



Proceedings 2015 International Conference on Science and Technology

Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi, Thailand
November 4-6, 2015

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Chemistry and Chemical Technology

Computer Science and Information Technology

Biology and Biotechnology

Applied Science and other related topics

Jointly Organized by:



Rajamangala University of Technology Thanyaburi (Thailand)
National Pingtung University of Science and Technology (Taiwan)
Kobe University (Japan)
Islamic University of Indonesia (Indonesia)
National Food Research Institute (Japan)



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Greeting from the Steering Committee



It is my great pleasure and honor to welcome all of you to the International Conference on Science and Technology 2015. A conference on Science and Technology is held at the Rajamangala University of Technology Thanyaburi (Thailand) from November 4 to November 6, 2015, with the joint support of the National Pingtung University of Science and Technology (Taiwan), the Kobe University (Japan), the Islamic University of Indonesia (Indonesia), and the National Food Research Institute (Japan).

The international conference on Science and Technology has been held annually with the cooperative effort for a number of organizations and universities in Thailand and other countries. It is aimed to promote research in Science and Technology by bringing together researchers and practitioners in the field to exchange ideas, to report on up-to-the-minute innovations and developments, and to present results from research on Science and Technology areas and various related fields. The emphasis of the conference is on interdisciplinary scientific exchange demonstrating openness towards high-quality research falling outside current dominant schools of thought, and on technological transfer within the world wide region.

With our great expectation to the innovative development of Science and Technology in the 21st century, the conference committee invited Professor Dr. Masayoshi Okubo from Kobe University (Japan) and Professor Dr. Srisakdi Charmonman (Thailand) as the keynote speakers for the conference. These speeches, together with the presentations of papers in the conference, will provide an enjoyable and fruitful time for each of the participants in this conference.

Your active participation is strongly encouraged and expected and will be the measure of the conference.

I wish to thank all the authors and the co-authors, the session chairs, the technical program committee and the reviewers. Thanks also to our partnerships, the National Pingtung University of Science and Technology (Taiwan), the Kobe University (Japan), the Islamic University of Indonesia (Indonesia), and the National Food Research Institute (Japan), IEEE Computer Society Thailand, acm Thailand, IEEE Thailand Section, IEEE XPlore and IEEE.

A handwritten signature in black ink that reads "P. pinpathomrat." with a period at the end.

Associate Professor Dr. Prasert Pinpathomrat
President RMUTT
Steering Committee

International Conference on Science and Technology 2015
Rajamangala University of Technology Thanyaburi (Thailand)

Message from the Conference Program Chair



The International Conference on Science and Technology is jointly organized by the Rajamangala University of Technology Thanyaburi (Thailand), the National Pingtung University of Science and Technology (Taiwan), the Kobe University (Japan), the Islamic University of Indonesia (Indonesia), and the National Food Research Institute (Japan), and is supported by IEEE Computer Society Thailand, acm Thailand, IEEE Thailand Section, IEEE Xplore and IEEE. The conference is hosted by the Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi. The aim of the conference is to bring together researchers, scientists, engineers, industry practitioners, and students to discuss, encourage and exchange new ideas, research results, and experiences on all aspects of Science and Technology.

Science and Technology 2015 received papers from the scientific community representing more than ten different countries. Each paper was reviewed by three members of the International Program Committee and additional reviewers. A large number of the papers were high quality submissions. After the completion of the peer review process, all selected papers will be published in the conference proceedings and some of them will be available through IEEE Xplore.

We would like to express our sincere appreciation to the following people for contributing to the success of this conference: Associate Professor Dr. Prasert Pinpathomrat, President of RMUTT and Steering Committee of the conference; our keynote speakers: Professor Dr. Masayoshi Okubo from Kobe University (Japan) and Professor Dr. Srisakdi Charmonman (Thailand), Technical Program Committee Chair; Technical Program Committee Members, Organizing Committee Members and reviewers who contributed a great amount of their time to evaluate the submissions to maintain high quality of the conference; the session chairs who preside over the sessions; all the authors, attendees, presenters who really made this conference successful; and, finally, the student volunteers, and the administrative and technical staff at the Faculty of Science and Technology of RMUTT.

We hope you enjoy meeting and staying at this TICST2015 conference in Pathum Thani.

Sirikhae Pongswat

Assistant Professor Dr. Sirikhae Pongswat
Steering Committee & Conference Program Chair
International Conference on Science and Technology 2015
Rajamangala University of Technology Thanyaburi (Thailand)



Presentation Schedule

The International Conference on Science and Technology 2015

Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi

November, 4 - 6 2015; Pathum Thani, Thailand.

Conference Location

Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi

November, 4 2015 (Wednesday)

TICST2015 Conference Opening Ceremony - President Office (Rinraubon Conference Hall, 1st Floor)"

Time	Activity
8.00-9.00	Registration
9.00-9.10	TICST 2015 Report by Assistant Professor Dr. Sirikae Pongswat (Conference Program Chair)
9.10-9.20	Welcome Address by Associate Professor Dr. Prasert Pinpathomrat (President of RMUTT)
9.20-9.30	Speech by Professor Dr. Ir. Harsoyo (President of Islamic University of Indonesia)
9.30-10.10	Speech and Special Lecture by Professor Dr. Tai Changhsien (President of National Pingtung University of Science and Technology)
10.10-10.50	<u>Keynote Speaker 1</u> : Professor Dr. Masayoshi Okubo (Kobe University, Japan) Topic : "How Have We Enjoyed the Research on Synthesis of Functional Polymer Particles? - Change in Thinking, Serendipity, and Challenge -"
10.50-11.30	<u>Keynote Speaker 2</u> : Professor Dr. Srisakdi Charmonman (Thailand) Topic : "Applications Internet of Things (IoT)"
11.30-13.00	Lunch
13.00-13.30	Special Lecture (6 parallel sessions)

Time	Activity
13.30-17.00	Oral/Poster Presentation Session (6 parallel sessions)
17.30-20.00	Banquet Party

Presentation Rooms

Classroom Building (Green Building) – 9th Floor

- Applied Science (November, 4 2015; 13.00 – 16.40 o'clock)

Oral Presentation (Room No. 901)

Time	Activity
13.00-13.30	<u>Invited Speaker</u> : Dr. Ir. Sugiyanta Department of Agronomy and Agriculture, Faculty of Agriculture, Bogor Agriculture University, Indonesia “IPB – Prima Good Agricultural Practices for Increasing Rice Yield using New Plant Type Rice Variety”
Session 1 : Chair : Professor Dr. Masayoshi Okubo Co-Chair : Assistant Professor Dr. Somboon Theerawisitpong	
13.30-13.50	<u>94-149-1</u> Anomalous STLF for Indonesia Power System using Artificial Neural Network Y. Mulyadi, L. Farida, A. G. Abdullah, K. A. Rohmah
13.50-14.10	<u>32-47-1</u> Effect of Coarse Aggregate Replacement with Working Mold from Ceramic Industry on Properties of Lightweight Aggregate Concrete Pronpimon Sakultong
14.10-14.30	<u>92-147-1</u> Design and Implementation of a Simple, Low-cost, and Portable Process Control Laboratory Kit A. G. Abdullah, D.L. Hakim, T. Gunawan, M.A. Auliya, M.A. Fahrurizal, D. Sofiani, A.B.D. Nandiyanto
14.30-14.50	<u>36-56-1</u> Using Animated Social Feedback to Motivate Air Conditioning Energy Saving Santika Sudiarta, I Ketut Gede Sudiarta, I.G.P. Mastawan E. Putra
14.50-15.00	Coffee Break
Session 2 : Chair : Dr. Sikaring Yoo-Kong (KMUTT) Co-Chair : Dr. Julaluk Watthananon (RMUTT)	
15.00-15.20	<u>110-178-1</u> A Finite Volume Simulation of Electrical Potential Drop in 2D Cracked Plates Ni-asri Cheputeh, Kuntinee Maneeratana, Jirapong Kasitvitamnuay
15.20-15.40	<u>145-255-1</u> Common fixed point theorems for generalized cyclic contraction pairs in b-metric spaces and application in a system of integral equations Oratai Yamaod, Wutiphol Sintunavarat

Time	Activity
15.40-16.00	<u>10-15-1</u> Coupled coincidence point theorems for generalized weakly contraction mappings with application to dynamic programmings Phumin Sumalai, Poom Kumam
16.00-16.20	<u>170-272-1</u> The Extreme Programming for Financial Management System on Local Government (Case Study Local Government of Central Java) kholid haryono
16.20-16.40	<u>181-294-1</u> Automatic landing assistant system based on stripe lines on runway using computer vision Muangmol Senpheng, Miti Ruchanurucks
17.30-20.00	Banquet Party

- Applied Science (November, 5 2015; 9.00 – 11.50 o'clock)

Oral Presentation (Room No. 901)

Time	Activity
Session 3 :	
Chair : Dr. Sumonman Niamlang (RMUTT)	
Co-Chair : Dr. Veeradate Piriya Wong (RU)	
9.00-9.20	<u>182-296-1</u> Realtime VDO stabilizer for small UAVs using the modified homography method Kittipat Wiriyaprasat, Miti Ruchanurucks
9.20-9.40	<u>62-95-1</u> Effect of dietary fibers on in-vitro lipid digestion in non dairy creamers Jirapat Singchai, Khongsak Srikaeo
9.40-10.00	<u>69-108-1</u> Effect of Water Treatment Residue on Properties of Compacted Clay Liner Pornphachara Takachart, Suwimol Asavapisit, Rungroj Piyapanuwat
10.00-10.20	<u>220-355-3</u> A model for the estimation of cloud cover from satellite data Noppamas Pratummasoot
10.20-10.30	Coffee Break
10.30-10.50	<u>167-265-1</u> Fractional Order Oscillators with Single Non-Zero Transmission Matrix Element Lobna Said, Ahmed G. Radwan, Ahmed H. Madian, Ahmed M. Soliman
10.50-11.10	<u>264-430-1</u> Sexual Differences in Palmprints in a Population of Buengkan Province, Thailand Rachadaporn Benchawattananon, Rujee Komjaroenpompong, Chompunut Saisophon
11.10-11.30	<u>163-261-1</u> 1D Thermodynamic Cycle Analysis of Micro Gas Turbine (MGT) for Small Power Plant Thanapol Poojitganont
11.30-11.50	<u>226-365-1</u> A Novel Technique for Multiple Targets Detection in Through-the-wall Radar Imaging N. S. N. Anwar, M. Z. Abdullah
11.50-13.00	Lunch

- Applied Science (November, 4-6 2015; 9.00 – 16.30 o'clock)

Poster Presentation (Room No. 907)

Time	Activity
9.00 A.M. – 16.30 P.M.	<u>35-52-1</u> Image Segmentation Approach for Realizing Zoomable Streaming HEVC Video K. R. Rao, Zarna Patel
	<u>82-128-1</u> Characteristics and Properties of Hand Woven Fabric from Thai Rice Straw for Home Textile Product Srikanjana Jatuphatwarodomtion, Rattanaphol Mongkhorrattanasit, Sakorn Chonsakorn, Natawat Jatuphatwarodom
	<u>87-136-3</u> Development of Fast-Neutron Radiography Technique N. Janklan, S. Rassame, C. Yenchai
	<u>100-159-1</u> Photo-degradation of Polypropylen-PEO/TiO ₂ composite films Tawat Soitong
	<u>103-164-1</u> Synthesis and Characterization of Barium Orthotitanate Powders for Carbon Dioxide Adsorption Supattra Wongsanmai
	<u>118-184-1</u> Soil Erosion Assessment Using MMF Model and Geoinformations in Small Watershed Komsan Kiriwongwattana
	<u>119-186-1</u> Inoculants Fungal Trichoderma for Improving Acidic Soils and Community Development Based on Philosophy of Sufficiency Economy Sukhan Rattanalertnusorn
	<u>126-206-1</u> Fuzzy numbers and arithmetic operation of fuzzy numbers using alpha-cut approach Atchanut Rattanalertnusorn
	<u>128-208-1</u> Inspection of sanitary bacteria in the Pacific white shrimp (Litopenaeus vanamei) pond culture, Trang Province for developing a safety culture system Dumrong Lohalaksanadech, Chutinut Sajarit
	<u>172-280-1</u> Fertilizer Source Influenced on Environmental Emissions from Andrographis Paniculata (Burm.) Wall. Ex Nees Somporn Pleanjai, Pranee Rattananupong
	<u>207-339-1</u> Comparison of Contrast Ratio of Two Ceramics in Two Different Thicknesses Porak Sethakamnerd, Chalernpol Leevailoj

Time	Activity
	<p><u>265-432-1</u> Study of lip prints patterns in two different population of Thailand : Pilot study in Thai and Nyah-Kur ethnic group Pirawan Poosekeaw, Rachadaporn Benchawattananon</p>
	<p><u>270-441-1</u> An evaluation of UV protection imparted by cotton fabrics dyed with natural dye (kram plant or Indigofera tinctoria Linn) Oiytip Papatana</p>

- **Biology and Biotechnology (November, 4 2015; 13.00 – 16.00 o'clock)**

Oral Presentation (Room No. 902)

Time	Activity
13.00-13.30	Invited Speaker 1 : Associate Professor Dr. Pravate Tuitemwong "Rapid Method Development and Certification of Method Validation in Thailand"
Session 1 : Chair : Professor Dr. Anwar R Baydoun Co-Chair 1 : Dr. Dolnapa Kaewpa Co-Chair 2 : Dr. Jantima Teeka	
13.30-13.50	<u>191-311-1</u> Influence of Substrate Concentration on Microbial Oil Production by Pseudozyma parantarctica CHC28 and Its Fatty Acid Characterization Atsawut Areesirisuk, Chiu-Hsia Chiu, Tsair-Bor Yen, Chun-Hung Liu, Sirikhae Pongswat, Jia-Hsin Guo
13.50-14.10	<u>102-162-1</u> Acute Toxicity of Brown Rice Kefir Powder Supaporn Chunchom, Sirirat Deeseenthum, Teeraporn Katisart, Chusri Talubmook
14.10-14.30	<u>116-181-1</u> Acute toxicity and sub-chronic toxicity of extract from Houltuyunia cordata Thumb Patcharee Poolsil, Wilawan Promprom, Chusri Talubmook
14.30-14.50	<u>39-62-1</u> Antimicrobial activity of Bacillus subtilis isolated from Thai fermented soybean Yasuhiro Inatsu, Yukie Hosotani, Chiraporn Ananchaipattana
14.50-15.00	Coffee Break
15.00-15.30	Invited Speaker 2 : Professor Dr. Anwar R Baydoun University of Hertfordshire, School of Life and Medical Sciences, College Lane, Hatfield, UK "Oxidative stress induced regulation of nitric oxide production in cardiovascular disease states"
Session 2 : Chair : Dr. Suthawan Suphan Co-Chair 1 : Dr. Wanthanee Khetkorn; Co-Chair 2 : Dr. Rumpa Jutakanoke	
15.30-15.50	<u>200-326-1</u> Removal of Microcystis spp. By Chitosan and Straw Extraction Natthaphon Chaosuan, Sirikhae Pongswat, Sutawan Supan
15.50-16.10	<u>14-19-1</u> Leaf Phenological Features and Monthly Wood Increments of Melia azedarach relating to Climate Variability Kritsadapan Palakit, Khwanchai Duangsathaporn
16.10-16.30	<u>236-379-1</u> Activated carbons from bacterial cellulose by chemical activation with potassium hydroxide Chinwaranon Boongate, Muenduen Phisalaphong
17.30-20.00	Banquet Party

- **Biology and Biotechnology (November, 4-6 2015; 9.00 – 16.30 o'clock)**

Poster Presentation (Room No. 907)

Time	Activity
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	<u>60-90-1</u> Acute Toxicity of Leaf Extracts from <i>Sphagneticola trilobata</i> (L.) Pruski in Rats Areeya Suchantabud, Teeraporn Katisart, Chusri Talubmook
	<u>61-93-1</u> Colorimetric Detection of <i>Campylobacter jejuni</i> Using DNA-Modified Gold Nanoparticles as Probes Yortyt Seetang-nun, Wijit Wonglumsom, Chamras Promptmas, Pravate Tuitemwong
	<u>81-126-1</u> Antidiabetic Property of Seed Extract from <i>Antidesma bunius</i> (Linn) Spreng in Diabetic Rats Pichaya Chowtivannakul, Buavaroon Srichaikul, Chusri Talubmook
	<u>89-140-1</u> Antidiabetic Activity and Antioxidant Activity of Leaf Extract from <i>Mangifera caloneura</i> Kurz Apinya Suwannapong, Theeraporn Katisart, Chusri Talubmook
	<u>130-210-1</u> Isolation of thermophilic mannanase- producing bacteria useful for mannoooligosaccharide (MOS) production Surachai Rattanasuk, Khanittha Prasertsang, Sunchai Phiwphetch
	<u>131-212-1</u> Foodborne pathogens in fermented fish purchased in Selaphum, Roi Et Surachai Rattanasuk, Jiraphat Boonbao, Nattawut Sankumpa, Thanai Surasilp
	<u>136-276-1</u> Anti-quorum sensing and anti-bacterial Activity of Thai Traditional Medicinal Plants in Nakhon-Ratchasima province, Thailand Monton Visutthi
	<u>162-258-3</u> Effect of <i>Millettia leucantha</i> Kurz Extract on Lipid Profiles in Diabetic Rats Supasorn Sakuljaitrong, Nopparat Buddhakala
	<u>176-288-1</u> α - Glucosidase inhibitory activity of ethanolic extracts from <i>Mimosa pudica</i> L. Ampa Konsue, Chayan Picheansoonthon, Chusri Talubmook
	<u>215-343-1</u> Preparation of microcrystalline cellulose from dissolving cellulose by cryo-crushing and acid hydrolysis Surached Eartrakulpaiboon

- Chemistry and Chemical Technology (November, 4 2015; 13.00 – 14.50 o'clock)

Oral Presentation (Room No. 903)

Time	Activity
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13.00-13.30	Invited Speaker : Professor Dr. James R. Ketudat-Cairns Institute of Science and Center for Biomolecular Structure, Function and Application, Suranaree University of Technology “Exploring β-glucosidase structure and function: from rice to bacteria to humans”
13.30-13.50	<u>53-174-1</u> Preparation and Properties of Poly (Acrylic Acid)/Diatomite Superabsorbent Composite Nutnicha Siriwong, Chutimon Satirapipathkul
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14.10-14.30	<u>107-172-1</u> Extraction method development to increase the yield of patchouli oil Noor Fitri
14.30-14.50	<u>192-313-1</u> Conversion of fructose to 5-hydroxyl-methyl-furfural on H-ZSM-5 (001) surface: a quantum chemical study Jittima Meeprasert, Supawadee Namuangruk
17.30-20.00	Banquet Party

- Chemistry and Chemical Technology (November, 4-6 2015; 9.00 o'clock – 16.30 o'clock)

Poster Presentation (Room No. 907)

Time	Activity
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	<u>73-111-1</u> Photocatalytic removal of lignin from pulp mill wastewater using LDPE-TiO ₂ film Saovapak Suktrakoolvait
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	<u>85-134-1</u> Development of copper oxide film electrode for high photoelectrocatalytic hydrogen evolution under visible light irradiation Chatchai Ponchio, Wannasiri Srevarit
	<u>96-152-1</u> A competitive immunosensor for the detection of biogenic amine compound Siriwan Teepoo, Achisa Promta, Pongsathon Phapugrangkul
	<u>109-176-3</u> Electrochemical Stripping Determination of Cadmium and Lead by a Carbon Paste Electrode Modified with Nanosilica and Antimony Preecha Mansalai, Watcharapong Worrasettpong
	<u>142-231-1</u> Effect of Cooking Methods on Gamma-Aminobutyric Acid (GABA) and Anthocyanin Content of Germinated Brown Rice (Leumpua Purple Sticky Rice) Sompong Sansenya, Saowapa Chumanee, Ruchira Khoomsab Chanai Munkalaratanasri
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<u>269-440-1</u>	

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The Development and Analysis of Quality of “Batik Detector” as a Learning Media for Indonesia Batik Motifs Android Based in Indonesian School of Singapore

Hardika Dwi Hermawan, Fatchul Arifin
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Yogyakarta State University
Yogyakarta, Indonesia
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Abstract-Batik is one of the Indonesian cultural heritages which contains symbol and deep philosophy of human life. But today, the young generation of Indonesia does not understand and recognize the diversity of Indonesian batik motifs. With sophisticated advance technology, it is become media for developer to create an application that can present the Indonesian batik motifs. The purpose of this research is to develop and analyse the quality of Batik Detector application as Android-based learning media for Indonesian Batik motifs at Singapore Indonesian School. Application development model used is Waterfall Model which consists of analysis, design, implementation and testing. Application development used development tools that are Unity 3D, mono-develop euphoria and markerless tracking augmented reality. The result of quality analysis for Batik Detector in performance efficiency aspect meets the Little Eye standard that was 15%. Functional suitability aspect was 100%, and met compatibility aspect. The feasibility level application based on opinions of media expert gained an average 4.31 in the category of highly proper, material expert was 100% in the category of valid, and from the users (usability) was 82.47%. It can be concluded that “Batik Detector” application is very feasible as learning media for Indonesian Batik motifs.

Keywords-learning media, batik, batik motifs, android

I. INTRODUCTION

Indonesian Batik, as the unity of technique, technology, and also development of motifs and related culture, has been decided to be the *Masterpieces of the Oral and Intangible Heritage of Humanity* since October 2nd, 2009 (Kebudayaan Indonesia, 2014) by UNESCO. Batik which has so many various handmade (by using canting) or printed motifs and patterns is the icon of national culture. It contains uniqueness, symbols, and philosophy of human life cycle.

Samsi (Felicia, 2011), the ex-chairman of the Research and Development of Handicraft and Batik (BBPPKB) and Rector of IKIP Yogyakarta stated,

“Inexistency of motifs and patterns collection of traditional Batik causes knowledge discrepancy among generations. Problems will arise up when the old generation has no time to the whole knowledge to the young one. This discrepancy will cause the young generation know a little even nothing about the richness of heritage in the past. We do not realise that actually the Javanese Batik has lots of patterns and motifs, even thousands.

Nowadays, Batik has been an additional subject in some schools in Indonesia. Those are some schools in Purbalingga District since 2014, Yogyakarta city since 2012 (Budhiana, 2012), Bantul District since 2010, Surakarta District since 2010 (Subkhan 2009), West Java since 2011 (Pratama, 2011), and many more other districts. Yet, how about Indonesian school in abroad becomes a question.

In addition to students in schools in Indonesia, Indonesia also has schools spread around the world through Ambassador of Indonesian Republic (KBRI) in some countries. One of the schools is Singapore Indonesian School or *Sekolah Indonesia Singapura* (SIS). Singapore Indonesian School participates in introducing and spreading Indonesian arts and cultures, especially to the Singaporean and generally to the international society who lives there (Sekolah Indonesia Singapura, 2014). Thus the role and duty of that school is getting harder because they have to the students who have a background far from Indonesia.

Singapore Indonesian School is one of Indonesian schools which actively participate in introducing Indonesian cultures in Singapore through culture exhibition, Edu Fun Day, local schools show, and many others. This school also actively supports various activities in the same purpose of spreading out Indonesia cultures.

Tina, one of students in SIS since she was in Australia, moves to Singapore in 2012. From the

interview (28/2/2015), Tina said she knew Batik but she does not have any idea about the variety of Indonesian Batik motifs, neither do her schoolmates. Some other students have the same testimony. Thus a media which is expected to be able to help introducing the rich various types of Indonesian Batik motifs is urgently needed especially for SIS students. As one of Indonesian assets in introducing Indonesian cultures directly to international society, especially Singapore, SIS needs a learning media especially for introducing Batik.

Android is a progressive operational system. Even in Android sites itself (Android, 2015), this operational system states that there is more than a million activation around the world each day. Android takes over hundreds million mobile ware in more than 190 countries in the world.

Singapore Indonesian School has no Batik learning media which has passed the quality test in software standards. Based on the explanation above, the expected media has to use interactive technology and commonly used by people. The developed media must be tested by ISO 25010 to identify the quality.

The innovation of technology usage as learning media is expected to be interactive and supportive learning media in introducing the motifs of Indonesian Batik.

II. RESEARCH METHOD

This research is a development of *Linear Sequential Model* or commonly called as *Waterfall Model* as illustrated in Figure 1. This model is very systematically, has some steps to do in developing software which starts from analysing, designing, coding, trial, and maintenance (Somerville, 2011).

The research is done in Singapore Indonesian schools year 2014/2015. Geographically, the position of the school is at 20A Siglap Road, Singapore.

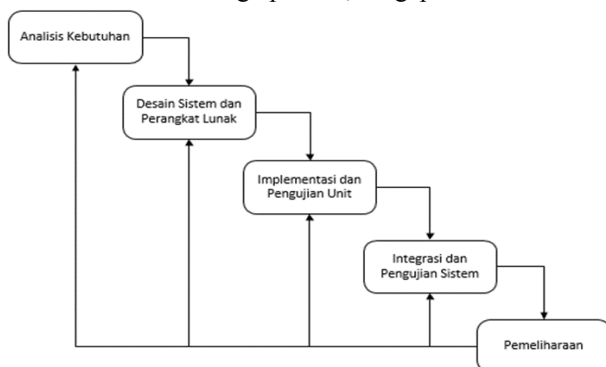


Figure 1. *Waterfall Model* (Somerville, 2011)

The research subject for aspects of functional suitability, performance efficiency, and compatibility tests is Batik Detector. The research subject for aspect of usability test is Singapore Indonesian School students. The research subjects for functional suitability test are 3 expert respondents.

The researcher used validated observation, questionnaire, and research instruments as the data collection technique. Usability instrument was *USE Questionnaire* developed by Arnold M. Lund and published in *STC Usability SIG Newsletter* in *Usability and User Experience an STC Community* (Lund, 2001).

Technique of Data Analysis

The technique of data analysis for media expert feasibility was descriptive analysis. The data obtained from media expert validation were converted into scores based on Likerts scale (Gwinner, n.d). The data then was analysed by calculating the average answers based on scoring each answer and respondent.

$$\text{Interval} = \frac{\text{highest score} - \text{lowest score}}{\text{number of internal class}}$$

$$\text{Interval} = \frac{5 - 1}{5}$$

$$\text{Interval} = 0,8$$

The technique of data analysis for content expert feasibility was obtained from content expert's validation. Data in the form of questionnaire were converted into score based on Guttman scale (Riduwan, 2011).

Total high score = highest score x number of questions
(1x7 = 7 = 100%)

Total low score = lowest score x number of questions
(0x7 = 7 = 0%)

Number of classes = 2 (false and true)

$$\text{Interval} = \frac{\text{highest score} - \text{lowest score}}{\text{number of internal class}}$$

$$= \frac{100\% - 0\%}{2}$$

$$= 50\%$$

Based on the interval calculation, the assessment classification by content expert on Batik Detector application can be seen in Table 2.

Assessment of *functional suitability* aspect was conducted using test case. Test case was for 3 experts of software engineering. The test case was in Guttman scale using alternative answers: succeed or failed.

The quality analysis of *performance efficiency* can be obtained from the memory and CPU usage. The testing fulfilled *performance efficiency* aspect if no leak memory happened and the memory usage did not reach the limit determined by Little Eyes; that is not more than 15% (Murthy, 2013).

Compatibility aspect of this application will be experimented in some version of Android, from Jellybean up to KitKat.

TABLE I. CLASSIFICATION OF ASSESSMENT BY THE MEDIA EXPERT

Average Answer	Assessment Classification
> 4,2 – 5,0	Very Feasible
> 3,6 – 4,2	Feasible
> 2,6 – 3,6	Quite Feasible
> 1,8 – 2,6	Not Feasible
1,0 – 1,8	Really Not Feasible

TABLE II. CLASSIFICATION OF ASSESSMENT BY THE CONTENT EXPERT

Score (x)	Assessment Classification
X > 50%	Valid
X < 50%	Less Valid

TABLE III. TABLE OF SCORE INTERPRETATION (GURITNO, 2011)

Percentage	Feasibility Criteria
0% - 20%	Really Not Feasible
21% - 40%	Not Feasible
41% - 60%	Quite Feasible
61% - 80%	Feasible
81% - 100%	Very Feasible

The calculation was done under the following formula:

$$\text{Percentage} = \frac{\text{Gained Score} \times 1}{\text{Maximum Score}} \times 100\%$$

The test of usability aspect was conducted by calculating the average of answers based scoring of each answer from USE questionnaire filled by the respondents. The feasibility percentage of the application was calculated as follows:

$$\text{Percentage} = \frac{\text{Gained Score}}{\text{Maximum Score}} \times 100\%$$

After obtaining result, the percentage was compared with the criteria of score interpretation in Table 3.

III. RESULT AND DISCUSSION

The development of Batik Detector application as the learning media for Indonesian Batik patterns and motifs is conducted through some steps, 1) Need analysis, 2) Design, 3) Implementation, and 4) Test.

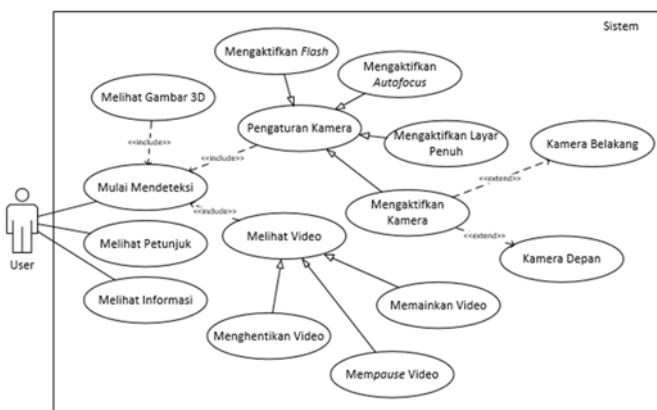


Figure 2. Use Case Diagram Batik Detector Application

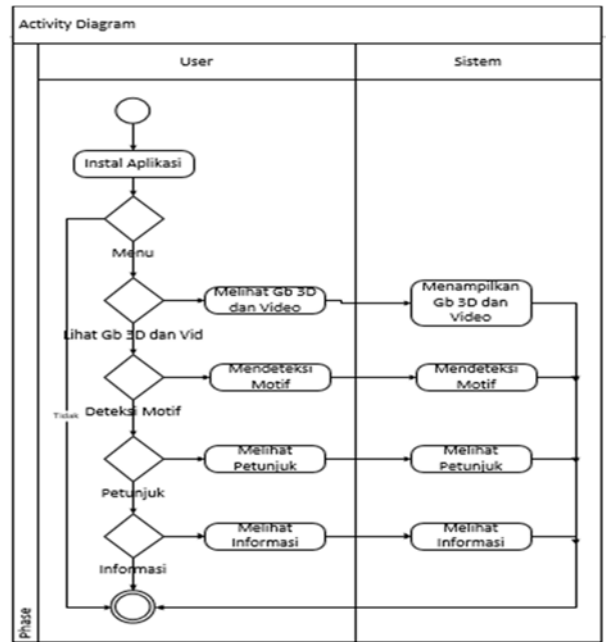


Figure 3. Activity Diagram Batik Detector Application

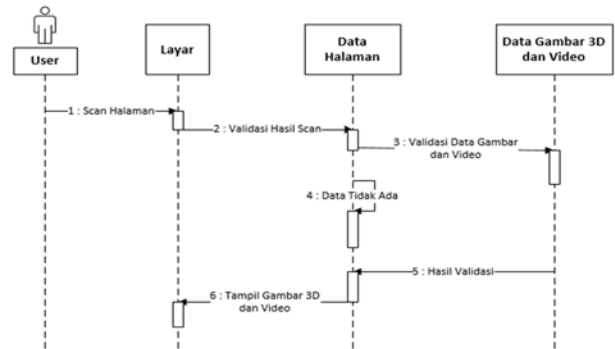


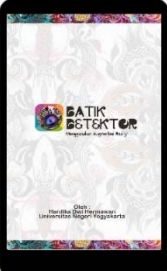



Figure 4. Sequence Diagram Batik Detector Application

The analysis was to identify the need of designing media. The contents which published in this learning media were definition of Batik, UNESCO acknowledgement, explanation of Batik making equipments and process, also explanation on Batik motifs from some regions in Indonesia. The developed product needed minimum specification of Android smartphone. They were 1) OS Android Jelly Bean 4.1, 2) minimum Storage 512 MB, and 3) small, normal, large, and extra-large screen dimensions.

Designing stage was to design the system and interface of developed media. It involved designing UML and designing interface. Design of system was using UML depicted through *use case diagram*, *activity diagram*, and *sequence diagram* as shown in Figure 1-3.

The next stage was media implementation based on the design made on the previous stage. Table 4 was to explain the result of implementing interface of Batik Detector learning media.

TABLE IV. INTERFACE IMPLEMENTATION OF BATIK DETECTOR APPLICATION

No	Interface	Description
1.	<p><i>Splashscreen</i></p> 	<p><i>Splash Screen</i> was an initial page at first the application is opened. This page shows the logo of the application, the name of the developer and institutions. This page appears a few seconds. Once completed, it will turn to the home page.</p>
2.	<p>Home</p> 	<p>The home page is the main page that contains 3 main menu as follows: The start menu is used to start detecting book Batik Detector. Help menu is used to get instructions of using Batik Detector application. Information menu is used to find out information about the application, developers, and addresses to get the application.</p>
3.	<p>Start Page</p> 	<p>Once users click it, the page will show the brief instructions as shown by a figure in the left column. There is a "OK" button to click if the instructions was already read. After that, the smartphone will automatically open the camera menu.</p>
	<p>Camera Page</p>  <p>Detecting Batik motifs</p>	<p>This page will open the default camera on smartphone. Camera page is used to start detecting detector Batik book from cover to Indonesian batik motifs. This page has submenu to set the detection of the page by double tapping the camera screen. The cover page of the application displays 3D objects and video cover on the front of the block in augmented reality. For motif page, the camera will automatically detect the batik camera and display the icon of playing video according to detected motif.</p>





		<p>In this section, we can see the digital and real objects in real time.</p>
	<p>Setup Page</p> 	<p>This setup page appears by double tapping on the smartphone camera screen. The settings can be done are extended tracking, autofocus, flash, full screen and adjust the camera function of the front/ back.</p>
4.	<p>Manual Page</p> 	<p>Manual page contains an explanation of how to use the application. On this page there is a home and the next/back buttons. Home button serves to return to the main menu page. While the next/back button serves to continue or go back to the previous/ next pages.</p>
5.	<p>Halaman Informasi</p> 	<p>Information page contains an explanation of the application, the developers and address where the application can be downloaded. On this page there is a home button which serves to return to home/main menu.</p>

TABLE V. RESULT OF VALIDITY ASSESSMENT BY MEDIA EXPERTS

No.	Indicator	Total Score	Average	Assessment Classification
Software Engineering Aspect				
1	Effectiveness & Efficiency	23	3,67	Feasible
2	Reliability	28	4,67	Very Feasible
3	Maintenance	27	4,50	Very Feasible
4	Usability	28	4,50	Very Feasible
5	Maintainability	24	4,00	Feasible
6	Compatibility	14	4,67	Very Feasible
7	Reusable	10	3,67	Feasible
Visual Communication Aspect				
1	Audio	37	4,11	Feasible
2	Visual	28	3,88	Feasible

3	Communicative	15	4,67	Very Feasible
4	Creative Idea	23	4,67	Very Feasible
5	Animation	23	4,16	Feasible
6	Pictures	10	4,00	Feasible
Total Score		301	4,31	Very Feasible

TABLE VI. RESULT OF VALIDITY ASSESSMENT BY CONTENT EXPERTS

No	Explanation	Gained Score			Total
		Expert 1	Expert 2	Expert 3	
Batik					
1.	About Batik	1	1	1	3
2.	Batik History	1	1	1	3
3.	UNESCO acknowledge ment	1	1	1	3
Batik Motifs					
4.	Solo	1	1	1	3
5.	Cirebon	1	1	1	3
6.	Yogyakarta	1	1	1	3
7.	Bengkulu	1	1	1	3
8.	Madura	1	1	1	3
9.	Kudus	1	1	1	3
10	Pekalongan	1	1	1	3
Total		10	10	10	30
Kat/Percentage		Valid			100 %

TABLE VII. RESULT OF FUNCTIONAL SUITABILITY TEST

No.	Succeed	Failed	No.	Succeed	Failed
1	3	0	9	3	0
2	3	0	10	3	0
3	3	0	11	3	0
4	3	0	12	3	0
5	3	0	13	3	0
6	3	0	14	3	0
7	3	0	15	3	0
8	3	0	16	3	0

Total/percentage		48/100%	0
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TABLE VIII. RESULT OF COMPATIBILITY TEST

No	Types of Smartphone	OS Version	Installation	Process
1	Lenovo A328 4.5"	4.4 Kitkat	Installation succeed	Run well without error
2	Samsung Grand Prime 5.5"	4.4 Kitkat	Installation succeed	Run well without error
3	Advan S5J 5.5"	4.2 Jelly Bean	Installation succeed	Run well without error
4	Zenfone 5 5.5"	4.4 Kitkat	Installation succeed	Run well without error
5	Zenfone 4 4.5"	4.2 Jelly Bean	Installation succeed	Run well without error

The last stage of the tests is the test on quality and eligibility of the application.

Software Feasibility Testing

Application Feasibility testing includes media and content validation by experts. Three experts were for each media and content experts. Results of the validation assessment by media experts were analysed from the aspects of software engineering and visual communication as shown in Table 5.

Based on the obtained results of validation assessment by media experts, it reached average of 4.31 and belongs to 'very feasible' category. For validation assessment on material which conducted by three experts, the result showed 100% valid as depicted in Table 6.

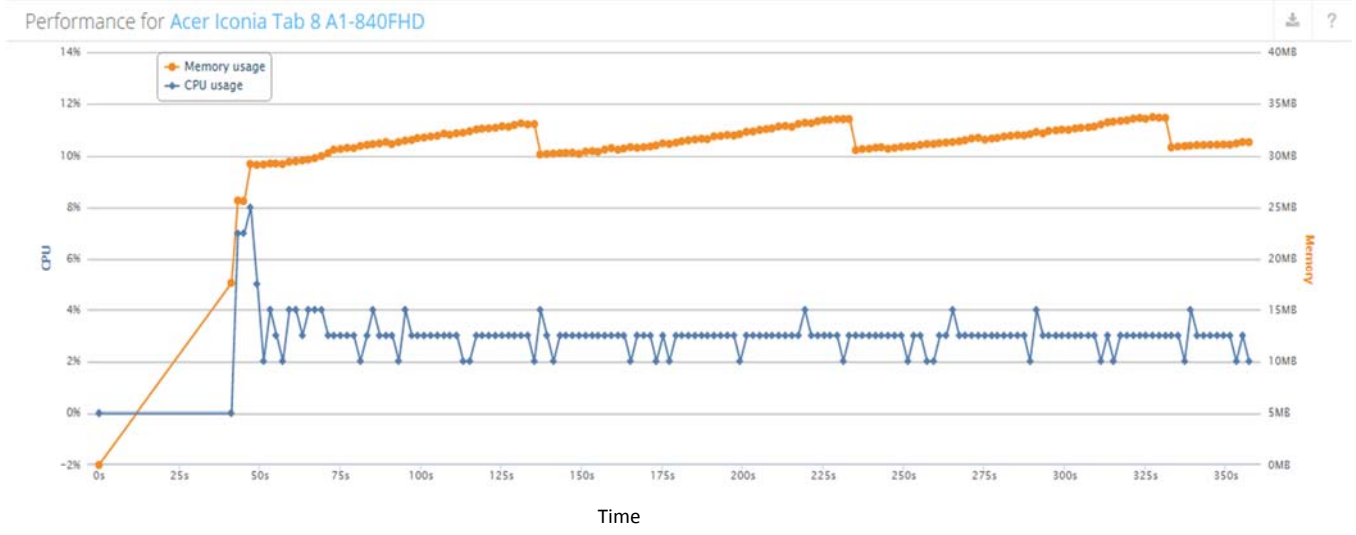


Figure 5. Result of CPU and Memory Usage Test

Software Quality Testing

Software quality testing consists of tests of efficiency performance, functional suitability, compatibility, and usability. The efficiency performance test was performed using *Testdroid*. The aspects observed were CPU and memory usages. The results were shown in Figure 4 showed the maximum CPU usage is 8%. The figure was still within safe limits set by Little Eye, which was 15%. Quite large memory usage was due to the existence of a video in this application.

Functional suitability test was conducted by three experts in the field of software engineering. Table 7 shows the results. Based on the test results, this application can 100% run smoothly and there is no failure. Compatibility test was conducted using 5 different Android devices. Compatibility test results can be seen in Table 8, which shows that this application can run well in various types of smartphones and Android versions.

The last stage of software quality test was upon the users (usability). They are 20 students at Singapore Indonesian School. Minimum number of sample is 20 people in accordance to Nielsen's opinion (Nielsen, 2012). The results of usability test which was conducted using questionnaires from Arnold M. Lund namely USE Questionnaire indicated as follows:

$$\begin{aligned}
 \text{Usability Percentage} &= \frac{\text{Gained score}}{\text{Expected score}} \times 100 \% \\
 &= \frac{2474}{3000} \times 100 \% \\
 &= 82,47 \%
 \end{aligned}$$

Based on the calculation of percentage on the aspects of usability, it was obtained 82.47%. The final rate shows "Very Feasible" scale.

IV. CONCLUSION

Based on the research and discussion, we can conclude as follows.

1. The development of "Batik Detector" application is conducted in some steps. Those are 1) Need analysis, 2) Design, 3) Implementation, and 4) Tests.
2. The result of "Batik Detector" quality test based on performance efficiency test has fulfilled the standard set by Little. The memory usage did not cause memory leak. The aspect of functionality, suitability, and compatibility has also been fulfilled.
3. Level of feasibility application "Batik detectors" was on the 'very viable' category based on media experts' opinion, on 'valid' category based on material expert, and in 'very good' category in terms of user (usability) included. The conclusion is that the application of "Batik Detectors" extremely fit for use as a learning media of Indonesian batik motifs.

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