitoon Rakluea\(^1\), Norakamon Wongsin\(^1\), and Thanadol Wangwijit\(^2\)
\(^1\)Rajamangala University of Technology Thanyaburi (RMUTT), Thailand
\(^2\)Shrewsbury International School Bangkok Riverside, Thailand

Weakly supervised video anomaly detection with temporal attention module
Wonjoon Song, Jonghyun Kim, Joongkyu Kim
Sungkyunkwan University, Korea
OL SS 6 (Room 5)
Thursday, 7 July 2022 : 10.45-12.15

1570806884 Flat and Texture Region Segmentation in Image Denoising
   Sung-Min Woo
   Korea University of Technology and Education, Korea

1570807547 Eye Gaze, Hand Pointing and Head Movements Feature
   Based Human Intention State Recognition
   Suparat Yeamkuan
   King Mongkut's University of Technology Thonburi, Thailand

1570807615 Fuzzy Bat Algorithm for improved Clustering of
   Convolutional Neural Network Data
   Somporn Tiacharoen
   King Mongkut’s University of Technology North Bangkok, Thailand

1570809417 Deep Convolutional Neural Network based Approach for
   Efficient Classification of Prostate Cancer
   Ejaz Ul Haq
   Chulalongkorn Universit, Thailand

1570809889 A New 3-D PCA Regression Method for Manifold Dimension
   Reduction with Image Analysis
   Kyung-min Lee, and Chi-Ho Lin
   Semyung University, Korea

OL SS 7 (Room 5)
Thursday, 7 July 2022 : 13.30-15.00

1570802753 Plant Leaf Area Estimation via Image Segmentation
   Sang-Ho Lee¹, Myung-Min Oh², and Jong-Ok Kim¹
   ¹Korea University, Korea
   ²Chungbuk National University, Korea

1570803664 Characterizing Subsoil with Ground Penetrating Radar using
   Shot-Time Matrix Pencil Method
   Nattawat Chantasen¹, Nattakarn Shutimarrungson², Akkarat Boonpoonga³, and Prayoot Akkaraekthalin³
   ¹Rajamangala University of Technology Phra Nakhon, Thailand
   ²Mahasarakham University, Thailand
   ³King Mongkut’s University of Technology North Bangkok, Thailand
1570804638  UHF RFID Tag Antenna-based Sensing for Non-destructive Monitoring of Frozen Meat using the RSSI
Adi Mahmud Marindra¹, Boby Mugi Pratama¹, Dwi Joko Suroso², and Ruslee Suthaweekul³
¹Kalimantan Balikpapan, Indonesia
²Universitas Gadjah Mada, Indonesia
³King Mongkut’s University of Technology North Bangkok, Thailand

1570807446  CFD Simulation of Gas Flow in a 122 mm Supersonic Nozzle
Kamonwan Srathonghuam¹, Adulyasak Boonpan², and Jatuporn Thongsri¹
¹King Mongkut’s Institute of Technology Ladkrabang, Thailand
²Defence Technology Institute, Ministry of Defense, Thailand

1570809260  Reconstruction of Digital Chemistry Lab by Incorporating Virtual Reality Platform
Imran Saeed Mirza¹, Prak Sasithong¹, Siwanart Jearavingtakul¹, Nithinun Sinpan¹, Panithan Le-aidee¹, Sushank Chaudhary¹, Lunchakorn Wutisittikulkij¹, Ambar Bajpai², Pisit Vanichchanunt³, Xian Wei⁴, and Xuan Tang⁵
¹Chulalongkorn University, Thailand
²Atria Institute of Technology, India
³King Mongkut's University of Technology North Bangkok, Thailand
⁴Fujian Institute of Research on the Structure, China
⁵Fujian Institute of Research on the Structure of Matter, China

OL SS 8 (Room 5)
Thursday, 7 July 2022: 15.00-16.45

1570800722  Modeling Shor’s Algorithm with Colored Petri Net
Atsushi Ohta and Kohkichi Tsuji
Aichi Prefectural University, Japan

1570802057  Decentralized Control of Nondeterministic Discrete Event Systems with Deterministic Specifications
Akari Kimura and Shigemasa Takai
Osaka University, Japan

1570802076  Decision of Acupoints in Acupuncture and Moxibustion Treatment by Artificial Intelligence
Hang Yang¹, Ren Wu², Mitsuru Nakata¹, and Qi-Wei Ge¹
¹Yamaguchi University, Japan
²Yamaguchi Junior College, Japan
1570802738 A Token-Replay-Based Conformance Checking Method for Dataflow in IoT System
Shingo Yamaguchi and Mohd Anuaruddin Bin Ahmadon
Yamaguchi University, Japan

1570804229 Online Optimization of Pickup and Delivery Problem with Fuel Constraints
Ryo Matsuoka, Koichi Kobayashi, and Yuh Yamashita
Hokkaido University, Japan

OL SS 9 (Room 5)
Friday, 8 July 2022: 9.00-10.30

1570800074 An Application of Deep Learning YOLOv5 Framework to Intelligent Radio Spectrum Monitoring
Thanh Le Truong, Ngoc Thien Le, and Watit Benjapolakul
Chulalongkorn University, Thailand

1570801119 Interest Level Estimation Using Behavior Information through Multi-View Feature Integration Considering Partial and Ordered Labels
Kyohei Kamikawa, Keisuke Maeda, Takahiro Ogawa, and Miki Haseyama
Hokkaido University, Japan

1570803518 One-Shot Disguised Face Generation to improve Robustness against Disguise Attacks
Mobeen Ahmad, Muhammad Abdullah, and Dongil Han
Sejong University, Korea

1570803730 Small Objects and Faults Detection on Corrugated Metal Roof using Drone equipped with Deep Learning
Muhammad Abdullah, Mobeen Ahmad, Yong-Guk Kim, and Dongil Han
Sejong University, Korea

1570805075 An Applied Holistic Landmark with Deep Learning for Thai Sign Language Recognition
Anusorn Chaikaew
Chiang Rai Rajabhat University, Thailand
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<td>Kwangwoon University, Korea, University of Applied Science Mannheim, Germany, Chonnam National University, Korea</td>
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