

# ECTI *e*-magazine

## *In this Issue...*

---

Message from Editor	Page 2
ECTI President Message	Page 3
Review Article ("MyCAT: A Management System for Copyright, Academic Work and Thesis")	Page 4
Paper list of ECTI Transaction (CIT, EEC)	Page 10
Reports from Conferences/Seminars/Workshops	Page 11
Announcements/Upcoming events/Call-for-Papers	Page 16
ECTI Who's Who	Page 20

## *Call for Contribution from members...*

---

We would like to call for contribution from our members, researchers and international students to describe your experiences, research works or research group activities. Please write at a maximum of 1 page including pictures.

Contact: [ecti.emagazine@gmail.com](mailto:ecti.emagazine@gmail.com)



## *Message from* Editor

Dear Valued ECTI Association Members,

First, I would like to welcome Dr. Watid Phakphisut from Bangkok Suvarnabhumi University as an Assistant Editor for the ECTI E-Magazine. He will bring his inputs and energy to publish the E-Magazine in a new format and appearance.

In this issue, we have an interesting article titled "MyCat : A Management System for Copyright, Academic Work and Thesis" by Dr. Alisa Kongthon, Dr. Choochart Haruechaiyasak and Mr. Santipong Thaiprayoon from the Speech and Audio Technology Laboratory (SPT), National Electronics and Computer Technology Center (NECTEC). In addition to the Activities/Workshops of each Technical Area as well as the ECTI Association, the list of articles in the ECTI Journals, upcoming sponsored conferences and seminars, we are calling for the articles related to the activities, collaboration projects at your research group, laboratories or research centers.

In the near future, we will publish the articles or updates related to industry, graduate students and new researchers. Should you have any comments or suggestions to improve the ECTI E-Magazine so that it serves our members better, please do not hesitate to contact us via E-mail or Facebook.



ECTI E-Magazine Editor

Pornchai Supnithi  
King Mongkut's Institute of Technology Ladkrabang

## *Message from* ECTI President

Pretty hot! Summer in Thailand this year. I think many of our members and our readers did have a lot of fun and enjoyed the Songkran festival (water festival). Global warming is quite revealing, isn't it? A thing we can do easily is just taking care of our environment, growing more trees and using water wisely.

In front of you is, of course, the April-June issue of ECTI magazine. Many thanks are given to editorial team and our valuable authors who have devoted a great effort for the issue to be published in time. I hope our readers can enjoy the wonderful mood and knowledge of well-selected articles. They are incredible!

If you can remember them well, at the end of this month (June 2016) and the end of next month, we are having ECTI-CON 2016 in Chiang Mai and ECTI-CARD 2016 at Hua-Hin. Both conferences have drawn a great number of papers. Not only seeing your old friends there, joining the events can also give you a good opportunity to make new friends who are perhaps in your research area. Last but not least, ECTI-CON 2017 is scheduled to be held in Phuket, the pearl of Andaman. Keep your eyes on it!



ECTI President

Somsak Choomchuay  
King Mongkut's Institute of Technology Ladkrabang

# MyCat : A Management System for Copyright, Academic Work and Thesis

---

Alisa Kongthon, Choochart Haruechaiyasak and Santipong Thaiprayoon

## ABSTRACT

Plagiarism is becoming an increasingly large problem for academic and research community in Thailand. With electronic documents and information available on the Internet, many students can now easily take someone else's work and then claim them as their own work. Furthermore, most universities still lack an effective system to help manage their thesis submission process. Some universities could encounter several problems such as the submitted final thesis file may be different from the printed version. As a result, we have developed MyCat as a tool to assist students, instructors, and department administrators to work seamlessly throughout the thesis submission workflow. Students are now able to submit their thesis draft to MyCat. The system will then check for any plagiarized contents using our plagiarism detection engine called CopyCat. At the end, the final version of dissertation will be generated for printing and stored in the database for future use.

## Keywords

Plagiarism, Plagiarism detection system, Thesis management system



## I. INTRODUCTION

With tremendous amount of electronic contents available online, many students can now easily plagiarize their homework assignments, project reports and thesis by copying, pasting and modifying those contents. Plagiarism is "the act of taking the writings of another person and passing them off as one's own. The fraudulence is closely related to forgery and piracy-practices generally in violation of copyright laws." [1]. Plagiarism can be taken in many forms. According to plagiarism.org, the followings are considered plagiarism:

- turning in someone else's work as your own
- copying words or ideas from someone else without giving credit
- failing to put a quotation in quotation marks
- giving incorrect information about the source of a quotation
- changing words but copying the sentence structure of a source without giving credit
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not [2]

Currently, there exist some commercial services for checking plagiarized contents. The most known plagiarism detection tools are Turnitin, iThenticate, Writecheck and CopyScape [3-7]. However, these tools perform well only for English language and do not provide the submission system which is customized for the academic workflow. As a result, this paper presents two collaborative systems called CopyCat and MyCat to assist with the thesis plagiarism checking and submission process. CopyCat is a system for detecting plagiarized contents in both Thai and English languages. CopyCat can handle different types of plagiarized texts including copy-and-paste to a more difficult case in which contents are partially modified. MyCat, on the other hand, is a thesis submission management system which assists students, instructors and department administrators to work seamlessly throughout the thesis submission workflow.

## II. THESIS SUBMISSION PROCESS: PROBLEMS AND SOLUTIONS

### A. The previous thesis submission process

The traditional process of submitting thesis document in most of the universities is carried out in a manual manner. Figure 1 shows the flow chart diagram of the traditional thesis submission process. The process begins by a student submits hard copies of the thesis draft to his/her advisor and committee members. The student will then give a public defense of the thesis with the committee. Upon passing the oral examination, the student will make any revision and submit the final version of the thesis document to committee for approval. Each of the committee members will sign on the approval page. The student will then submit a hard copy of thesis document with CD-ROM containing the digital version with all related files to the library for indexing and keeping on the book shelf.

*Plagiarism is "the act of taking the writings of another person and passing them off as one's own. The fraudulence is closely related to forgery and piracy- practices generally in violation of copyright laws." [1].*

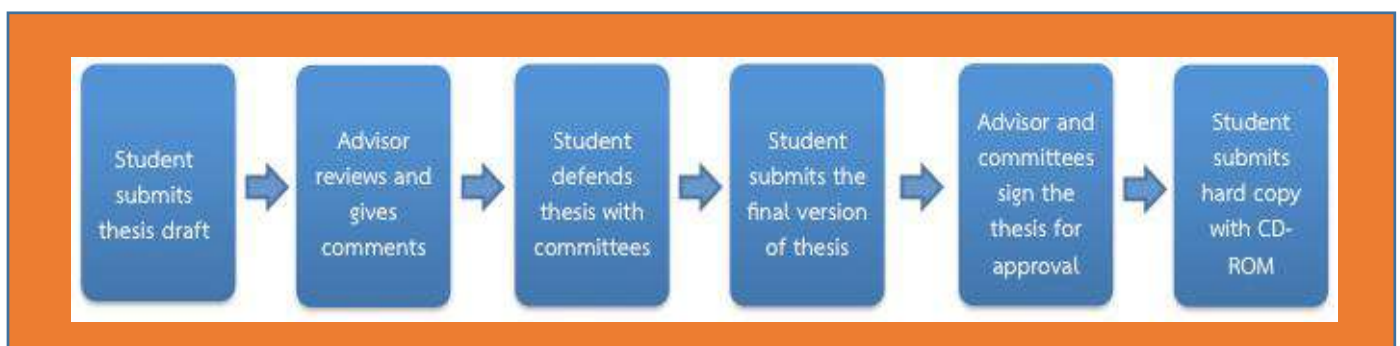


Figure 1: Previous Thesis Submission Process.

There are several problem issues occur with the traditional thesis submission approach. The problems could be summarized as follows.

- 1) The content in the hard copy and the soft file do not match.
  - Soft file was missing some parts of the contents, e.g., chapters, figures and tables.
  - Soft file was edited with a different software or a different version, therefore could not be opened by the librarians.
  - Soft file was not the thesis document, but a paper in proceedings or journals.
- 2) The soft file could not be opened due to the damage of CD-ROMs.
  - To digitize and index the thesis document, librarians may solve the problem by scanning the hard copy. This process results in a scanned document which could not be perfectly converted to text by the Optical Character Recognition (OCR) programs.

### B. The proposed thesis submission process

To solve the problems related to the previous thesis submission process, we have proposed a solution using a management system for copyrighted and thesis documents called MyCat. MyCat is designed as a web-based application which can be conveniently accessed by web browsers.

Figure 2 illustrates the proposed process of thesis submission supported by MyCat. The process begins by a student submits the thesis draft in PDF file format to the system. The thesis file will then be sent to the CopyCat module for plagiarism checking. CopyCat is a tool designed to perform the plagiarism detection in the submitted document file. CopyCat will perform text analysis and report all text segments which are suspicious for copy-and-paste style plagiarism. Once the thesis draft is checked for plagiarism, his/her advisor will log in to the system, view the results and give the comments. With the advisor's approval, the student will give a public defense of the thesis with the committee. Upon passing the oral examination, the student will make any revision and submit the final version of the thesis document to MyCat for plagiarism checking. The advisor and all committee members will sign on the approval page. The student will then register the final version of the thesis by uploading the final version and inputting all metadata. All the steps mentioned above are carried out online, therefore the process could be tracked and monitored for any problem. Another benefit includes the plagiarism checking process provided by the system, therefore, could help thesis advisors detect any copy-and-paste or partially modified plagiarism. The submission of digital thesis document also helps guarantee the contents in the thesis file are the correct final version for indexing and retrieval.

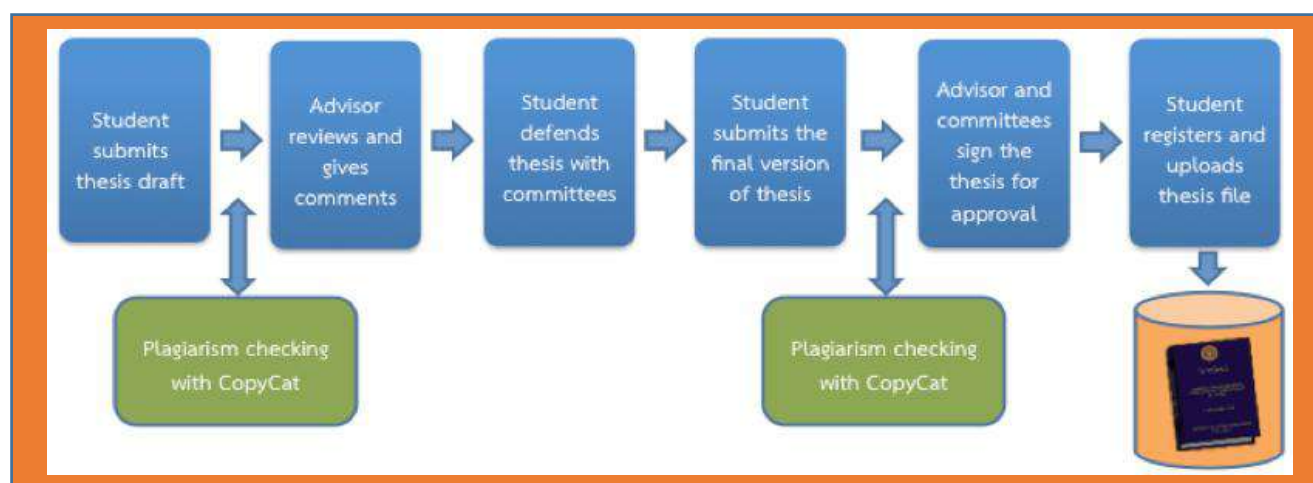


Figure 2: Proposed Thesis Submission Process using MyCat.



### III. THE SYSTEM DESIGN OF MYCAT

MyCat applies several techniques from natural language processing, text mining and information retrieval. Figure 3. illustrates system architecture of MyCat which consists of the following components:

- Document processing  
The main task of this module is to convert PDF documents to texts. MyCat then uses a word segmentation program to tokenize these texts. The tokenized texts are used to construct a search index for full-text retrieval task. Metadata such as title, abstract and references are also extracted and indexed.
- Resources  
Resources consist of Metadata, Search Index and Keyword Suggestion Module. Metadata is used for displaying the results such as titles of related similar documents. Search Index is used for the retrieval of similar documents. Keyword Suggestion Module is used for suggesting keywords related to the submitted final thesis file.
- Servicing Modules  
Servicing modules consist of the following three components:
  - 1) *User and Task Flow Management*: The main task is to manage four different types of user as follows:
    - Administrators: The assigned administrators are librarians. The responsibility of the administrators includes creating and managing departments and staffs. The administrators can also monitor all the submission activities in the system including viewing the statistics of submission status and plagiarism checking reports.
    - Staffs: The staffs are persons who are responsible for administrating course registration of the academic programs at academic departments. In MyCat, staffs create and manage dissertation courses, add faculty members and students into each course. The Staffs can also monitor all the submission activities for each course created.
    - Faculty members: In MyCat, faculty members are thesis advisors of the students who registers for dissertation courses. Faculty members can view the student's thesis files including the plagiarism checking report and make comments. The faculties have authorities in approval or disapproval of the submitted thesis files based on the plagiarism checking reports.
    - Students: In MyCat, student have responsibility to submit his/her thesis draft for plagiarism checking process which occurs in two phases: before the thesis defense and afterwards. After passing the examination, the student must register the final version of thesis file by inputting all related metadata which include title in both Thai and English, abstract and keywords. This module also control workflow starting from thesis draft submission, plagiarism detection, thesis approval to final thesis registration.
  - 2) *Plagiarism Checking*: The main task for this module is to detect plagiarized texts in submitted thesis draft by using the sliding window technique [8] to obtain the overlapped text chunks. Each text chunk is used to perform a phrase query from the search index to detect similar text segments. Highly similar text segments are considered very suspicious for copy-and-paste plagiarism. Text similarity analysis based on containment measure [9, 10] is used to calculate the similarity score between an input text chunk and the queried text segment from the index. MyCat will generate a summary report of suspicious document sources ranked by the number of highly similar text segments.
  - 3) *Keyword Suggestion*: This module uses content-based filtering to suggest related keywords to the submitted document. This function will be used when the students register their final thesis title. The system will automatically suggest the most related keywords to the students.

#### IV. SYSTEM EVALUATION

To evaluate the performance of the plagiarism checking module, we created 100 test documents from the thesis repository. We divided these test documents into 5 different groups:

1. Documents with no plagiarism
2. Documents with 10% plagiarism level
3. Documents with 20% plagiarism level
4. Documents with 30% plagiarism level
5. Documents with 40% plagiarism level

where:

- Document with  $n\%$  plagiarism level means that document has plagiarized content from other sources in the amount of  $n\%$  of the total number of words in that document.
- Documents can plagiarize content from other sources by "copy-and-paste" or "partially modified" methods. Partially modified method includes inserting, deleting, or replacing words.

We evaluate the performance of the plagiarism checking module by calculating the percentage error as shown in the equation 1.

$$\%Error = \frac{\text{Theoretical Value} - \text{Experimental Value}}{\text{Theoretical Value}} \times 100 \quad (1)$$

The average error for the copy-and-paste documents and partially modified documents is calculated to be 10.05% and 18.05%, respectively. We have observed that for most of the documents that return high plagiarism levels, they are theses from the law department. Such thesis typically cites the same cases, legislations and regulations many times in a document. This could result in higher plagiarism level.

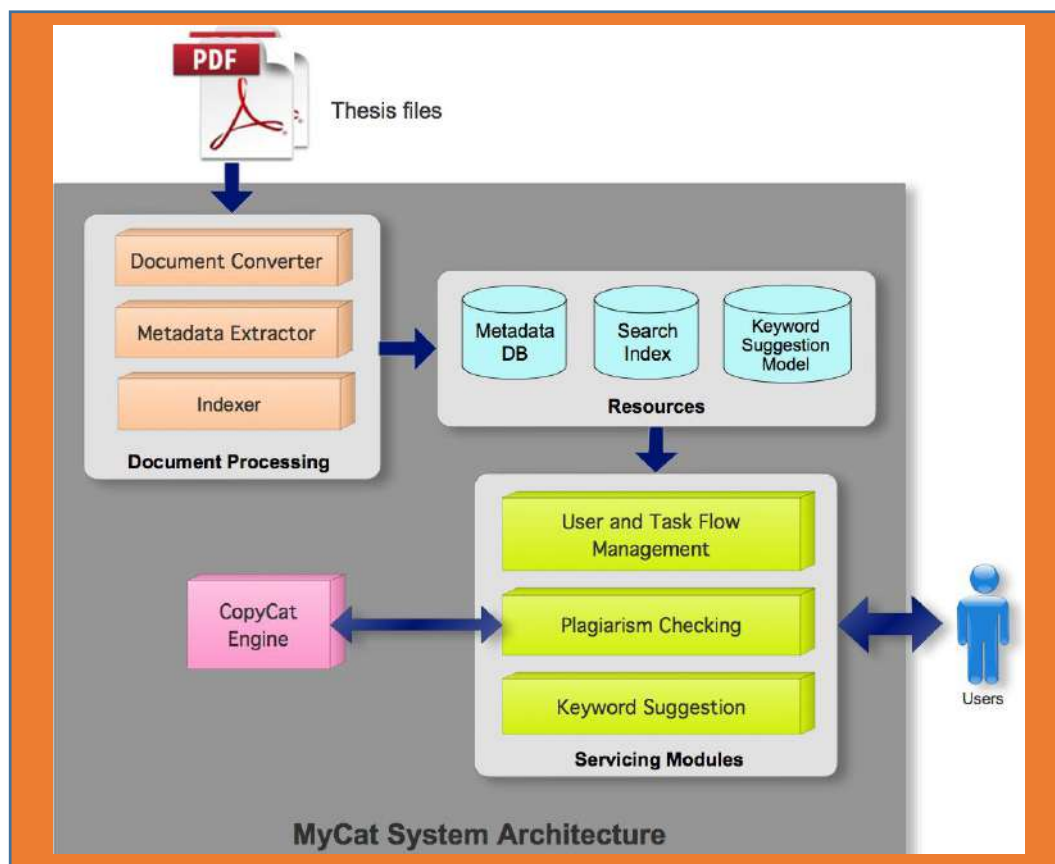


Figure 3: System Architecture of MyCat.



## V. CONCLUSIONS AND FUTURE WORKS

In this paper, we present MyCat, a system that can help manage the thesis submission process. The plagiarism detection function in MyCat can assist thesis advisors to detect any copy-and-paste or partially modified plagiarism. With the complete workflow starting from thesis draft submission, plagiarism detection, thesis approval to final thesis registration, the system helps guarantee the contents in the thesis file are the correct final version. The current plagiarism detection engine can detect the direct copy-and-paste or partially modified (i.e., inserting, deleting, or replacing words) documents. In the future, we plan to improve our engine to detect paraphrasing plagiarism.

## REFERENCES

- [1] Encyclopedia Britannica, <http://global.britannica.com/topic/plagiarism> (last access March 7, 2016)
- [2] Plagiarism.org, <http://www.plagiarism.org/plagiarism-101/what-is-plagiarism> (last access March 7, 2015)
- [3] Lukashenko, R., Graudina, V., and Grundspenkis, J., "Computer-based plagiarism detection methods and tools: an overview," In Proceedings of the 2007 international conference on Computer systems and technologies, June 14-15, 2007, Bulgaria.
- [4] Turnitin, LLC, <http://www.turnitin.com/>
- [5] Turnitin, LLC, <http://www.ithenticate.com/>
- [6] Turnitin, LLC, <http://en.writecheck.com/>
- [7] Indigo Stream Technologies, <http://www.copyscape.com>
- [8] Sergey Butakov and Vladislav Shcherbinin, "On the number of search queries required for Internet plagiarism detection", Washington, DC: ICALT, IEEE International Conference on Advanced Learning Technologies, pp. 482-483, 2009.
- [9] Andrei Z. Broder, "On the resemblance and containment of documents", Proc. of the Compression and Complexity of Sequences, pp.21-29, 1997.
- [10] Salha M Alzahrani, Naomie Salim and Ajith Abraham, "Understanding plagiarism linguistic patterns, textual features, and detection methods", IEEE Transactions on Systems, Man, and Cybernetics, 42(2), 2012.



Alisa Kongthon received her Ph.D. from the Department of Industrial and Systems Engineering, Georgia Institute of Technology, in 2004. She is currently working as a full time researcher at the National Electronics and Computer Technology Center (NECTEC), National Science and Technology Development Agency (NSTDA). Her research interests include text mining, bibliometric analysis, information retrieval, sentiment analysis and management of technology.



Choochart Haruechaiyasak received his Ph.D. degree from the Department of Electrical and Computer Engineering, University of Miami, in 2003. After receiving his degree, he has worked as a researcher at the National Electronics and Computer Technology Center (NECTEC), National Science and Technology Development Agency (NSTDA). His current research interests include data and text mining, natural language processing, information retrieval, and data management. One of his objectives is to promote R&D works through IT applications for government offices and business sectors in Thailand. He is also a visiting lecturer at several universities in Thailand.



Santipong Thaiprayoon received his M.S. in Information Technology from the King Mongkut's University of Technology North Bangkok in 2007. He is currently working as a full time research assistant at the Speech and Audio Technology Laboratory (SPT) under the National Electronics and Computer Technology Center (NECTEC) since 2007. His research interests include web and database management system, information retrieval and search engine, natural language processing, and plagiarism detection.

## Paper List of ECTI Transaction

ECTI-EEC Transaction: -

Website: <http://www.ecti-eec.org/>

---

Two issues are available annually. The next issue is during the second half of the year.

ECTI-CIT Transaction: Vol. 10, No. 2, May-2016 issue

Website: <http://www.ecti-thailand.org/paper/journal/ECTI-CIT>

---

### Regular paper

A Security Key Recovery System with Channel Quality Awareness for Smart Grid Applications  
*Prachya Huadpaknam, Chaeyod Pirak, and Rudolf Mathar*

Enhancing Process Visibility of the Supply Chain 'Data Pipeline'  
*Potchara Pruksasri*

Rotation Algorithms for Balancing Search Trees  
*Chumphol Bunkhumpornpat, Varin Chouvatut and Saowaluk Rattanaudomsawat*

### Special section on papers selected from ECTI-CON 2015 paper

An Early Exploratory Method to Avoid Local Minima in Ant Colony System  
*Thanet Satukitchai and Kietikul Jearanaitanakij*

Novel Generic Analytical Model of Fractance Response  
*Rawid Banchuin and Roungsan Chaisricharoen*

Cluster Analysis to Find Sets of High-frequency Queries for Filtering in Similarity Join  
*Kamolwan Kunanusont and Jaruloj Chongstitvatana*

Coverage Maximization with Sleep Scheduling for Wireless Sensor Networks  
*Chanrit Danratchadakorn and Chotipat Pornavalai*

PID Controller Based Nelder Mead Algorithm for Electric Furnace System with Disturbance  
*Vunlop Sinlapakun and Wudhichai Assawinchaichote*

System Modelling and Controller designed for Thermoelectric Generator using a First Order Plus Dead Time  
*Rung-aroon Photoon and Warit Wichakool*

Automatic code locations identification for replacing temporary variable with query method  
*Songsakdi Rongviriyapanish, Nopphawit Karunlanchakorn and Panita Meananeatra*

## Report from Conferences/Workshops/Seminars/Events

### 2<sup>nd</sup> ECTI Association Committee Meeting

Date: 2 April, 2016

Venue: ครีวกรุงเทพ (The Bangkok Heritage)





## iEMAT Summer EM School



**"Experience in Satellite Integration and Test"**  
 Mr. Udomsak Luengkhwan  
 Communication System Department Manager  
 Thaicom Public Company Limited

**"1<sup>st</sup> Button in Telecom Industry"**  
 Panachit Kittipanya-Ngam  
 True Corporation

**"Challenges in Manufacturing of Optoelectronics Products"**  
 Phattanard Phattanasri  
 Mahidol University

**"EMC/EMI/ESD กับเทคโนโลยีทางทหารของไทย"**  
 Peerayudh Saratayon  
 Ministry of Defence

Date: 22 April 2016

Venue: King Mongkut's University of Technology Thonburi

Organizer: ECTI-Electromagnetics

Attendants: 148

Gallery: [http://www.iemat.org/Gallery\\_summer\\_2016.php](http://www.iemat.org/Gallery_summer_2016.php)



### The 3<sup>rd</sup> ECTI Workshop on Journal Writing

This workshop aims to be a meeting place for all graduate students in the field of Signal/Image/Information Processing Theory and Applications present their conceptual idea and proposed methodology. Moreover, all prospective participants will not only get useful comments, but also, technically discuss the detailed idea by experienced professors those working in the related field to improve manuscript before submitting to the journal.

**Date:** 11 May 2016

**Venue:** Rajamangala University of Technology Tawan-ok

**Organizer:** ECTI-Signal Processing





## 2016 IEEE AP-S Distinguished Lectures



"Remote Sensing of the Physical Qualities of Fruits"

"A Phased Array Consisting of Switched Beam Elements in Improving Channel Capacity"

Prof. Dr. Monai Krairiksh

King Mongkut's Institute of Technology Ladkrabang

"Basic Computational Electromagnetics Overview"

"Multiscale Computational Electromagnetics and Applications"

"Subsurface Sensing and Super-Resolution Imaging: Application of Computational Acoustics and Electromagnetics"

"Progress and Challenges in Microwave Imaging and Microwave Induced Thermoacoustic Tomography"

Prof. Dr. Qing Huo Liu

Duke University, USA



Date: 12-13 May 2016

Venue: King Mongkut's Institute of Technology Ladkrabang

Organizer: ECTI-Electromagnetics

Attendants: 43

Gallery: [http://www.iemat.org/Gallery\\_IEEE\\_APS\\_2016.php](http://www.iemat.org/Gallery_IEEE_APS_2016.php)





## 2016 Thailand-Japan Microwave (TJMW2016)

Date: 9-11 June 2016

Venue: King Mongkut's University of Technology North Bangkok

Organizer: ECTI-Electromagnetics

Attendants: 112

Gallery: [http://www.iemat.org/Gallery\\_TJMW\\_2016.php](http://www.iemat.org/Gallery_TJMW_2016.php)



# Announcements/Upcoming events/Call-for-Papers



## The 13<sup>th</sup> International Joint Conference on Computer Science and Software Engineering (JCSSE 2016)

### "Machine Learning in the Internet of Things Era"

July 13-15, 2016

Pullman Khon Kaen Raja Orchid Hotel, Khon Kaen, Thailand



## Call for Papers

#### Honorary Committee

Chidchanok Lursinsap, CU  
Kittichai Triratnasirichai, KCU  
Kanchit Malaiwong, The Royal Institute of Thailand  
Nunthai Lorrattanasakul, IEEE Thailand Section  
Prayoot Akkarakethin, ECTI Thailand Association

#### Steering Committee

Anongnart Srivithok, KU  
Benchaphon Limthamaphon, KMUTB  
Chakchai So-In, KCU  
Chalida Madhyamapornush, MU  
Chatklaw Jareanpon, MSU  
Chavalit Srisathapornphat, KU  
Sirikom Channul, KU  
Chularat Tanprasert, NECTEC  
Ekkarat Boonchieng, CMU  
Jaratsri Rungtrattanaul, NU  
Jirada Herbst, UBU  
Kanungniy Kubola, BUU  
Sirapat Chiewchanwattana, KCU  
Karanrat Thammarak, WU  
Kittichai Lavangnananda, KMUTT  
Kriengsak Treeprapin, UBU  
Ladda Preechaveerakul, PSU  
Nathakan Iam-On, MFU  
Opas Wongtawee-sap, SU  
Orasa Teltwat, NU  
Ouen Pingerin, RU  
Peraphon Sophatsathit, CU  
Prabhas Chongstittavattana, CU  
Punnee Sittidech, NU  
Ratchada Kongkahantra, TU  
Rattasit Sukhahuta, CMU  
Saranya Maneerol, CU  
Sattra Wongthanasavasu, KCU  
Sarun Intakosum, KMUTL  
Sathit Nakkrasae, RU  
Somnuk Puangprompitag, MSU  
Sudsanguan Ngamsuriyaroj, MU  
Sunee Pongpiniginyo, SU  
Supakit Pueksaaron, TU  
Surapong Auwata namongkol, NIDA  
Surapong Uttama, MFU  
Suwanna Rasmequan, BUU  
Thavatchai Tayjanant, IEEE Thailand Section  
Tirane Achalakul, KMUTT  
Vera Varavithyo, KMUTNB  
Veera Boonleng, KMUTL  
Wiphada Wettayaprasit, PSU  
Yaowadee Temtanapat, TU

#### General Chair

Pipat Reungsang, KCU

#### General Co-Chairs

Apirada Thadsadech, PSU  
Wannarat Suntiamontut, PSU  
Jitima Sunkhamani, WU

#### Technical Program Chairs

Kosin Chamnongthai, KMUTT  
Krisana Chinnasam, BUU  
Chakchai So-In, KCU  
Suphakant Phimoltares, CU  
Saichon Jaiyen, KMUTL  
Khamron Sunat, KCU

#### Publication Chairs

Monika Wattana, KCU  
Saiyan Saiyod, KCU

#### Registration and Financial Chairs

Pusadee Seresantakul, KCU  
Rasamee Suwanweraakorn, KCU

#### Public Relation Chairs

Sirapat Chiewchanwattana, KCU  
Paweena Wanchai, KCU

#### General Secretariat

Chitsutha Soomlek, KCU  
Nunnapus Benjamas, KCU

#### Topics of Interest

Prospective authors are invited to submit their original and unpublished papers in the areas of computer science and software engineering and the related fields. Topics include, but are not limited to, the followings:

- Algorithmic Bioinformatics
- Cluster and Grid Computing
- Computational Science and Engineering
- Computer and Internet Security
- Computer Networks and Communications
- Computer Vision
- Embedded Systems
- Geoinformatics
- Information Technology
- Information Retrieval
- Internet of Things
- Knowledge and Data Management
- Machine Learning and Intelligent Systems
- Multimedia and Computer Graphics
- Ontology and Semantic Web
- Wireless and Mobile Computing
- Software Engineering

Papers should not exceed six (6) pages including results, figures, and references. All manuscripts must be prepared in the standard IEEE Conference Proceedings format in PDF. Manuscript templates are made available on the website (<http://jcsse2016.cs.kku.ac.th>). Only electronic submissions in PDF format will be accepted via EDAS submission system (<http://edas.info/N21928>). All submissions will be subjected to a double-blind review procedure. At least one of the authors is expected to register and present the paper at the conference upon acceptance. Presented and selected papers will be submitted for inclusion in IEEE Xplore® Digital Library.

The authors of the high quality papers will be invited to extend their works for the submission to a special issue of the *Journal of Internet Technology (Impact Factor: 0.438)*. Selected papers will be invited for further extension before publishing in a special issue of the *Journal of Computers (JoC: Taiwan)*, indexed by Scopus, or *Engineering Journal (EJ)*, indexed by Scopus, or *ECTI-Transaction on Computer and Information Technology (ECTI-CIT)*, indexed by TCI (<http://www.ecti-thailand.org/paper/journal/ECTI-CIT>), or *KKU Science Journal*, indexed by TCI (<http://scijournal.kku.ac.th>), or *KKU Research Journal*, indexed by TCI (<http://www.resjournal.kku.ac.th>)

#### Keynote Speakers



Prof. Dr. Roger Zimmermann, Department of Computer Science, National University of Singapore, Singapore



Prof. Dr. Guang-Bin Huang, IEEE Senior Member, School of Electrical and Electronic Engineering NTU, Singapore



AVM. Dr. Thanapant Raicharoen, Deputy Secretary General of Regional and Spectrum Management of the Office of the National Broadcasting and Telecommunications Commission (NBTC), Thailand



Prof. Dr. Han-Chieh Chao, Department of Computer Science and Information Engineering, National Ilan University, Taiwan



Prof. Dr. Prabhas Chongstittavattana, Faculty of Engineering, Chulalongkorn University, Thailand

#### Important Dates

Paper Submission Deadline	April 30, 2016
Notification of Acceptance	May 25, 2016
Submission of Camera-ready Manuscripts	June 10, 2016
Registration Deadline	June 10, 2016
Conference Dates	July 13-15, 2016

#### International Committee

Andrew Woodward, Edith Cowan University, Australia  
Christine Chan, University of Regina, Canada  
Dusit Niyato, Nanyang Technological University, Singapore  
Herwig Unger, FernUniversität in Hagen, Germany  
Isun You, Soonchunhyang University, Korea  
Lian Wen, Griffith University, Australia

Luigi Benedicenti, University of Regina, Canada  
Mitsunori Makino, Chuo University, Japan  
Sheng-Lung Peng, National Dong Hwa University, Taiwan  
Stephen John Turner, Nanyang Technological University, Singapore  
Suryoung Han, Konkuk University, Korea  
Tham Chen Khong, National University of Singapore, Singapore

#### Hosted by

Department of Computer Science, Faculty of Science, Khon Kaen University, Thailand

#### JCSSE 2016 Secretariat

Further information, please refer to

Conference website: <http://jcsse2016.cs.kku.ac.th>

Facebook: <https://www.facebook.com/jcsse2016/>

Email: [jcsse2016@kku.ac.th](mailto:jcsse2016@kku.ac.th)



IEEE Catalog Number: 380221





การประชุมวิชาการ งานวิจัย และพัฒนาเชิงประยุกต์ ครั้งที่ 8



# ECTI CARD 2016

## 27-29 กรกฎาคม 2559

โรงแรมหัวหินแกรนด์ โฮเทล แอนด์ พลาซ่า จังหวัดประจวบคีรีขันธ์

### Conference Committee

#### Advisory

ดร.อุทรา ใดโศกานนท์ (นทร.พระนคร)  
ศ.ดร.ประภากร จงสถิตวัฒนา (จุฬาลงกรณ์)

#### General Co-Chair

ศ.ดร.ประจักษ์ อัครธรรมาสิน (มจร.)  
ผศ.ดร.วิโรจน์ ฤทธิทอง (นทร.พระนคร)  
นายประจักษ์ เชื้อวัฒนา (นทร.)  
ผศ.ดร.ปฐกานต์ อิ่มนพธนา (นทร.พระนคร)

#### Technical Program Chairs

ศ.ดร.โกสินทร์ จันทน์ (มจร.)  
รศ.ดร.พิพัฒน์ พรหมณี (สจล.)  
รศ.ดร.อริยพงศ์ ชัยสาธิต (อเลปโปอาคาเดมี)  
รศ.ดร.พรชัย พงศ์กิจพิริยะ (มจร.)  
ดร.ณัฐ สุวรรณกิจ (นทร.พระนคร)  
ดร.ณัฐ สุวรรณกิจ (นทร.พระนคร)  
ดร.ณัฐ สุวรรณกิจ (นทร.พระนคร)  
ดร.ณัฐ สุวรรณกิจ (นทร.พระนคร)

#### Secretaries

ผศ.ดร.ณัฐพงศ์ พันธะ (นทร.พระนคร)  
อ.ระพีกร วิเศษศิริ (นทร.พระนคร)

## 2<sup>nd</sup> Call for Papers

งานประชุมวิชาการ ECTI-CARD 2016 ครั้งที่ 8 “การประยุกต์ใช้เทคโนโลยีอย่างชาญฉลาดเพื่อตอบสนองภาคอุตสาหกรรมสมัยใหม่อย่างยั่งยืน” จัดโดยคณะวิศวกรรมศาสตร์ มหาวิทยาลัยเทคโนโลยีราชมงคลพระนคร สถาบันมาตรวิทยาแห่งชาติ และสมาคมวิชาการไฟฟ้า อิเล็กทรอนิกส์ โทรคมนาคมและสารสนเทศประเทศไทย ที่ถูกจัดขึ้นระหว่างวันที่ 27-29 กรกฎาคม พ.ศ.2559 ณ โรงแรมหัวหินแกรนด์แอนด์พลาซ่า จ.ประจวบคีรีขันธ์ มีจุดมุ่งหมายหลักของการจัดงานเพื่อรวบรวมผลงานวิจัยและพัฒนาเชิงประยุกต์ งานนวัตกรรม และสิ่งประดิษฐ์รวมถึงเปิดโอกาสให้นักวิจัย ผู้พัฒนาและผู้ใช้งานหรือหน่วยงานต่างๆ ได้มีโอกาสในการแลกเปลี่ยนเรียนรู้ซึ่งกันและกันและสามารถนำผลงานที่ตีพิมพ์ไปพัฒนาต่อยอดหรือพัฒนาสู่ผลิตภัณฑ์เชิงพาณิชย์ได้ ซึ่งบทความที่ส่งมานั้นจะได้รับการพิจารณาโดยผู้ทรงคุณวุฒิจากคุณภาพและความสมบูรณ์ของงาน บทความที่ได้รับการคัดเลือกและได้นำเสนอในที่ประชุม ECTI-CARD 2016 จะถูกตีพิมพ์ใน ECTI-CARD Proceedings ซึ่งสามารถสืบค้นได้ที่ฐานข้อมูลของสมาคม ECTI

#### หัวข้อบทความที่เกี่ยวข้อง

- กลุ่มที่ 1 : เกษตรกรรม อุตสาหกรรมเกษตร
- กลุ่มที่ 2 : เทคโนโลยีชีวภาพ การแพทย์ วิทยาศาสตร์กายภาพ วิทยาศาสตร์การกีฬา
- กลุ่มที่ 3 : การประยุกต์ใช้พลังงาน การจัดการพลังงานบ้านอัตโนมัติ
- กลุ่มที่ 4 : การเรียนการสอนทางไกล การศึกษาขั้นพื้นฐานคอมพิวเตอร์ออนไลน์
- กลุ่มที่ 5 : การกู้ภัย ระบบเตือนภัย และพยากรณ์
- กลุ่มที่ 6 : การสื่อสาร การสนับสนุนผู้ใช้ตามบ้าน เครือข่ายไร้สาย
- กลุ่มที่ 7 : การขนส่ง การควบคุมจราจร การจัดการอุตสาหกรรม
- กลุ่มที่ 8 : ธุรกิจการธนาคาร การท่องเที่ยว และการโรงแรม
- กลุ่มที่ 9 : ระบบความปลอดภัย การควบคุมการเข้าถึงการขึ้นบันได ระบบจราจร
- กลุ่มที่ 10 : นาฬิกาวิทยา การวัดและควบคุม
- กลุ่มที่ 11 : หัวข้ออื่นๆ ที่เกี่ยวข้อง

#### การส่งบทความแบ่งเป็น 2 รูปแบบ ดังนี้

1. รูปแบบบทความวิจัย เป็นบทความเต็มรูปแบบภาษาไทยหรือภาษาอังกฤษไม่เกิน 4 หน้ากระดาษ A4 ในรูปแบบมาตรฐาน 2 คอลัมน์ของ IEEE โดยต้องกล่าวถึงที่มาและผลที่ได้ รับรายละเอียดและ/หรือการนำไปใช้งาน ซึ่งเกี่ยวข้องกับหัวข้อใดหัวข้อหนึ่งหรือมากกว่า จากกลุ่มต่างๆ ที่ได้กำหนดไว้
2. รูปแบบสิ่งประดิษฐ์และนวัตกรรมเป็นบทความเต็มรูปแบบภาษาไทยหรือภาษาอังกฤษไม่เกิน 2 หน้ากระดาษ A4 ในรูปแบบมาตรฐาน 2 คอลัมน์ของ IEEE โดยผู้เขียนบทความอาจนำเสนอผลงานหรือสิ่งประดิษฐ์ร่วมจัดแสดงในงานประชุมด้วยก็ได้

<http://ecticard2016.ecticard.org/>

### WORKSHOP

#### Session A

การสาธิตอุปกรณ์การวัดสัญญาณไฟฟ้าแบบต่างๆ

#### Session B

การสอบเทียบเครื่องมือ ข้อมูลเฉพาะของเครื่องมือ กระบวนการสอบเทียบ สาธิตการสอบเทียบ DMM

#### Session C,D

ให้บริการสอบเทียบ DMM ให้แก่ผู้ร่วมงานสัมมนา

### กำหนดการสำคัญ

วันสุดท้ายของการส่งบทความฉบับสมบูรณ์  
วันที่ 6 มีนาคม 2559

ประกาศผลการพิจารณาบทความ  
วันที่ 11 พฤษภาคม 2559

ส่งบทความต้นฉบับเพื่อตีพิมพ์และลงทะเบียน  
วันที่ 24 มิถุนายน 2559

วันจัดประชุมวิชาการ ECTI-CARD 2016  
วันที่ 27 - 29 กรกฎาคม 2559

ประสานงานโดย :

ผศ.ดร.ณัฐพงศ์ พันธะ 081-838-6780

ผศ.ดร.ณัฐพงศ์ พันธะ 090-925-5856

ดร.ณัฐ สุวรรณกิจ 080-044-1915

คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเทคโนโลยีราชมงคลพระนคร ร่วมจัดประชุมโดย :

1381 ถนนประชาราษฎร์ 1 แขวงวงศ์สว่าง เขตบางซื่อ กรุงเทพมหานคร 10800

โทรศัพท์ 02-836-3000 ต่อ 4150 โทรสาร 02-836-3000 ต่อ 4151

EMAIL : [ecticard2016@gmail.com](mailto:ecticard2016@gmail.com)



ISPACS 2016  
Phuket, Thailand  
24-27 October 2016

## 2016 International Symposium on Intelligent Signal Processing and Communication Systems



### Organizing Committee

#### Honorary Chairs

Prayoot Akkarachalin, *KMUTNB, Thailand*  
Yoshikazu Miyahara, *Hokkaido University, Japan*

#### General Chair

Pichaya Tandyay, *PSU, Thailand*

#### General Co-Chairs

Masayuki Kawamata, *Tohoku University, Japan*  
Shiunn-Jang Chern, *Tamkang University, Taiwan*  
Tan Lee, *The Chinese University of Hong Kong, China*

#### Technical Program Chair

Wannarat Sunthornrat, *PSU, Thailand*

#### Technical Program Co-Chairs

Charoen Vongchamych, *KMITL, Thailand*  
Nikom Suwonvorn, *PSU, Thailand*  
R. Badlishah Ahmad, *UNIMAP, Malaysia*  
Yo-Sung Ho, *GIST, Korea*

#### Special Session Chairs

Go Tanaka, *Nagoya City University, Japan*  
Montri Kunjanadecha, *PSU, Thailand*  
Richard Hsin-Hyong Yang, *NKFUST, Taiwan*  
Sinehai Kamolphiwong, *PSU, Thailand*  
Somsak Mittha, *KMITL, Thailand*  
Yui-Lam Chan, *Hong Kong Polytechnic Univ., China*

#### Publicity Chairs

Percharat Suriyachai, *PSU, Thailand*  
Wasimon Panichpatanakul, *PSU, Thailand*

#### Publication Chairs

Sangsuee Vasupongyay, *PSU, Thailand*  
Panyat Chaihan, *PSU, Thailand*

#### Registration Chairs

Aree Teeraparbsee, *PSU, Thailand*  
Thammarat Somtalanpa, *PSU, Thailand*

#### Information System Chairs

Toochai Angchuan, *PSU, Thailand*  
Warodom Weerapa, *PSU, Thailand*

#### Financial Chairs

Phatcharee Thepnimit, *PSU, Thailand*  
Sakuna Charoenpanyasak, *PSU, Thailand*  
Sunawuth Chaimool, *KMUTNB, Thailand*

#### Exhibition and Sponsor Chairs

Anant Choksurirong, *PSU, Thailand*  
Suthon Wong, *PSU, Thailand*

#### Local Arrangement Chair

Komsan Konjanasit, *PSU, Thailand*

#### Secretariats

Andrew Davison, *PSU, Thailand*  
Chatchai Jantarapim, *PSU, Thailand*  
Shingo Yoshizawa, *KIT, Japan*  
Wacharin Kaewapichai, *PSU, Thailand*

#### International Steering Committee Chair

Kaori Amkawa, *Meiji University, Japan*

#### Vice Chair

Jen-Shun Chiang, *Tamkang University, Taiwan*

#### Secretary

Shingo Yoshizawa, *KIT, Japan*

#### Committee

Akira Taguchi, *Tokyo City University, Japan*  
Canhui Cai, *Huaqiao University, China*  
Chiranut Sa-ngiamsak, *Khon Kaen Univ., Thailand*  
Hongliang Li, *UESTC, China*  
Kai-Kuang Ma, *NTU, Singapore*  
Kenji Nakayama, *Kanagawa University, Japan*  
KokSheik Wong, *University of Malaya, Malaysia*  
Lap Pui Chau, *NTU, Singapore*  
Masahide Abe, *Tohoku University, Japan*  
Min-Jong Hao, *NKFUST, Taiwan*  
Somsak Choomchuan, *KMITL, Thailand*  
Supavadee Aramvith, *Chulalongkorn Univ., Thailand*  
Takayuki Nakachi, *NTT Corporation, Japan*  
Trio Adiono, *Institut Teknologi Bandung, Indonesia*  
Yoshio Itoh, *Tottori University, Japan*

### Call for Papers

The 2016 International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS 2016) will be held during 24-27 October 2016 at Phuket Graceland Resort & Spa, Patong, Phuket, Thailand. The symposium presents every possibility on new technologies based on signal processing and communications. ISPACS 2016 (IEEE Conference Record Number #37442) will include regular sessions on the topics listed below and some special sessions on emerging topics concerning intelligent signal processing and communication systems.

#### 1. Communication Systems

- Radio Propagation and Channel Modeling
- Communication Theory
- Antenna and Propagation
- Wideband Communications
- Wireless Systems
- Intelligent Communication Systems and Network Protocols

#### 2. Multimedia and Systems

- Speech Processing and Coding
- Image Processing
- Video Processing and Coding
- Video and Multimedia Technology and Communications
- Audio/Acoustic Signal Processing
- Multimedia Processing for e-Learning

#### 3. Signal Processing

- Digital Filters and Filter Banks
- Wavelets and Multi-rate Signal Processing
- Adaptive, Non-linear and Multidimensional Signal Processing
- Fast Computations for Signal Processing, and Communication Systems
- Radar, Antennas and Mobile Signal Processing
- Intelligent Signal Processing for Communications and Systems
- Security Signal Processing
- Optical Signal Processing
- Medical Signal Processing
- Noise Control

#### 4. VLSI

- Analog and Digital ICs for Communications
- Low Power Design and VLSI Physical Synthesis
- Modeling, Simulation and CAD Tools
- VLSI Architecture for Signal Processing

#### 5. Circuits and Systems

- Analog Circuits, Filters and Data Conversion
- Analog and Mixed Signal Processing
- Numerical Methods and Circuit Simulation
- Circuits and Systems for Communications
- Neural Networks and Fuzzy Logic Processing
- Sensors and Devices
- Intelligent Instrumentations
- Wireless Sensor Networks

#### 6. Emerging Technologies in Signal Processing and Communications

#### Important Dates

Submission of Special Session Proposals:

**30 April 2016**

Submission of Full Papers:

**15 June 2016**

Acceptance Notification:

**15 August 2016**

Submission of Camera-ready Manuscripts:

**10 September 2016**

Travelling grants, around 5% of the number of actual participants, will be given to participants who truly need support, especially the ASEAN Economic Community (AEC) members. The applications are required and will be considered by the TPC committee.

For more information about the conference, please visit our official web site: <http://ispacs2016.psu.ac.th>

or contact [ispacs2016@coe.psu.ac.th](mailto:ispacs2016@coe.psu.ac.th).

Phuket is one of the most internationally well-known and popular islands. Phuket, known as "Pearl of the Andaman Sea" and its unique combination of the sea and mountains, has many fine white sandy beaches and deep blue sea as well as fascinating history and mixed cultures such as Sino-Portuguese architecture, local traditions, living styles and food.

See more information about Phuket at <http://www.phukettourist.com/index.php>.

Organized by



Technically co-sponsored by





## 2016 International Workshop on Smart Info-Media Systems in Asia (SISA 2016)

Classic Kameo Hotel & Serviced Apartments, Ayutthaya

September 14 – 17, 2016

Ayutthaya City, World Heritage, Thailand

<http://www.ieice-sisa.org/>



### Organizing Committee:

#### Honorary Chairs

Kasame Bunrueveth  
ARU, Thailand  
Yoshikazu Miyahara  
Hokkaido University, Japan  
Prayoot Akkarachitahin  
ECTI Association, Thailand  
Kosin Chamnongthai  
KMUTT, Thailand

#### General co-Chairs

Mitsuji Muneyasu  
Kansai University, Japan  
Chusit Pradabpet  
ARU, Thailand

#### Technical Program co-Chairs

Hiroshi Tsutsui  
Hokkaido University, Japan  
Sathaporn Promwong  
KMITL, Thailand

#### Promotion Chair

Takao Onoye  
Osaka University, Japan

#### Special Tutorial Session co-Chairs

Montree Sirinuchayanun  
KMUTNB, Thailand  
Shingo Yoshizawa  
Kitami Institute of Technology, Japan

#### Publicity co-Chairs

Tomeaki Sato  
Hiroshima University, Japan  
Sorawat Chivapreecha  
KMITL, Thailand  
Rachada Kongkachandra  
TU, Thailand

#### Financial co-Chair

Sudarat Kliangsart  
ARU, Thailand  
Hiroyuki Tsuji  
Kanagawa Institute of Technology, Japan

#### IPSI-AT Liaison

Hiroshi Fujii  
Nippon Telegraph and Telephone  
Corporation, Japan

#### Advisory Board Liaison

Hirokazu Tanaka  
Hiroshima City University, Japan

#### Publication Chairs

Chunwong Pongcharoenpanich  
KMITL, Thailand  
Pipat Prommee  
KMITL, Thailand

#### Local Arrangement Chairs

Surapan Yunnan  
KMUTNB, Thailand

Pattarapong Phasukit  
KMITL, Thailand

#### General Secretaries

Takashi Imagawa  
Hokkaido University, Japan  
Sukanya Praesornboon  
KMUTNB, Thailand  
Kanyalak Phodong  
ARU, Thailand

## Call for Papers

**2016 International Workshop on Smart Info-Media Systems in Asia (SISA 2016).** The symposium will be held at Pranakhon Si Ayutthaya, 600-year-old ancient capital of Thailand and now become the world heritage as a historical city. The SISA 2016 presents every possibility on new information technologies and its smart systems.

The SISA 2016 is aiming at promoting young researchers in the fields of multimedia system and wireless communications. We plan to organize short oral presentations with poster discussion for regular sessions as well as a keynote talk and special sessions. Prospective authors are invited to submit their papers reporting original works in these fields.

The topics in SISA 2016 include the followings but not limited to:

### 1. Communication Systems

- 1.1 Smart Wireless Systems, Smart Mobile Systems
- 1.2 Cognitive Systems, Intelligent Soft-Wireless Systems
- 1.3 Multi-Media over Wireless
- 1.4 Signal Processing for Communication Systems
- 1.5 Intelligent Communication systems
- 1.6 MIMO Systems
- 1.7 NFC, RFID Sensor Network Systems, Mesh Network
- 1.8 WAN/MAN/LAN/PAN/BAN
- 1.9 Emerging Technologies for communications

### 2. Multimedia and Systems

- 2.1 Speech Processing and Coding
- 2.2 Video Processing and coding
- 2.3 Video and Multimedia Technology & Communications
- 2.4 Audio/Acoustic Signal Processing
- 2.5 Signal Processing for Medical Technologies
- 2.6 Intelligent Signal Processing for Multimedia & Systems
- 2.7 Security Signal Processing for Multimedia & Systems
- 2.8 Parallel Implementation for Multimedia & Systems
- 2.9 Emerging Technologies for Multimedia & Systems

### 3. Information Science and Technologies

- 3.1 Intelligent Transport Systems
- 3.2 Bioinformatics, Neural Networks and Fuzzy Systems
- 3.3 Informatics for Green Earth & Environmental Technologies

### SISA 2016 Student Paper Awards

Any paper can be nominated for the Student Paper Awards, provided that the first author is a full time undergraduate, Masters or Ph.D. student.

### Special Section on IEICE Trans. Fundamentals

We plan to publish a Special Section on IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences on November 2017. Authors who presented their original works in SISA 2016 are solicited to submit papers to this special section.

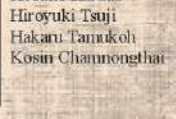
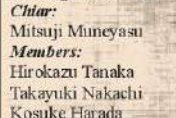
### Author's Schedule

Deadline for Special Session Proposal:	April 29, 2016
Deadline for Submission of 6-page Full-Paper:	May 20, 2016 June 6, 2016
Notification of Acceptance:	July 11, 2016 FINAL EXTENSION
Deadline for Submission of Camera Ready Paper:	August 12, 2016

### Submission Instruction

Paper must be written in English and should describe the authors' original research work. The length of the paper is limited to 6 pages including figures, tables and references. The paper must be in A4 size, two-column format. Please download paper template from SISA 2016 website.

Contact information: [sisa2016aru@gmail.com](mailto:sisa2016aru@gmail.com), [rdiaru@gmail.com](mailto:rdiaru@gmail.com)



### International Steering Committee Chair:

Mitsuji Muneyasu

### Members:

Hirokazu Tanaka  
Takayuki Nakachi  
Kosuke Harada  
Hiroyuki Tsuji  
Hakan Tanukoh  
Kosin Chamnongthai

Sponsored by Smart Info-media System (SIS) Technical Committee, Engineering Science Society (ESS), The Institute of Electronics, Information and Communication Engineers (IEICE), In-Cooperation with Electrical Engineering/Electronics, Computer, Communications and Information Technology (ECTI) Association, Thailand, and IPSJ Special Interest Group on Audio Visual and Multimedia Information Processing (IPSI-AVM).

## *ECTI Who's Who*

### President:

Somsak Choomchuay (KMITL)

### Advisory Board:

Prabhas Chongstitvatana (CU)

### President Elect:

Kosin Chamnongthai (KMUTT)

Pinit Srithorn (RMUTI)

### Board Committee:

Wannaree Wongtrairat (RMUTI)

Wiboon Promphanich (KMITL)

Panuwat Janpugdee (CU)

Akkarat Boonpoonga (KMUTNB)

Kittisak Phaebua (KMUTNB)

Theerayod Wiangtong (MUT)

Rangsan Wongsan (SUT)

### ECTI Journal Editor:

EEC: Apisak Worapishet (MUT)

CIT: Prabhas chongstitvatana (CU)

Kosin Chamnongthai (KMUTT)

### TC (Electrical Engineering)

Nattachote Rugthaicharoencheep (RMUTPK)

### TC (Electronics)

Sataporn Pornpromlikit (KKU)

### TC (Electromagnetics)

Danai Torrungrueng (AsianU)

### TC (Computers)

Krerk Piromsopa (CU)

### TC (Telecommunications)

Keattisak Sripimanwat

### TC (Information Technology)

Pratya Nuankaew (UP)

### Secretary:

Pairin Kaewkuay

### Regional Committee

Thailand: North: Rounsang Chaisricharoen (MFU)

Thailand: South: Petcharat Suriyachai (PSU)

Myanmar: Saya Oo (YTU)

Laos: Somsanouk Phatumvanh (NUOL)

Cambodia: Des Phal (RUPP)

### Editorial Team:

Editor: Pornchai Supnithi (KMITL)

Assistant Editor: Watid Phakphisut (BSU)

### ECTI E-Magazine Editorial Board:

Monai Krairiksh (KMITL)

Jirayuth Mahhattanakul (MUT)

Prayoot Akkaraekthalin (KMUTNB)

Apisak Worapishet (MUT)



### Contact Us

ECTI Association

Sirindhorn International Institute of Technology

131 Moo 5 Tiwanon Rd., Bangkok

Pathumthani 12000, Thailand

Tel: 02-5012578

E-mail: [ecti.secretary@gmail.com](mailto:ecti.secretary@gmail.com)

Website: <http://www.ecti-thailand.org/>

Facebook: <https://www.facebook.com/ecti.thailand>