



Dean's Message

It is my pleasure to welcome you to our latest issue of the FCSIT Research Bulletin for 2014.

The research at the Faculty is progressing well with more than 51% of the lecturers being Principle Investigators for internal and external research grants. Furthermore, there are 80 postgraduate students who are actively involved in various research projects in the Faculty. Nonetheless, there are also various challenges that we have to face in terms of R&D within the Faculty, university, nationally, and globally. The key challenge is finding a way to generate an environment to build upon existing research and scholarly activity in order to develop a strong academic culture where research, teaching, and commercialization are interconnected and equally valued.

This Research Bulletin covers all research areas in the Faculty and seeks to share the latest research activities and findings from various research projects within the Faculty. Sharing research findings is the key to ensure that the research can benefit others and is part and parcel of research activities.

I hope that this Research Bulletin will provide information to the readers on our current research activities and will stimulate further research and collaboration in relevant areas. Finally, I would like to express my sincere gratitude to the Editor-in-Chief of this Research Bulletin, Dr. Stephanie Chua, the editorial team, and to all contributors of the content within the bulletin, for all your efforts in ensuring the successful publication of the FCSIT Research Bulletin 2014.

Dr. Johari bin Abdullah
Dean
Faculty of Computer Science and Information Technology

Editorial Team

Advisor: Assoc. Prof. Dr. Jane Labadin
Editor-in-Chief: Dr. Stephanie Chua
Editorial Team Members: Dr. Dayang Nurfatimah bt Awang Iskandar
Emmy Dahlia bt Hossain
Norazian bt Mohd Hamdan
Suhaila bt Saeed
Wee Bui Lin

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 Dr. Narayanan Kulathuramaiyer
 Dr. Wang Yin Chai

Associate Professors

Dr. Balisoamanandray Ranaivo-Malaçon
 Dr. Jane Labadin
 Dr. Tan Chong Eng

Senior Lecturers

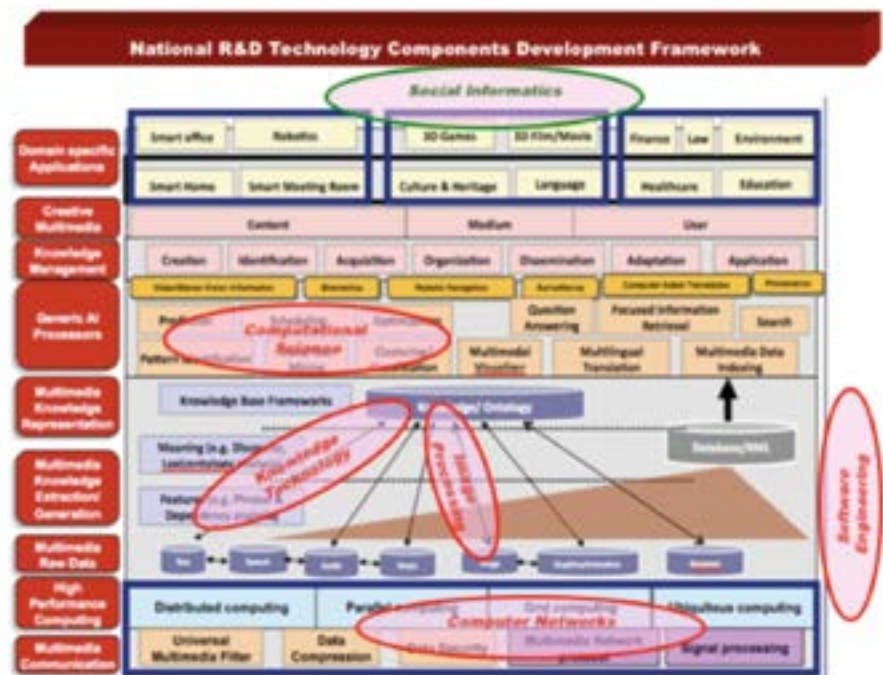
Dr. Adnan Shahid Khan
 Dr. Azman Bujang Masli
 Dr. Bong Chih How
 Dr. Chai Soo See
 Dr. Cheah Wai Siang
 Dr. Chiew Kang Leng
 Dr. Dayang Nurfatimah bt Awang Iskandar
 Dr. Edwin Mit
 Dr. Halikul Lenando
 Dr. Hamimah bt Ujir
 Dr. Irwandi Hipni Mohamad Hipiny Inson bt Din
 Dr. Jacey-Lynn Minoi
 Dr. Johari Abdullah
 Jonathan Sidi
 Dr. Kartinah Zen
 Dr. Mohammad Hossin
 Dr. Mohamad Nazim Jambli
 Dr. Nadianatra bt Musa
 Dr. Noor Alamshah Bolhassan
 Dr. Nuha bt Loling Othman
 Dr. Shapiee Abdul Rahman
 Dr. Stephanie Chua Hui Li
 Hj Syahrul Nizam Junaini
 Dr. Sze San Nah
 Dr. Tiong Wei King
 Dr. Wang Hui Hui

FCSIT R & D Roadmap 2012-2020

Strengthening R&D Culture

The FCSIT R&D Roadmap 2012 – 2020 is a comprehensive “living” document, currently at 327 pages, and is the first of its kind at UNIMAS. Launched on the 28th February 2013 by the then Vice Chancellor, Prof. Datuk Dr Khairuddin Ab-Hamid, it serves as the reference for alignment for the research at the faculty. The roadmap is the result of collective efforts of the faculty members through various workshops conducted at the faculty level.

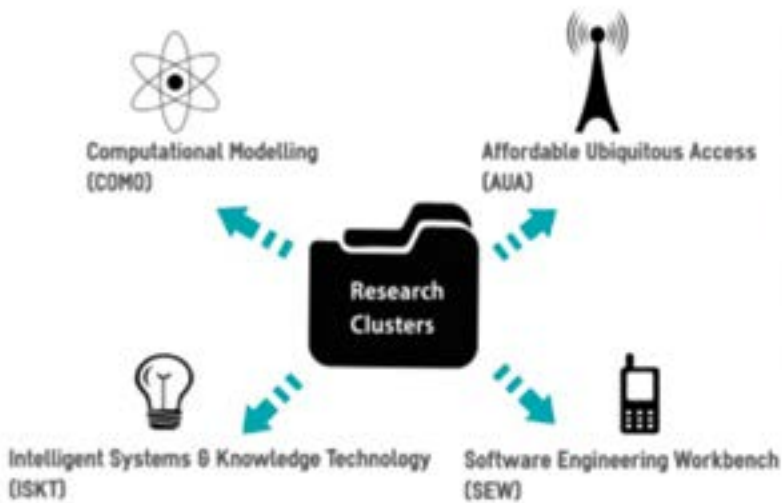
The FCSIT R&D Roadmap directly aligns with the National ICT R&D Framework as established by the Ministry of Higher Education (MoHE) National ICT Human Resource Development Task Force in their 2010 document on National ICT Human Resource Development Framework, which has since been adopted by MoHE and in the process of implementation by other ministries, agencies, universities and industries. In fact, the FCSIT R&D Roadmap is a refinement of certain areas of the National ICT R&D Framework, based on the strengths and experiences of the faculty, as shown in circles of the diagram below.



FCSIT R&D Roadmap as a refinement of the National ICT R&D Framework based on the strengths and experience of the Faculty

Hence, the faculty defined a vision for the FCSIT R&D Roadmap, namely – Conducting research & development and commercialising next generation infra- and info-structures, content, core competencies, services and products towards affordable ubiquitous broadband platforms for mobile internet running intelligent knowledge management technology systems/applications, with generic toolkits for software architects and developers for these domains.

These will be delivered via 4 strategies, each of which will be implemented via their defined programmes, and in turn by projects under the following clusters:



Affordable Ubiquitous Access (AUA)

(sub-goal – developing a computer networks toolkit for providing affordable ubiquitous broadband platforms for mobile internet).

- Network Infrastructure
- Network Technology
- Network Services

Intelligent Systems and Knowledge Technology (ISKT)

(sub-goal – developing state-of-the-art tools, modules and content for effective knowledge management, culminating in an intelligent system builder that will expedite the development of intelligent applications).

- Intelligent System Builder
 - Language Platform
 - Image Platform
 - Knowledge Platform
 - Knowledge Management Technology Platform

Computational Modelling (COMO)

(sub-goal - developing models that represent complex real life problems, the application of qualitative and quantitative analysis techniques to study such problems, the use of computers to solve the problems, as well as ensuring that the problem solving strategies are validated).

- Computational Modeling Workbench
 - Problem Characterisation
 - Techniques Multiplexor
 - Analysis Modules

Software Engineering Workbench (SEW)

(sub-goal – developing a generic software/application development system for software architects and developers)

- Analysis & Design
- Development
- Testing & Delivery (including Maintenance)

The above form the core components of the Roadmap, which will result in generic applications and tools that are modular and incremental in terms of development, and most importantly reusable in other applications. The core components have exemplar projects to assist in setting immediate targets.

Since 2012, the faculty has successfully secured 67 grants amounting to more than RM4.7 million.

Faculty Members

Lecturers

Abdul Rahman Mat
 Ahmad Hadinata Fauzi
 Amelia Jati ak Robert Jupit
 Azlina bt Ahmadi Julaihi
 Chiu Po Chan
 Dyg Hanani bt Abang Ibrahim
 Eaqerzilla Phang
 Emmy Dahliana bt Hossain
 Fatihah bt Ramli
 Hamizan bt Sharbini
 Izzatul Nabila bt Sarbini
 Jennifer Fiona ak Wilfred Busu
 Lau Sei Ping
 Lee Jun Choi
 Ling Yeong Tyng
 Mohamad Imran Hj Bandan
 Mohamad Johan Ahmad Khiri
 Mohamad Nazri Khairuddin
 Muhammad Asyraf Khairuddin
 Noor Hazlini bt Hj Borhan
 Noralifah bt Annuar
 Norazian bt Mohd Hamdan
 Norfadzlan Yusup
 Nurfaeza bt Jali
 Nurul Zawayah bt Mohamad Phang Piau
 Rajan Thangaveloo
 Rosita bt Mohamed Othman
 Sarah Flora ak Samson Juan
 Seleviawati bt Tarmizi
 Suhaila bt Saeed
 Suriati Khartini bt Jali
 Sze Jeeu Fong
 Tan Ping Ping
 Terrin Lim
 Wee Bui Lin
 Yanti Rosmunie bt Bujang

AUA

01

Title: Development of Security Protocols for Mobile Multihop Relay Based WiMAX Networks
Project Leader: Dr. Adnan Shahid Khan
Project Member(s): Dr Johari Abdullah, Dr Halikul Lenando

Mobile multihop relay (MMR) Worldwide Interoperability for Microwave Access (WiMAX) networks support multihop communication to increase wireless coverage and provide lower backhaul deployment cost with high throughput. Due to lack of physical infrastructure, MMR WiMAX is vulnerable to several medium access control (MAC) layer attacks especially denial of service, replay attack, man in the middle attack and interleaving attack. The objective of the research work is to develop security measures in MMR WiMAX networks to provide secure end-to-end data transmission and secure multicast and broadcast service (MBS). The proposed MMR WiMAX security protocols incorporate two different security phases, one for authentication and key management and the other for ensuring forward and backward secrecy in MBS. In the first phase, self-organized efficient authentication and key management scheme (SEAKS) is proposed to counter various attacks. In the second phase, a secure and efficient distributed relay-based rekeying algorithm (SEDRRA) is proposed to tackle forward and backward secrecy. According to the simulation analysis, SEAKS protocol exhibits higher packet delivery ratio by 13% and 22%. It also experiences lower packet overhead by 9% and 12% and lesser processing time by 43% and 14% as compared to SEN XU and OD-2009 respectively. Mathematical analysis proves that SEAKS protocol is more efficient in terms of communication cost as compared to OD-2009. BAN LOGIC verifies the correctness and security proficiency of the SEAKS-PKMv1 and SEAKS-PKMv2 authentication protocols against MAC layer attacks. Based on Mathematical derivation, the communication cost of SEDRRA protocol outperformed relay multicast rekeying algorithm (RMRA) by 33% for single hop and 90% for the multihop. The communication complexity has been reduced from $O(n)$ to $O(1)$ as compared to RMRA in MBS. Formal analysis using rank theorem proved that SEDRRA protocols hold forward and backward secrecy compared to RMRA protocol. Most importantly, the proposed security protocols have significantly enhanced network performance by providing efficient counter measures for security vulnerabilities. The proposed SEAKS protocols are backward and forward compatible which is applicable to mobile WiMAX networks. SEDRRA however, can be applied to secure MBS including for pay-per-view and TV broadcasting applications.

AUA

02

Title: A Dynamic Energy-savvy Routing Algorithm for Mobile Ad-hoc and Sensor Networks
Project Leader: Dr. Mohamad Nazim Jambli
Project Member(s): Dr Johari Abdullah, Dr Halikul Lenando, Sinarwati Mohamad Suhaili

The increasing interest in MASNET applications poses several challenges to design efficient routing protocols for MASNETs as the sensor nodes have limited power source, memory, bandwidth and energy. In MASNETs, mobile nodes are deployed in mobile applications such as ocean temperature monitoring and these moving nodes network cause the network topology to keep on changing. The frequent topology change effects the communication between these nodes and increases the energy consumption related to transmitting and receiving packets. Since this communication is the most energy-consuming activity in MASNETs, the power use for transmission or reception of packets should be controlled as much as possible in order to prolong the network life time and the reliability of network communication in MASNETs. Thus, the proposed energy-savvy routing algorithm for MASNETs based on Transmission Power Control (TPC) and energy metric can effectively reduce energy consumption by adaptively controlling the transmission power in real time and use the most energy-efficient routing route for communication based on the estimated distance between nodes, which is determined by Link Quality Estimator (LQI) values. The use of ideal transmission power for communication and the transmission of packets based on the most energy-efficient route to the destination will indirectly prolong the life time and the reliability of communication of MASNETs in mobile environment. Therefore, the main objectives of this research project are to analyse how far the impact of mobility on MASNETs is and to propose a new energy-savvy routing algorithm for MASNETs in mobile environment. The proposed energy-savvy routing algorithm will be evaluated and compared with the basic AODV in MASNETs through extensive simulation environment. It is expected that the proposed algorithm will prolong the network lifetime of MASNETs in mobile environment that can be implemented on a real sensor to be deployed on any MASNET's applications.

ISKT

01

Title: Inducing Morphological Information from Three Under-Resourced Languages (U-RL) in Sarawak
 Project Leader: Suhaila Saeed
 Project Member(s): Assoc. Prof. Dr. Balisoamanandray Ranaivo-Malançon

Morphological analyser is an important component for many Natural Language Processing (NLP) applications. This project aims to induce morphological information from the text corpus of three types U-RL in Sarawak by using two established segmentations tools. Since the automatic method has its own drawbacks, the results obtained from this morphology induction process will be verified by native speakers. This is due to the fact that the linguistic resources required for the evaluation did not yet have a segmentation reference, or gold standard. Therefore, it will be constructed based on existing resources of the U-RL. The U-RL(s) are Sarawak Malay, Bidayuh and Penan languages. The gold standards of the languages shall be used as a reference in other NLP works for U-RL in Sarawak.

ISKT

02

Title: The Modified Data Classification Version of Bacterial Foraging Swarm Optimization Algorithm
 Project Leader: Dr Mohamad Bin Hossin
 Project Member(s): Dr Syafiq Fikri Lee Nung Kion (FCSHD), Assoc. Prof. Dr. Md Nasir Sulaiman (UPM)

The Bacterial Foraging Swarm Optimization (BFSO) algorithm was originally introduced to solve distributed optimization and control problems. Since its inception, the BFSO algorithm has drawn many attentions of researchers and has been proven its effectiveness over many variants of Genetic Algorithm and Particle Swarm Optimization on many real optimization problems. However, the use of BFSO in data analysis and data mining were still not thoroughly explored by the researchers. Therefore, this proposal proposes two modified versions of BFSO algorithm that are specifically designed for data classification problems. This modified BFSO algorithm will be constructed from adaptations of other nature-inspired optimization algorithms. In order to build a BFSO classifier, the original BFSO will incorporate a suitable clustering strategy and learning strategy from other nature-inspired algorithms, which is as in most classifiers, is pre-defined. Then the second proposal uses the ideas of other nature-inspired techniques to build a constructive BFSO that can eliminate the need for the user to pre-defined the swarm size, which is a critical parameter that is required by many data classification algorithms. Through these modifications, we believe the convergence process of original BFSO can be sped up and simultaneously, able to train an optimal classifier with good generalization ability. Then, all these modified versions of BFSO will be analyzed and compared with a wide range of databases from the literature which varies in terms of domains, dimensionality, volume and noise data. This study will recommend and discuss which modified version of BFSO is better for data classification problems. Lastly, the modified versions of BFSO algorithm will be compared to other data classification algorithms in terms of effectiveness (accuracy) and its time efficiency in Sarawak.

ISKT

03

Title: A Design of Transcribing Tool for Kelabit Language
 Project Leader: Emmy Dahliana Hossain
 Project Member(s): Assoc. Prof. Dr. Jane Labadin

The Kelabit language is an under-resourced language, which means the language do not have sufficient resources such as data, linguistic resources (including computational linguistic resources), and literature, as well as language technologies, to maintain itself. Currently, there are no specific transcribing tool that is specifically tailored for the Kelabit language, and the Kelabit community's usage. The transcribing tool is a type of software that enables users to do transcription work: listen to audio files containing the spoken/dictated materials, type the transcription text on the tool's text editor, and save the transcription for further usage in other endeavours. This research aims to produce the design of a transcribing tool meant specifically for the Kelabit language and the Kelabit people.

Title: Global Model and Observatory for International Responsible Research And Innovation Coordination
 Project Leader: Dr Rohaya Mohd Nor (FEB)
 Project Member(s): Prof. Dr. Alvin Yeo, Dr Nadianatra Musa, Dayang Hanani Abang Ibrahim (FCSIT), Dr Mahani Mohammad Abdu Shakur and Muhd Hafiz (FEB), Dr Nariman Singmamae (FMHS)

In an increasingly globalized world, efforts to foster the take up of Responsible Research and Innovation (RRI) could lead to positive and durable impacts, provided they are not restricted solely to national or European boundaries; but rather, are implemented worldwide. The project's vision is to become an effective knowledge transfer tool that diffuses scientific knowledge and simultaneously involves researchers, policy makers as well as societal stakeholders in a user-friendly manner, to further the concept and practice of RRI. The strategy for fulfilling this vision is to integrate the RESPONSIBILITY Observatory in an innovative way that will assist the research community to develop and implement RRI in their own research and innovation process.

Title: An Enhancement of Provenance Model to Enable Reproducibility
 Project Leader: Dayang Hanani Abang Ibrahim
 Project Member(s): Dr. Johari Abdullah, Assoc. Prof. Dr. Jane Labadin, Dr. Nadianatra Musa, Dr. Chiew Kang Leng

Reproducibility is now becoming a key research area for science. This is because it provides a way to validate, and build on, previous experimental results. This study is to propose an enhancement of a provenance model that enables reproducibility. This research will produce an extended model, based on the Open Provenance Model (OPM), which is capable of addressing service versioning issues. This study also involves the design of a new technique to allow reproduction of past experiments. A proof-of-concept prototype is implemented and evaluated, which is based on the Web Services architecture, to demonstrate and validate the feasibility of this approach. Finally, a reproducibility taxonomy will be presented that provides a better understanding of information required for reproducibility in the presence of versions and provenance

Title: A Generative Probabilistic Linguistic Algorithm to Support Open-domain Question and Answering
 Project Leader: Dr Bong Chih How
 Project Member(s): Assoc Prof Dr Norisma Idris (UM) and Dr Stephanie Chua

Adaptive help seeking (ALS) in adaptive learning environment has played a major role in helping students to apply the knowledge they have gained. However, current questioning and answering component in ALS lacks the scalability to cover wider learning topics and capability to handle complex natural language questions, thus, rendering the answers irrelevant to the question asked, especially if the question falls out of the templates in the tailored system. Past research had shown that open domain questioning and answering (Q&A) was able to improve student learning experience, but with the limitation particularly in handling complex questions. The ultimate goal of the study is to propose a computational semantics approach based on natural language processing and machine learning to support high degree of natural language questions in Q&A. This study is to propose a probabilistic generative approach to discover hidden topics embedded in the question to help students in solving problems. The study examines approaches to map words distribution in the question to important principles and equations through semantic analysis. The study will produce a robust and scalable open-domain Q&A approach to provide guidance in solving problems. The approach is expected to improve students' learning experience, especially ALS when integrated into the existing adaptive learning environment. Finally, a comparison will be carried out at the end of study to evaluate the proposed approach. The study will focus on adaptive learning environment in the domain of Physics.

Title: Language Documentation and Dictionary Resource Development for Machine Readable Dictionary (MRD) of Underdescribed and Undeveloped Indigenous Language
 Project Leader: Dr Norazuna bt. Norahim (CLS)
 Project Member(s): Suhaila binti Sae (FCSIT), Mohamad Fairuz (CLS), Isabella binti Jali (CLS) & Bibi Aminah binti Abdul Ghani (Curtin University of Technology)

By year 2100, it is predicted that half of the existing 7,000 world languages will disappear. Dictionary resource development is a critical first step towards documentation and revival of the disappearing cultures, and languages of the world. Many Orang Asli and indigenous languages of Sabah and Sarawak are still underdescribed and undeveloped. Hence, this study embarks on a two-tier dictionary resource development project of one such community language with less than 5,000 speakers situated in Miri, Sarawak.

Title: Applying Text Mining Techniques to Sarawak Gazette
 Project Leader: Dr Stephanie Chua
 Project Member(s): Assoc. Prof. Dr. Balisoamanandray Ranaivo-Malançon, Emmy Dahlia Hossain

Text mining is the process of extracting useful information from textual data. It encompasses a number of tasks including text clustering, text classification, entity extraction and sentiment analysis among others. The task of interest in this research project is entity extraction. Entity extraction is the process of finding and classifying the text elements into predefined classes such as the names of persons, organizations, locations, dates and so on. It is also known as named entity recognition. Sarawak Gazette is a collection of historical news documents from Sarawak from 1870 to 1984. This collection of documents contains a lot of entities that can be identified so that further processing can be performed on it. The uniqueness of this collection is that the documents are historical and thus, has immense value to the preservation of Sarawak history. Currently, this collection of Sarawak Gazette is in .pdf format. The documents need to be converted into .txt format before any processing can be performed on it. In order to learn a model to perform annotations on the collection, manual human effort is first needed to annotate and verify the annotations for a portion of the Sarawak Gazette collection. The portion used cannot be too large as manual annotation and verification takes time and effort. Therefore, it is suggested that the collection from years 1903 to 1923, which contain 430 pages of documents, is used for manual annotation and verification. When this is completed, text mining techniques can be used to learn a model that can be used to annotate other documents in the collection. Hence, the aim of this research project is to use the machine learning approach by applying text mining techniques to learn a model for annotating the Sarawak Gazette.

Title: A Pattern Discovery Model for Text Mining
 Project Leader: Dr Stephanie Chua
 Project Member(s): Dr Bong Chih How, Dr Puteri Nor Ellyza bt Nohuddin (UPNM)

Text mining is a process of extracting useful information from unstructured textual data such as web pages, emails, news articles and other text-based documents. The use of keywords as a basic feature for representation in text mining is fairly common. However, with the natural language text being rich with semantics, a keyword can be highly ambiguous. Therefore, the use of phrases for representation becomes increasingly popular. A phrase here is defined as two or more words occurring together in a sequence and thus, is less ambiguous than a keyword. The use of phrases is largely motivated by the potential benefit of preserving semantic information that is not present in keywords. However, despite being a richer representation, the use of phrases did not show significant improvement over the use of keywords because of a number of problems. It was found that not all phrases extracted from textual data were good content indicators. In addition, phrases have a low frequency of occurrence because of their uniqueness and thus, were statistically less significant than keywords. Many phrases were actually corresponding to the same keyword feature. In order to overcome the problems with using keywords and phrases, an alternative representation is needed to provide a better representation of textual data. This research therefore focuses on deriving a pattern discovery model by adopting the techniques for frequent pattern mining to discover useful and interesting frequent patterns in textual data. The discovered frequent patterns are then used as features for representation of the textual data. This proposed pattern discovery model is evaluated by applying it to a text classification task. In particular, the use of pattern representation will be compared with the keyword and phrase representations. The machine learning approach to text classification will be employed, using the Waikato Environment for Knowledge Analysis (WEKA) machine learning workbench.

Title: Effect of Climate Change on Rates of Water Inflow Erosion and Sedimentation at Bengoh Dam
 Project Leader: Ir. Dr. Kuok King Kuok (Swinburne)
 Project Member(s): Chiu Po Chan (FCSIT), Mohd Elfy Mersal

Global warming as a result of greenhouse gases has caused irreversible climate change to the planet. Consequently, flash floods and prolonged draught seasons seem to happen more regularly in recent years. Such natural disasters have the potential to cause loss of human lives as well as massive damages to infrastructures and economy. Therefore, the ability to reliably predict future climate is of paramount importance. Therefore, global circulation models (GCM) are developed. GCMs are mathematical models that quantified future climate change in terms of increasing greenhouse gases scenarios (IPCC Data Distribution Centre, 2011). However, the data generated by GCMs are too coarse, spanning from 150km to 500km. Thus, it is impractical for direct application. In order to increase reliability on regional climate forecasting, downscaling approach was adopted to refine the resolution of GCMs (Wilby et al., 2012, Harun et al., 2008 and Mpelasoka, 2000). It involves finding correlation between GCMs outputs and local weather data, and quantifying the relationship into equations. The main aim of this research is to use existing artificial neural network (ANN) models to downscale GCMs for predicting potential regional climate changes. The results will be compared with the more well-established Statistical Downscaling Model (SDSM). Rainfall and runoff data from 1960 to 1990 will be used for model calibration, and will be validated with two sets of data ranging from 1990 to 2000, and from 2000 to 2010. The accuracy of the simulation results will be evaluated using root mean square error (RMSE), coefficient of correlation (R) and coefficient of efficiency (E2). The model that produced the most accurate simulation results will be used to forecast rainfall and runoff data starting from 2020 to 2080. Thereafter, the most accurate predicted future rainfall and runoff will be selected as input data into Infoworks RS (InfoWorks RS, 2013). The reliably predicted future rainfall and runoff data will then be used to simulate the inflows rate of water into Bengoh reservoir during drought season, and forecast future erosion and sedimentation rates at downstream of Bengoh Dam during rainy seasons. The benefits of this study are to ensure that there would be sufficient water inflow for generating hydro power at Bengoh Dam in the near future during drought season.

COMO 01

Title: The Effect of Damping on the Evolution of Large-Amplitude Undular Bores.

Project Leader: Dr Tiong Wei King

Project Member(s): Dr Chiew Kang Leng, Dr Sze San Nah, Ong Chee Tiong, Tay Kim Gaik

In real world problems, nonlinear waves are often propagating in a weakly nonlinear and weakly dissipative environment, e.g. shallow water waves propagating in a river and internal waves propagating in ocean subject to frictional effects. In this proposed work, we are interested in studying the effect of damping or friction on the evolution of large-amplitude undular bores. An undular bore represents a slowly modulated nonlinear periodic wavetrain with a solitary wave at the leading edge and a linear wave packet at the trailing edge while a solitary wave is a nonlinear localised wave of permanent form. The appropriate mathematical model for this problem is the perturbed extended Korteweg-de Vries (peKdV) equation. In this project, we will consider two types of dissipative terms, i.e. linear friction and Chezy friction and examine the impact of these types of dissipation on the evolution of undular bores. The detailed analysis of the behaviour of damping of large-amplitude solitary waves and the theory behind it was carried out by Grimshaw et al. (2003). However, the analogous theory for nonlinear wavetrain propagating in a weakly nonlinear and dissipative environment has not been developed so far. In the context of water waves, nonlinear wavetrains are often generated in the form of undular bores, which connect two different basic flow states and exhibit solitary waves at one of the edges. Undular bores can be generated as the result of dispersive resolution of a shock or an initial discontinuity in fluid depth/velocity (Smyth & Holloway, 1988; El, Grimshaw & Smyth, 2006; Esler & Pearce, 2011). Another way to form an undular bore is through the resonant interaction of a fluid flow with variable topography (Grimshaw & Smyth, 1986; El, Grimshaw & Smyth, 2009). The principal aim of this work is to study the impact of different types of dissipation on the evolution of the undular bores using Whitham modulation theory and numerical simulations.

COMO 02

Title: An Efficient Numerical Method for Solving the Gardner Equation

Project Leader: Dr Sze San Nah

Project Member(s): Tay Kim Gaik

In real world problems, waves propagation are modelled using nonlinear wave evolution equations, e.g. the Korteweg-de Vries (KdV) equation, the Gardner equation and nonlinear Schrodinger equation. Due to the nonlinearity effects, most of the solutions of the nonlinear wave evolution equation have to be obtained numerically. Thus, suitable and stable numerical methods are important in order to obtain accurate results. Although there are various numerical methods available, not all of them are suitable to solve a particular nonlinear evolution equation. In addition, different methods have different computation time and thus effecting the simulation time. Therefore, the aim of this project is to find an efficient method to solve the Gardner equation.

COMO 03

Title: Quantifying Fear Factor to be Used in Disease Modeling

Project Leader: Ling Yeong Tyng

Project Member(s): Assoc. Prof. Dr Jane Labadin, Dr Shapiee Abd Rahman

In the mathematical behavioral-disease model, the population is assumed as well-mixed. But in fact, the population has the characteristics of heterogeneity. The mathematical model has the limitation to provide a solution applied to a heterogeneous population. The limitation of the mathematical model can be overcome by individual-based model, where it is a computational approach for the simulation of the actions taken and the interactions of the individuals in the population. In the behavioral-disease model, "Fear" and "Vaccinated" compartments are introduced as the extension of the conventional SIR model. The governing equations for the model consist of a set of parameters. One of the parameters, which is to measure the probability of an individual getting fear, need to be quantified through the specific method as the feel of fear cannot be detected by eye sight. The fear or awareness has to be measured in the population because it is an important value to determine the impact of the prevention actions taken by the government in controlling the spread of infectious diseases. With the behavioral-disease model, the effect of awareness or fear among the rural residents on the spread of the infectious disease can be observed and therefore may assist the government in organizing health programs more effectively.

COMO

05

Title: 3D Facial Features Tracking for 4D Facial Expression Intensity Estimation

Project Leader: Dr Hamimah Ujir

Project Member(s): Dr Dayang Nurfatimah binti Awg Iskandar, Dr Michael Spann, Dr Irwandi Hipni bin Mohamad Hipiny, Muhamad Najib bin Zamri

This research is motivated by the completion of our previous project which focused on finding the discriminative facial feature to classify six basic expressions using static type of data without intensity information [12]. Facial expressions provide the cues of communication in which we can interpret the mood, meaning and emotions at the same time. In addition, facial expressions are highly dynamical processes and looking at sequences of faces instances rather than to still images can help to improve facial expression classification performance. The function of facial expression intensity is to convey the level of psychological arousal to other people. The most prolific way to measure the facial expression intensity is to track the 3D properties that deform in 4D space. These properties should be the significant properties that involve the deformation of at least seven basic facial expressions (anger, disgust, fear, happy, sad, surprise and neutral) and therefore the facial deformation can be scrutinized. The establishment of the 4D (3D data plus time) database has made it possible to track 3D facial features. This database is available upon request and has been developed by the University of Binghamton, United States. They successfully acquired seven basic facial expressions of 4D data. In this project, the trajectory of 3D facial properties shall be investigated and its exclusive relationship with the level of facial expression intensity shall be defined. The expected outcome is a prototype of 4D facial expression intensity estimation system which will be using the discriminative 3D facial features delivered in this research. The estimation of human facial expression intensity is an important step in enhancing the capability of human-robot interfaces. Besides, any sign of the 3D features deformation with an ordered trajectory shall serve as a signal to the observer as the cue of emotional changes which will bring benefit to psychological studies as well as a start on a development of an emotional detection augmented reality tool.

COMO

04

Title: Application of Second Hadamard Variation to a Dam / Filtration Problem

Project Leader: Dr Nuha Loling Othman

Project Member(s): Dr Tiong Wei King, Izzatul Nabila Sarbini

The study of variational inequalities and free boundary problems finds application in a wide variety of disciplines including physics, engineering and economics as well as potential theory and geometry. In this study, we consider an application in physics and engineering where the steady state of the fluid flow through flow media rises to free boundary problem for linear elliptic equations. This problem has been widely considered in literature by Baiocchi [7], Brezis [10], Chipot [13] etc. At first, we deal with quantities defined on a domain. If the domain is perturbed, the quantities are perturbed. Such variation with respect to domain perturbation is called Hadamard variation. In this research, we want to present second Hadamard variational formula as an iterative scheme for computing solutions of a free boundary problem. We also combine this scheme with the other iterative scheme to get an optimal shape design of the free boundary problem. As for now, we only study the Hadamard variational formula theoretically. Particularly, we obtain Hadamard second variational formula, which is an extension of Garabedian-Schiffer's formula, developing a simple methodology, which provide a clearer understanding of Hadamard variational formula. From this, we will implement this formula into the dam problem which is one of the famous problem in free boundary problem. We will use this formula and the other iterative scheme that we combine as the new combine iterative scheme for the new solution of the free boundary problem.

COMMO

COMMO 06

Title: Evaluation of Existing 3D Facial Features Performance for 3D Facial Expression Using UPM-3DFE Database.

Project Leader: Dr Hamimah Ujir

Project Member(s): Dr Irwandi Hipni bin Mohamad Hipiny

Combinations of facial features form a human facial expression. Therefore, the deformation of facial features should be a suitable approach in order to determine the facial expressions shown by the subjects. The question is which 3D properties best describe the deformation of facial features so that a higher success rate of facial expression classification can be achieved. These 3D properties should be the significant properties that involve at least seven basic facial expressions (neutral, angry, disgust, fear, happy, sad, surprise) and therefore the facial deformation can be easily observed. In our previous works [12], we managed to prove that 3D surface normals are the most discriminative facial feature to classify six basic facial expressions. In the experiments, 3D surface normals were compared with the 3D facial points and 3D facial distance measurements (i.e. the distance from each of the facial point to the nose tip). The Bosphorus database was used in the previous experiments and it does not contain facial expression with intensity information. The existing work used the highest intensity expression in BU-3DFE database [11], therefore the comparison between our work and the works using BU-3DFE database was indicated as unfair. UPM-3DFE is the latest database developed by UPM researchers released in late of 2012. This database provides seven basic facial expressions without the level of intensity. Our goal is to compare the results obtained from the experiments using Bosphorus database with the experiments using UPM-3DFE database.

COMMO 07

Title: Staff Planning and Rostering at Malaysia Airport

Project Leader: Dr. Chiew Kang Leng

Project Member(s): Sze Jeeu Fong

This research studies manpower rostering and scheduling, focusing on airport ground staff operation. The human resource planning and rostering system in this study will assist in the scheduling of approximately 400 staffs for one of the largest airports in Malaysia. The system rosters airline ground staff over a monthly planning horizon so that work load is evenly distributed among the staff. Besides, staff overtime and idle time, the main productivity measure, is minimized. The rosters are subject to a large number of rules designed to ensure reasonable working conditions and service standards. This study consists of two optimisation modules: the first considers the main roster design, while the second is a task allocation module in which the system allocates individual tasks to the staff for any particular day. Solving this problem efficiently can be academically and economically significant (in terms of labour wages and time). However, this problem is very challenging to be solved optimally within its complex operational constraints. Thus, this research investigates on how heuristic and meta-heuristic methods can be applied effectively in the problem, to solve large problem instances and provide decision in a very short amount of time. This is due to the demand of effectively managed, in real-time, any emergency disruptions that occur such as aircraft delays, unexpected staff absences on the day of operations. The main goal of this study is to minimize staff overtime working hours and enable staff to take their annual leave, while the productivity of the airline is not compromised.

COMMO 08

Title: Integrating Surface and Subsurface in Open Channel Flow

Project Leader: Izzatul Nabila Sarbini

Project Member(s): Assoc. Prof. Dr Jane Labadin, Dr Tiong Wei King, Sze Jeeu Fong

The focus of this project is on the integration of surface and subsurface flow with the application on the behavior of flood. We consider only on channel water flow such as drains and rivers. The choice of such flow is due to the fact that such examples are normally the source of flash flood should the configurations allow the case. Hence, our study will reveal "what if" scenario, given specific configurations of drains and river and the amount of rain. As such, this project entails in formulating the mathematical model of this water flow with boundary and initial conditions; and solves these governing equations numerically and then simulates the scenarios. The simulations are based on Shallow water equations or Saint Venant equations. For our case, we are implementing the finite difference method to solve the governing equations which will be based on the equations earlier mentioned.

SEW

01

Title: Interactive Segmentation: How Extreme Learning Machine (ELM) Could Model The User Intention?

Project Leader: Dr. Chai Soo See

Project Member(s): Prof Dr Wang Yin Chai, Assoc Prof Dr Teh Chee Siong (FCSHD), Dr Wang Hui Hui

Recently, a novel machine learning algorithm namely Extreme Learning Machine (ELM) that can significantly reduce the training time of an NN was proposed. ELM has been successfully applied in image processing applications including image segmentation. To date, the use of ELM in image segmentation was focused only on automated image segmentation. This is mainly because the location and size of the strokes that the user input in interactive segmentation will affect the final segmentation result greatly. Moreover, the research using ELM in image segmentation focused on the use of medical images and not on the natural scene images, which has larger variabilities of objects of interest including inhomogeneous region appearance and ambiguous object boundaries. Therefore, the challenge of modeling the user intention by constructing an ELM model in interactive segmentation using appropriate input that would not fluctuate the segmentation error is looked into in this research, focusing particularly on natural scene images. To construct the ELM model, a user study to formulate the different input combinations is needed. The ELM model constructed could be used in criminal detection and medical imaging to detect and segment the particular object of interest using the user input formulated from this research.

SEW

02

Title: Portable Intelligent Sorting Machine for Grading Malaysia Pepper

Project Leader: Dr Dayang Nurfatimah Awang Iskandar

Project Member(s): Ahmad Hadinata Fauzi, Prof Dr Alvin Yeo



Sarawak pepper is one of the key agriculture exports, and it generates income for the local farmers in Sarawak. Processed pepper berries are graded by size, colour, moisture content, and extraneous matters. Currently, the use of an automatic commercial colour sorter for pepper berries is only for discriminating one grade, which is the best white pepper namely "Creamy white". The other ten grades are done manually in the lab. The manual, time consuming and error-prone pepper grading task can be improved using image processing, computer vision and automatic sorting machine. In our previous work, we have developed a system prototype that combines the colour and moisture content to automatically grade the pepper berries based on the Malaysia Pepper Board (MPB) ISO pepper grading standard. We have also built a simple preliminary prototype of a portable pepper grader. In this project, we will build an intelligent portable sorter machine which has the capabilities to grade and sort each berries based on their respective grade on site. This will serve as an up-scale prototype. The capabilities to extract higher grade berries from tones of white pepper berries will increase the income of the farmer and Malaysia Pepper Board because higher grade can be sold at a premium price. This prototype machine will use image processing and computer vision technique along with microcontroller engineering for sorting berries. It will be able to sort the berries accurately into more grades and faster. The current practice is to collect the dried peppers from the farms located at various sites in Sarawak, and the pepper samples are sent to the MPB labs for manual quality testing and price determination. This practice is costly and time consuming. To summarise, this project involves proof of concept, evaluation and up scaling of the existing Malaysia's pepper grading process.

SEW

03

Title : A Reusable Model for After School BM through Multipoint Technology

Project Leader: Dr. Cheah Wai Shiang

Project Member(s): N/A

Addressing the practical issue encountered in resource constrained schools where access to computer technology is limited, the exploration of single display groupware (SDG) provides an alternate solution to the problem. SDG is a technology which allows multiple users to work concurrently on a single display. The aim of this study was to investigate the effectiveness and the efficacy of SDG as educational technology. A prototype SDG system, Rimballmu, is designed and developed. Quantitative evaluations were carried out and the results showed the feasibility of Rimballmu towards students' engagement and performance while overcoming technical constraints. Based on the results collected from the evaluations conducted, the results proved that Rimballmu is able to engage with the community (e.g. Students, teachers) with positive affective impacts and motivational values. Meeting its core objective, Rimballmu is didactic, harnessing collaborative peer learning and interaction via single shared technology. On the other hand, the downside of the SDG is also presented and is worth future exploration.

Title: Formal Fuzzy-Based Approach to Model the Abstract Values of Beliefs to the Consequences

Project Leader: Dr. Edwin Mit

Project Member(s): Dr. Cheah Wai Shiang, Abdul Rahman Mat

This project is to formulate the truth values for the logical explanation derived from the taboos and beliefs of the indigenous community in Borneo. The project includes designing and building up a knowledge repository. There are complex and multi-relationships between taboos, beliefs and its consequences. The truthfulness of the knowledge acquired from the relationships is very uncertain, vague and ambiguous. The heterogeneous consequences of similar taboo and belief of different communities affect the preciseness of the capturing, modeling and manipulating the indigenous knowledge. Formal-fuzzy approach is an integration of formal methods and fuzzy logic. This approach is used, as formal methods is well-known for specifying a precise, complete and consistent software model and fuzzy logic is a well-known approach dealing with uncertainty problems. The designed framework, shown in Figure 1, is also expected to be used to preserve the knowledge behind the indigenous community taboos and beliefs. This knowledge is a baseline to derive the logical justification or explanation of the taboos and beliefs, related to current life style.

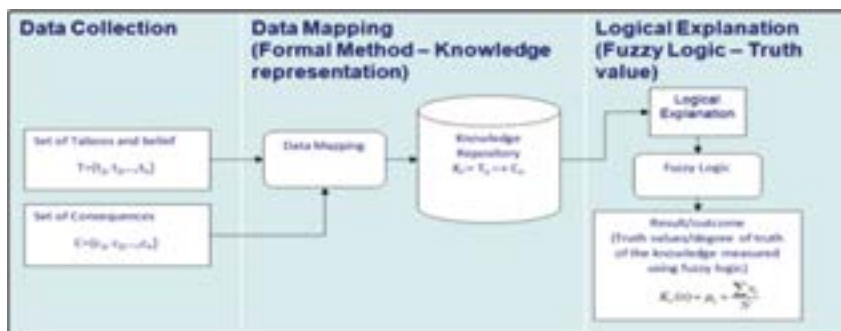


Figure 1: Indigenous Knowledge Repository Framework

Title: Artificial Bee Colony (ABC) Optimization Algorithm for Piper Nigrum Classification

Project Leader: Norfadzlan bin Yusup

Project Member(s): Dr Dayang Nurfatimah Awang Iskandar, Dr Shapiee bin Abdul Rahman

Pepper or the scientific name Piper Nigrum is grown predominantly in the state of Sarawak, Malaysia. With the production of 95%, the pepper of Malaysian origin is traded in the world market as Sarawak Pepper. Currently the grading of pepper berries is semi-automatic. Processed pepper berries are graded by size, colour, moisture content, and extraneous matter content. This research focuses on image processing and artificial intelligent techniques in classifying the pepper berries according to the respective grades. Previous research work had studied the fusion of



colour and moisture content. The objective of this research is to further investigate the fusion of all grading attributes which are size, colour, moisture and extraneous matter content using Artificial Bee Colony (ABC) optimization algorithm. ABC is one of the most recent optimization algorithms adapting the intelligent behavior of honey bees. The standard image processing and content-based image retrieval methodology will be used along with ABC. The end result of this research project is a framework and prototype for an effective and efficient automatic pepper grading utilising ABC. The outcome of this research can be extended as a framework for other agricultural products.

Title: System's Property Preservation Under Refinement in Integrated Formal Specifications.

Project Leader: Dr. Azman Bujang Masli

Project Member(s): Dr. Edwin Mit

The complexity of software systems is increasing and, consequently, making it more difficult and necessary to determine whether or not they work correctly. In the context of the currently applied software development techniques, tests are commonly used for validating software, but they cannot ensure that important behavioral properties of the system are preserved, such as robustness or safety requirements. Formal verification techniques aim to detect and aid the designer to correct mistakes during the software development, being useful when defining whether the software satisfies its requirements and specifications. Through formal modeling and verification methods, it is possible to determine if the system works correctly while considering all possible behaviors. This research project attempts to model and preserve the requirements of software system through formal modeling and verification methods.

Nonetheless, there will be different types of requirements co-existing in a system requirement, and this needs a technique to model the requirements and consequently to verify it via formal refinement. Hence this research project attempts to formulate a technique to combine the modeling of the different types of requirements in such a way that they can be formally verified and preserved. Thus, here the preservation of temporal properties of an integrated formal specification can be applied. In order to prove the technique, a case study of developing an eCommerce system for rural community will be used. The system is a part of Knowledge Transfer Programme (KTP) project conducted at the Institute of Social Informatics and Technological Innovation (ISITI), UNIMAS. The system is unique where the requirements may contain culture and tradition related needs. As a result, some preservation techniques will be proposed. Consequently, the research also looks into the formal verification technique of the requirements and this will result in methodology or procedures to verify the integrated requirements and how to preserve them.

Institute of Social Informatics and Technological Innovations



The Institute of Social Informatics and Technological Innovations (ISITI-CRI) began its operation in April 2011, and was upgraded from the Centre of Excellence for Rural Informatics (CoERI); the Centre was established given the success of our flagship bridging-the-digital-divide pilot project, eBario. A key focus of ISITI is to bridge the technology-people's gap; in particular, encompassing technological innovations for indigenous communities.



ISITI

Research Projects

01

Title: Indigenous Knowledge Governance Framework
Project Leader: Professor Dr Alvin Yeo Wee
Project Member(s): Prof Dr Narayanan Kulathuramaiyer, Dr Tariq Zaman

Development organisations acknowledge and recognise the role of Indigenous Knowledge (IK) in solutions to local problems. IK is a resource that can help produce more and better food, maintain healthy lives, share wealth, prevent conflict, manage local affairs, and thus contribute to global solutions. As a wide range of digital tools have been developed, researchers and development experts are focusing on how to use ICTs. However, ICTs for Indigenous Knowledge Management (IKM) have been designed using the conventional approach of creating and manipulating databases of knowledge. This typical approach of IKM generates the issues of indigenous knowledge governance, de-contextualisation and data manipulation. Hence, the main research question of the study is “How can we introduce indigenous knowledge governance into ICT-based Indigenous Knowledge Management System (IKMS)?” We have developed a holistic indigenous knowledge governance framework which helps to understand and systematically analyse the inherent social, cultural and governance structure of IKM in indigenous communities. We used the framework to model Penan’s indigenous botanical knowledge management system (Toro) and then evaluated the functionalities of the proposed framework by operationalising it in ICT-based IKM system (eToro).

02

Title: Mobile Computer Assisted Intervention Programme (Evaluation and Process Protocols) for Isolated Speech and Language Impairment Among Pre-School Children in Sarawak
Project Leader: Dr. Jacey-Lynn Minoi (PI)
Project Member(s): Dr. Chin Saw Sian, Prof Dr Alvin Yeo Wee, Assoc Prof Dr Ling How Kee, Mr. Tan Boon Seng

Studies showed that 3-10% of pre-school children may present with speech and language impairment (SLI). In a local Paediatrician-led children development centre (KCDC), children with SLI is the most important presenting problem that parents brought to seek professional help, which alone is 20% of overall clinic caseloads. Speech and language intervention programmes are vitally important to facilitate communication and to prevent ensuing difficulties of interpersonal relationship and mental health problems. Existing speech therapy sessions for children with SLI are usually done on one-to-one basis and in blocks period, which is labour intensive. The number of speech therapists is only three for the whole state of Sarawak; children mainly wasted valuable learning time while waiting for the therapy. There are numerous computer-assisted programmes in phonetic awareness, and speech and language development. However, in Malaysia, there is no computer-assisted programme which content is culturally appropriate for the local children. Therefore, it is the main aim of this research project to design, develop and implement a mobile computer-assisted programme by leveraging on the current tools used by the speech therapists and is appropriate to the local culture, which can then be used by speech pathologists and primary caregivers as part of intervention programmes or at home as part of daily activities.

03

Title: Constructing a Competitive Rural Tourism Competency Index for Rural Tourism Destinations in East Malaysia
Project Leader: Ms. Sharon Cheuk Choy Sheung (PI)
Project Member(s): Prof Dr Peter Songan, Prof Dr Alvin Yeo Wee, Assoc Prof Dr Lo May Chiun, Ms. Azuriaty Atang

Rural tourism has been viewed/ perceived and cited as having many benefits and problems. Hence, it is imperative that development of any rural tourism destination (should) be implemented in line with tested model(s) or framework which maximizes the competency of the said destination. As such, we propose a rural tourism destination competency model (and thereafter, an index). The proposed index has never been developed for rural destinations (in Malaysia/ around the world), thus the originality of this study is considered high. The research objectives of this study are to investigate the applicability of the proposed rural destination competency model on selected destinations in East Malaysia; to highlight the strengths, weaknesses and opportunities of the said destinations, and thereafter to construct a rural tourism destination competency index. This study is using a mixed methods design strategy. Two (2) rural tourism sites will be selected for study, namely Panampang in Sabah and Long Lamai in Sarawak. Survey research is applied in order to validate the model/ index and to rank the indicators within the said model/ index. Statistical measures and procedures will be modified, introduced and tested accordingly. The expected outcomes/ benefits of this research identifies strengths, weaknesses and economic opportunities of the rural destination competency index that will provide planners/ policy makers in tourism and or other sectors with a robust theoretical framework to formulate and implement policies and programmes/ strategies that achieve developmental objectives, thus optimising resource allocation that enhances a destination’s competitive position.

04

Research Projects

Title: Cost Effective and Self-Sufficient Power Supply Model for Wireless End User Access Equipment in Rural Long Houses

Project Leader: Assoc Prof Dr Tan Chong Eng

Project Member(s): Prof Datuk Dr Khairuddin Ab Hamid, Dr Kismet Hong Peng, Dr Halikul Lenando, Ms Noralifah Annuar, Mr Mohamad Imran Badaan, Dr. Mohamad Nazim Jambli, Mr Rajan Thangavaloo

The self-sustainable long range wireless relay proposed in previous research has been proven to be effective for the purpose of extending the Internet coverage from the rural telecentre in Bario. However, such wireless network has to connect huge number of users. This huge number of equipment not only gives raise to the issue of high deployment cost of end user equipment but also the power provision to the equipment itself. In addition, rural houses also has limited hours of power generated by diesel generators, i.e., 2 to 3 hours per day. Hence, a cost effective self-sustainable power supply model is mandatory for enabling mass end user equipment deployment. In this research, the main objective is to explore and experiment on cost effective self-sufficient power supply model via green energy sources. The new green power supply will be a cost effective solution that is tailor made for meeting the current rural conditions. The new design will be modular and smaller size for transportation cost reduction as well. Hence, the network access deployment will not incur additional operational expenses to the users. The design of the self-sufficient modular power supply will be influenced by other factors such as usage pattern, weather condition and unforeseen circumstances beyond the imagination of the researchers who do not live in the rural. Intelligence also to be included in the proposed power supply module to take advantage of other power sources available and to provide power based on the criticality of the need for different category of appliances. Hence, via the real life experiment of the proposed technology, some of the practical technology deployment issues can be identified and taken into account in perfecting the design. The self-sufficient modular power supply model for equipment will also create a new platform for equipment designers to design their equipment for environment without utilities power supply and at the same time drive down the cost of ownership to a range within the affordability of the general end users.

05

Title: Maxis CBC Reporting, Marketing & ICT Enhancement Training Programme

Project Leader: Prof Dr Alvin Yeo Wee (PI)

Project Member(s): Dr Jacey-Lynn Minoi, Dr Poline Bala, Dr Tariq Zaman

The proposal was prepared by the Institute of Social Informatics and Technological Innovations (ISITI) Universiti Malaysia Sarawak (UNIMAS) with the aim of carrying put community engagement, training and adoption of information and communication technology (ICT) to bridge the digital divide between urban and rural communities in Malaysia. The project will be divided into four parts based on the requirements given by Maxis Berhad. The main objectives of the project are:

To engage the community, conduct assessment of actual information as well as ICT needs and uses in the communities to be served by these facilities

To develop marketing initiatives for the CBC and conduct awareness campaigns and promotional activities

To provide ICT enrichment and local capacity building training programmes for CBC personnel and the community which will bring about socio-economic development for the community

To plan for sustainability programmes

Research Projects

06

Title: MAXIS Connected Village

Project Leader: Dr Jacey-Lynn Minoi (PI)

Project Member(s): Prof Dr Alvin Yeo Wee, Assoc Prof Dr Fitri Suraya Mohamad, Dr Cheah Wai Shing, Dr Tariq Zaman

MAXIS connected Village programme was a collaboration of MAXIS, Malaysian Communications and Multimedia Commission, Embedded Wireless and Universiti Malaysia Sarawak. It comprised of 3 programmes running simultaneously:

- a. Remote healthy monitoring system
- b. Astro Learning programme
- c. eBSN

A total of 7 sites were selected to run these programmes:

- a. Remote health monitoring system: Yan Kechil, Meradong, Serasot, Fort Arundell, **Rumah George
- b. Astro Learning: Serasot, Yan Kechil, Fort Arundell
- c. eBSN: Bukit Besar, Guar Chempedak

An assessment Community needs was gathered and the impact of the programme carried out has been studied.



07

Title: PI1M Assesment (HCCD 2013) (Under UNIMAS Holding)

Project Leader: Prof Dr Alvin Yeo Wee

Project Member(s): Dr Jacey-Lynn Minoi, Dr Tariq Zaman

This study was conducted by the Institute of Social Informatics and Technological Innovations (ISITI) for NERA Infocom Sdn Bhd. The purpose of this study is to undertake capability evaluation of staffs at MAXIS Community Broadband Centre (CBC) and to provide recommendations for training programmes that can contribute to the sustainability of the CBC. There are four specific objectives for this study. They are: to assess the capability of the CBC's management; to identify ways to enhance the centre's capacity in community engagement; to identify desired and useful services to be delivered through the CBC, and lastly to provide recommendation(s) for the CBC's staff capacity building programme. A total of ten CBCs were covered in the study- two in Kedah (Guar Chempedak and Yan Kechil) and eight in Sarawak (Sungai Asap, Daro, Meradong, Lubok Antu, Engkilili, Serasot, Sibuluh, and Krokong). By using Participatory Action Research methodology, researchers from ISITI conducted assessment for this study via interviews with two groups of participants; first group consisted of the Manager(s) and Assistant Manager(s) of the CBCs, while the second group consisted of users and non-users from the community. The researchers had devised several key areas of measurement to be tested on each of the CBC sites for both groups. The first group was tested on awareness level, ownership, operation and sustainability of the CBC. The second group was tested on ownership, operations, satisfaction of services (provided) and quality of the CBC. These assessments were conducted over the period of 1 month covering the 10 sites mentioned.

08

Research Projects

Title: Success and Happiness by Activating Regional Economy (SHARE)

Project Leader: Assoc Prof Dr Fitri Suraya Mohamad (PI)

Project Member(s): Dr Cheah Wai Shiang, Dr Noor Alam Bolhassan, Prof Dr Alvin Yeo Wee, Prof Datuk Dr Khairuddin Ab. Hamid, Ms. Noorhaslina Senin, Ms. Siti Marina Kamil, Ms. Syaryfah Fazidawaty Binti Wan Busrah, Dr Norazila Binti Abdul Aziz, Mr. Azwan Abidin, Ms. Ida Juliana Hutasuhut, Ms. Jaya Laxshmi Meenatchisundaram

The project is an extension of the successful innovations created for two previously funded APT projects, which are the E-Education and E-Health applications. The main objective of the project is to introduce and integrate the two APT applications to Tanah Datar, West Sumatra; to enable its local community to use the applications to improve the quality of life of the people. The team is tasked with conducting needs analysis, evaluation design and implementing relevant on-site training, to ensure effective and efficient running of the proposed SHARE applications in Indonesia.

09

Title: Implementation of Telecentre for Orang Asli Programme

Project Leader: Dr Poline Bala

Project Member(s): Prof Dr Alvin Yeo Wee, Dr Faisal Hazis

In July 2013, ISITI was given the project to implement a four year telecentre programme for the Orang Asli (2013-2016) in continuation with "Needs Analysis in Developing Telecentre at Pos Bala & Pos Gob at Gua Musang, Kelantan and Pos Sinderut & Pos Lenjang at Kuala Lipis, Pahang". Following up on lessons learnt from the eBario project, which was initiated in 1999 at Bario in the Kelabit Highlands of Sarawak, this initiative is based on a holistic and multi-level collaborative approach to Information Communication and Technology (ICT) deployment among rural and remote communities. The research team for this project consists of researchers from different disciplines and fields of expertise of social anthropology, rural sociology, information systems, electrical and electronic engineering, civil engineering, education and health. Based on multi-disciplinary approach, six economic development programmes namely: health, education, agri-business, indigenous knowledge documentation, capacity building training and tourism have been outlined to complement the setup of these telecentre infrastructure. These programmes are targeted at members of all levels of the community including women and the youths.

10

Title: The Grassroots Grant Assistance for Human Security Project from the government of Japan under Official Development Assistant (ODA) for the Electrification of Long Puah using Solar Power System

Project Leader: Assoc Prof Dr Tan Chong Eng

Project Member(s): Dr John Phoa Chui Leong, Prof Dr Alvin Yeo Wee, Ms. Elise Wong

Long Puah is a Penan village and has a population of about 250 with 26 families. This village is accessible by road and then by river. The best option is to hire a four wheel drive vehicle from Miri City and this road journey takes many turns passing through abandoned logging roads and numerous oil plantation estates. It is estimated to take 5 hours on four wheel drive and a 1 hour boat journey from Miri. Long Puah has no continuous supply of electricity. The village is situated at the upper reaches of the Tinjar river which is a major tributary of the Baram river in the Miri Division of Sarawak. A few families who can afford use diesel-run generator to light up their houses. The research scope for Long Puah covers enabling technologies (alternative/renewable energy, which is environmental friendly), cohesiveness of communities and stakeholders, individual and community transformation and empowerment, knowledge-based value creation and in this proposal, specifically to adopt solar powered energy efficient home lighting system to some houses in the villages to cultivate the renewable energy awareness and education. Through this project, an innovative design solar-power for home lighting with study lamp had been conceived and implemented for each of the households. There are total 26 households or 250 population are benefited from this project. An effective organisation change in Penan community has been observed. In other words, local community were exposure and learn to adopt solar technology in their daily life, this had led to the change to improve their living and education.

Achievement

International

Malaysia Technology Exposition (MTE) 2014 – Special Award – Leading Innovation Award by Japan Patent Office

WikiTours: Achieving Business Tourism Publicity through Spatial Integration
Assoc Prof. Dr Lo May Chiun (Principal Investigator)

Malaysia International Technology Expo 2014 – Silver Medal

Indigenous Knowledge Governance Framework
Dr Tariq Zaman

National

Malaysia Technology Exposition (MTE) 2014- Special Award – Gold Medal by Jury Panel

WikiTours: Achieving Business Tourism Publicity through Spatial Integration
Assoc Prof. Dr Lo May Chiun (Principal Investigator)

Malaysia Technology Exposition (MTE) 2014- Gold Medal

WikiTours: Achieving Business Tourism Publicity through Spatial Integration
Assoc Prof. Dr Lo May Chiun (Principal Investigator)

Broadband Empowered Entrepreneur (BEE) Awards 2014 – Winner

Edwin Meru, Ba'kelalan telecentre manager

Internet Society Award

e-Commerce Content Development and Capacity Building of Indigenous Penans Community in Sarawak
Dr Tariq Zaman (Principal Investigator) & Prof Dr. Alvin Yeo Wee (Project Member)

University Level

R&D Expo 2014 – Silver Medal

Phonetic Mobile App for Pre-school Children with Articulation Speech Impairment
Dr. Jacey- Lynn Minoi, Dr. Chin Saw Sian, Tan Boon Seng, Prof Dr. Alvin Yeo Wee, Dr. Ling How Kee, Carolyne Binti Alphonsus Tommy

R&D Expo 2014 – Consolation prize

Grassroots Aerial Mapping Using Unmanned Aerial Vehicle
Dr. Jacey-Lynn Minoi, Prof Dr. Roger Harris, Mohd Ismail Jolhip

Activities



Workshop for the Orang Asli on the implementation of telecentres in West Malaysia

Recording and preservation of indigenous botanical knowledge at Long Lamai

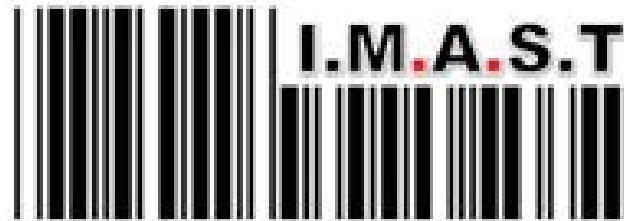


Android application in assisting speech-delayed children



UNIMAS Solar Energy Electrification in Long Puah, Ulu Tinjar, Sarawak





Centre of Excellence for Image Analysis and Spatial Technologies (CoE IMAST)

Established in 2007, the Centre of Excellence for Image Analysis and Spatial Technologies (IMAST) is one of two research centres anchored in the Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak (UNIMAS). IMAST is a forward looking Technology center which focuses on IT software development, business strategies planning and consultancy services. IMAST consultants and developers are highly trained professionally in order to meet clients' needs that are increasingly fickle and challenging. We have a proven track record in quickly understanding complex business requirements to be competitive and become the market leader in the Information Technology field. Based in Malaysia, IMAST has a wealth of experience in Image Analysis and Spatial Technologies fields with several award winning products such as Content Based Image Retrieval Algorithm.

Research Projects in CoEIMAST



Title: The Competitiveness Opinion among SMEs in Malaysia

Project Leader: Assoc. Prof. Dr. Lo May Chiun

Project Member(s): Mustafa Abdul Rahman

The economic activity of Sarawak is mostly dominated by mining, agriculture, and forestry sectors. Other sectors like manufacturing, wholesale, retail trading and construction also contributed to the State's income. The primary sectors (i.e., mining, agriculture, and forestry) make up about 40 % of the state's total real Gross Domestic Product (GDP), followed by the secondary sector (e.g., manufacturing and construction) with about slightly more than 30 % of total real GDP. One obvious development initiated by Sarawak State government is that providing economic opportunities within the state is the SCORE, which aims to accelerate economic growth and improve the quality of life in Sarawak. Moreover, under the Tenth Malaysia Plan (2011-2015), RM22 billion has been pledged towards the development of Sarawak. In general, the Sarawak State Planning Unit (SPU) has successfully led the way in mapping Sarawak's future through short-term, medium-term and long-term development plans. SPU has been entrusted to plan for the development of human capital, in tandem with its K-economy ambitions, while also ensuring that socio-economic development complements the policies and practices of sustainable resource and environmental management. The SPU, in addition, promotes the increasing use of ICT products and services towards the development of a state e-economy and activates structured and coordinated research and development programmes in order to create value added products that strengthens the state's GDP. With the state embarking on another economic development boom with the Sarawak, Corridor of Renewable Energy (SCORE) project aimed to bring the state closer to a developed nation status by 2030. Score has, so far, contributed 4.5 % to the GDP and to date, it has received a total of RM51 billion in investments in main sectors such as oil and gas, agriculture, aluminum smelter and polysilicone. With SCORE, it is reported that Sarawak could exceed the growth by 5% to 6% in 2015, and possibly outpacing the projected average of 6% national growth.



Some of the challenges that were noted from this research are that no doubt that the development of the oil and gas industry has attracted the largest international players to Bintulu, as well as industries associated with the sector. However, there are many more opportunities in the area, as highlighted by the fact that Bintulu continues to be the biggest contributor to the forestry sector, which is traditionally responsible for the state's economic growth. The other main challenge for Sarawak to achieve its higher growth potential would be the inability of the domestic economy to fully optimise the current development. With a population of just 2 million, Sarawak is under populated and is in real need to be in industries that are value-added and capital intensive. Meanwhile, income distribution within Sarawak has been an ongoing issue, mainly due to the historically uneven spread of the population between urban and rural areas. Hence, more initiatives are needed to ensure the decade-long effort of economic diversification and population migration into more concentrated growth to bridge the income gap between the rural majority and the urban population.

02

Title: Developing a Holistic and Sustainable Performance Competencies Index in Small Medium Enterprise in Malaysia

Project Leader: Assoc. Prof. Dr. Lo May Chiun

Project Member(s): Peter Songan, Wang Yin Chai, T. Ramayah, Constance Rinin

Entrepreneurship is one of the National Key Economic Areas (NKEA) under the Tenth Malaysia Plan and the Economic Transformation Programme (ETP), whereby promoting entrepreneurship serves as supporting a risk-taking culture, eliminating the stigma of failure and allowing high calibre and credible entrepreneurs who had failed previously to be active in business once again. The purpose of this research is to provide internal and external indicators which serves as the criteria to gauge the characteristics of critical success factors in implementing changes among entrepreneurs in Malaysia. These transformation processes are complex, multi-dimensional, and dynamic, comprising of socio-economic (exogenous) factors, organizational (endogenous) factors, as well as individual factors (employees). A list of hard and soft success indicators were generated based on the above holistic examination of internal and external factors. In view that change forces are interdependent and interrelated, and when it is examined from a holistic perspective, a balanced score for all stakeholders can be achieved in a given competitive business environment. It is believed that through the optimal structure of economics and human capital factors, the critical success factors can be determined and a score will be generated to determine the success level of the entrepreneurs. The outcome from this research are the list of critical success factors which can be utilised by the entrepreneurs by self-evaluating the process of value creation and to ensure the entrepreneurs' sustainable growth can be achieved. This study perhaps is the first that has systematically attempted to integrate all parties that are involved directly and indirectly in small and medium enterprises (SME) development. The research has also produced an automated web based system framework and system known as E- FitnessSMEs or Enterpris-Fitness which were developed based on an integrated Critical Success Performance Competency Index for SMEs.

This project has won a Gold Medal in UNIMAS R and D Expo 2014, Gold Medal and Special award at British Invention Show, London, 2014.



FoCuSIT Research Bulletin | Volume 3 | December 2014

03

Title: Semantic Query Approach for Image Retrieval in Traffic Images

Project Leader: Dr Wang Hui Hui

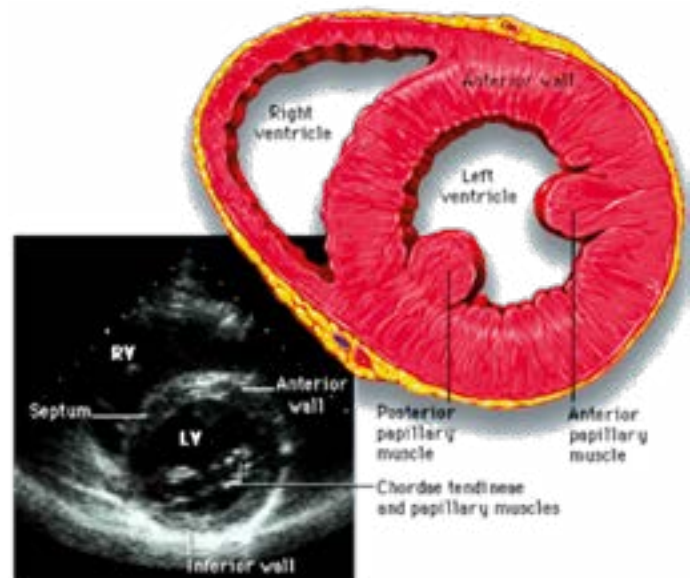
Project Member(s): Prof Dr Wang Yin Chai, Dr Chai Soo See

Image search has become one of the main challenges of research in the field of image retrieval to find exactly what a user is looking for in more effective ways. The image search results and their accuracy are directly affected by the submitted queries. Formulating a query such as submitting an example image or a sketch is sometimes not convenient for users since users do not always have an example image on hand (for the Image Retrieval application by example) and also it is hard to find a suitable example to describe what is in the user's mind (for the image retrieval application by sketch). However, query by keyword is usually ambiguous especially when they are short (one or two words) and thus cannot reflect users' intents precisely. So, a semantic image searching approach that helps the user in expressing their needs and intent is needed for contributing in bridging the semantic gap in image retrieval apart from retrieving images that are closest to human perception. This research is conducted by doing the data collection and user survey on the understanding the user's intent and needs for image retrieval. Next, the semantic image search approach is proposed. It includes the user query builder that is allowing users to express their image query in their mind easily and semantic query extraction that are able to generate the semantic features and representation. Experiments will be carried out and evaluation will be done to measure the acceptability and subjective satisfaction of the proposed semantic image search approach. This research aim to propose a semantic image search that allows users to express their need in image based on the high level concept. The outcome of this research is an image search method to resolve the user difficulties for image searching for image retrieval and understanding the user behaviors in image retrieval.

05

Title: Spatio-temporal Semantic Representation of Cardiac MRI
Project Leader: Dr Dayang NurFatimah Awang Iskandar
Project Member(s): Mohd Zamrin Bin Dimon, Prof Dr Wang Yin Chai, Dr Hamimah Ujir

Semantic Web technologies, applications and tools have made great steps forward in the life science and health care data exchange. However, developing appropriate semantic representations, including designing spatio-temporal ontologies, remains difficult and challenging. Biomedical atlases typically consist of a three main components. These components are the graphical model, the ontology that is associated with the graphical model and a mapping between those two. In this exploratory research, the graphical model that will be used is the Cardiac MRI image. An ontology is composed of objects and conceptual relations between the objects. Ontology is the theory of objects in terms of the criteria which allow one to distinguish between different types of objects and their relationships, dependencies, and properties. The spatio-temporal ontology (that will be created) contains spatial information of the cardiac physical and anatomical relations; and the temporal information is the sequence of clinical events and episodes of care. The mapping between the Cardiac MRI images and ontology would guide medical decision making as it can be used to characterise the state and behaviour of a patient's disease both in terms of natural course and as the result of therapeutic interventions. Hence, it also contributes as phenomenon-centric data to support health care research. We will focus on Semantic Web technologies for spatio-temporal representation of the Cardiac MRI images alongside clinical data. The objectives are to explore and study how to design, represent and engineer a spatio-temporal ontology for Cardiac MRI Images. Expected outcomes are the spatio-temporal semantic representation of the knowledge implicit in biomedical image data represented using an ontology. The ontology will be in RDF/OWL. The research will include prototyping of SPARQL end points to test querying the underlying data using the representations developed in this work.



04

Title: Data Driven Modeling: Exploring its Capabilities for Microwave Remote Sensing of Soil Moisture Retrieval
Project Leader: Dr Chai Soo See
Project Member(s): Assoc. Prof. Dr. Teh Chee Siong, Dr. Wang Hui Hui

Soil moisture values derived from remote sensing platforms only accounts for the top 5cm near surface soil layers. The measuring of soil moisture using remote sensing is dependent on a relationship between the remote sensing parameter and soil moisture. Microwave remote sensing measurements (both active (radar) and passive (radiometry)) of bare soil surface are very sensitive to the water content in the surface layer due to the pronounced increase in the soil dielectric constant with increasing water content. Various theoretical and empirical models have been devised to retrieve soil moisture from data. Recent advancements entitled Data Driven Modeling (DDM) which encompasses computational intelligence has emerged. DDM is based on analyzing the data about the system, in particular finding connections between the system variables (input, internal and output variables) without explicit knowledge of the physical behavior of the system. The most popular DDM techniques in the field of hydrological problems include neural networks, fuzzy-rule based systems, genetic programming, evolutionary polynomial regression, support vector machines, M5 model trees and K-nearest neighbors. Researchers in this field applied the DDM methods without analyzing the advantages of one DDM method over the others. Moreover, as soil moisture data is geographical and temporal dependent, the use of the same data set over the different range of DDM methods is not being studied. The effects of active and passive or assimilation of these two types of microwave data on different DDM methods were also not explored. Therefore, this research aims to explore the use of different DDM methods for soil moisture retrieval, focusing on either one or assimilation of both of the types of the microwave data using the same data set. At the end of the research, a DDM model will be developed for soil moisture retrieval using microwave data.

Achievement

International

iENA, Nuremberg, Germany 2013 - Bronze Medal

WikiTours: Achieving Performance sustainability through spatial intergration
Associate Prof. Dr Lo May Chiun (Principal Investigator)

University Level

PECIPTA 2013 - Gold Medal

WikiTours: Achieving Performance sustainability through spatial intergration
Associate Prof. Dr Lo May Chiun (Principal Investigator)

PECIPTA 2013 - Gold Medal - Special Award from Qatar

WikiTours: Achieving Performance sustainability through spatial intergration
Associate Prof. Dr Lo May Chiun (Principal Investigator)

UNIMAS Research and Development Exposition 2013 - Gold Medal

Tourism Destinations” Achieving Performance Sustainability Through Spatial Intergration
Associate Prof. Dr Lo May Chiun (Principal Investigator)

Expo R & D UNIMAS 2013 - Gold Medal

Developing Rural Tourism: Effective Positioning Strategies and Enhancing Destination Commercial Values
Associate Prof. Dr Lo May Chiun (Principal Investigator)

Expo R & D UNIMAS 2013 - Gold Medal

Spatial integration of Tourism Destinations: The Success towards Sustainability Performance
Associate Prof. Dr Lo May Chiun (Principal Investigator)

FCSIT Awards

Intranet™ Linguists of the Year for 2013

Recipients: Dr. Merlin Franco (Curtin Sarawak), Assoc. Prof. Dr. Balisoamanandray Ranaivo-Malançon (UNIMAS), Bibi Aminah Abdul Ghani (Curtin Sarawak), Syafitri Hidayati (Curtin Sarawak)

The members of the Intranet™, the global network of professional interpreters and translators, have nominated Curtin and UNIMAS Universities as their “Linguist of the Year” for developing the world’s first index to assess traditional knowledge and language vitality simultaneously.



Bronze Medal, British Invention Show 2014, London

Recipients: Predicting Human Behaviour from Text by Dr. Bong Chih How, Mohamad Nazri B Khairuddin Yap, Dayang Hanani Bt Abang Ibrahim



Bronze Medal, British Invention Show 2014, London

Recipients: Phishing Attack Protection System by Colin Tan Choon Lin, Dr Chiew Kang Leng, Dr Sze San Nah, Dr Tiong Wei King and Ms Ling Yeong Tyng



Gold Medal, Invention and Innovation Awards 2014, Malaysia Technology Expo 2014, Kuala Lumpur

Recipients: ECODEMIA Project by Dr Noor Alamshah Bolhassan, Prof Dr Narayanan Kulathuramaiyer, Dr Johari Abdullah, Dr Nadianatra Musa, Dayang Hanani Abang Ibrahim, Mohd Nazri Khairuddin, Emmy Dahlia Hossain, Inson Din, Adam Francis

Gold Medal UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: Beyond Context Polarity: Towards a topic-sensitive opinion mining model using behavioral variables by Dr. Bong Chih How, Mohamad Nazri B Khairuddin Yap, Dayang Hanani Bt Abang Ibrahim



Gold Medal, UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: Enhancing the Phishing Website Detection Model Through Uniform Resources Locator Analysis by Dr Chiew Kang Leng, Dr Sze San Nah, Dr Tiong Wei King and Ms Ling Yeong Tyng

Silver Medal, UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: Secondary Security Layer for Anti – Phishing Technique using Image Processing Algorithm by Dr Chiew Kang Leng, Dr Sze San Nah, Ling Yeong Tyng, Sze Jeeu Fong and Izzatul Nabila Bt. Sarbini

Bronze Medal, UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: A Visualisation tool for Network Models of Malaria Transmission by Assoc. Prof. Dr. Jane Labadin, Terrin Lim, Monday Eze Okpoto, Wong Ji Yeh

Bronze Medal, UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: HISA Crossword: On-line & On-demand Crossword on Sarawak History by Terrin Lim, AP Dr Bali Ranaivo-Malacon, Dr Jacey-Lynn Minoi, Mdm Amelia Jati, Tan Li Min

Bronze Medal, UNIMAS R&D Expo 2014 (ICT Cluster)

Recipients: Formal Fuzzy-Based Approach to Model the Abstract Values of Beliefs to the Consequences by Dr Edwin Mit, Dr Cheah Wai Shiang, Abdul Rahman Mat, Dr Azman Bujang Masli, Jonathan Sidi, Ng Boon Ding

FCSIT Events

Title: Android Mobile Training Camp
Date: 8-18 July 2014
Organiser: UNIMAS

The android mobile training camp is a once-a-year android training camp organized in the Faculty of Computer Science & IT. This recent android mobile training camp was conducted from the 8th of July, 2014 till the 18th of July, 2014 at the Microsoft Lab, FCSIT and was led by third year and second year students, Dennis Yong Chuan Kuan (29996), assisted by Chai Min Chun (35657), Lai Ted Liang (36579), Willis Fung Shin Choi (39324) and Raymond Koo (38468). The training was aim to deliver the knowledge of both Java and Android to the first year students in FCSIT. There were a total of 14 students who joined this training camp.



Title: Workshop on Disease Modeling
Date: 5 September 2014
Organiser: UNIMAS

The Disease Modeling Workshop (|D|Mo 2014) was held for the first time on the 5th September, at the Faculty of Computer Science and Information Technology. The workshop was organized by the Department of Computational Science and Mathematics led by Associate Professor Dr Jane Labadin who has been active in the research work since 2007. The workshop aims to bring together Public Health practitioner and researchers in Disease Modeling on a common platform to share knowledge and learn from one another.††The invited speakers for the workshop were Dr Marc Choisy, IRD†(Institut de recherche pour le dÉveloppement) researcher at MIVEGEC Laboratory currently based at NIHE, Hanoi, Vietnam, and Associate Professor Dr Razitasham bt Safii, Head of Department Community Medicine & Public Health, Universiti Malaysia Sarawak. The workshop was a success as the 20 participants agreed that |D|Mo should be a yearly meeting.



Title: International Conference on Asian Processing Language (IALP2014)
Date: 20-22 October 2014
Organisers: UNIMAS and COLIPS



FCSIT Events

Title: International Conference on Information and Communication Technology for the Muslim World 2014 (ICT4M 2014)

Date: 17-19 November 2014

Organisers: UNIMAS and IIUM



Title: Python Train-the-Trainers Program

Date: 24 – 26th November 2014

Organiser: Multimedia Development Corporation (MDeC)

Title: The 10th Asia Information Retrieval Societies (AIRS) Conference 2014

Date: 3 - 5 December 2014

Organisers: Information Retrieval and Knowledge Management Society (PECAMP), UKM, UTM, UPM, IIUM, UPMN, UNIMAS, SIIUC



Distinguished Speakers

22 Jan 2014

Title: IS Research Hour
- Creating Impact in IS
Field by Prof Dr. Roger
Harris



22 Aug 2014

Title: Seminar series
- Generating Natural
Language Specifications
from UML Class Diagram
by Prof Dr Farid Meziane
(University of Salford,
UK)



12 Nov 2014

Title: IS Research Hour
- Entrepreneurial Mind
Setting by Dr Mohd Zaidi
Abdul Rozan (UTM)



9th International Conference on IT in Asia

Transforming Big Data into Knowledge



4th – 6th August 2015, Kuching, Sarawak, Malaysia

IMPORTANT DATES

Submission of paper	: 2 nd March 2015
Notification of acceptance	: 4 th May 2015
Camera ready	: 8 th May 2015
Early bird	: 28 th May 2015
Final registration	: 30 th June 2015
Workshop	: 3 rd August 2015
Conference	: 4 th - 6 th August 2015

CALL FOR WORKSHOP

CITA`15 is pleased to invite proposals for workshops to be held in conjunction with the conference.

CONTACT US

Secretary
Faculty of Computer Science and Information Technology
Universiti Malaysia Sarawak (UNIMAS)
Jalan Datuk Mohd Musa
94300 Kota Samarahan, Sarawak
Malaysia

Email: secretary@cita.my
Contact No: +6082 583795/3643
Fax No: +6082 583764

ORGANISED BY



CALL FOR PAPERS

The Conference on Information Technology in Asia (CITA) is an international event organised every two years by Universiti Malaysia Sarawak. This year, the 9th CITA theme is "Transforming Big Data into Knowledge" emphasising the big data challenges and its potential solutions which include data capture, curation, storage, search, sharing, transfer, analysis and visualisation. With the aim of managing the ever growing data, big data is also a key enabler to various fields such as engineering, medical, and business.

SCOPE

CITA`15 is looking for submissions with original contribution in the areas including but not restricted to the following topics:

Taming Multimedia Big Data

- Multimedia Big Data Semantics
- Multimedia Big Data Compression
- Multimedia Big Data Storage and Transmission
- Multimedia Big Data Analysis and Recognition
- Multimedia Big Data Retrieval
- Surveillance-video Big Data
- Social-Multimedia Big Data

Software Engineering (SE)

- Managing Big Data
- Big Data Modelling and Engineering
- Patterns and Frameworks
- Data Verification and Validation
- Big data tools, applications and services

Big Data Knowledge Management

- Big Data Mining
- Big Data Business Intelligence
- Big Data Governance

Computational Modelling and Simulation for Big Data

- Computational optimization, engineering optimization and design
- Computing and algorithms (Bio-inspired and Metaheuristic)
- Mathematical and Statistical Modelling
- Application Case Studies in Engineering and Industry

Computer Systems & Communication Technologies

- Next-Generation Networking
- Wireless Networking
- Information Systems Security

PAPER SUBMISSION

Papers should describe original and unpublished work on the topics of the conference. Prospective authors should prepare a full paper, written in English, a minimum of 4 pages and not exceeding 6 pages. The paper must be submitted electronically. Submissions will be rigorously reviewed and should provide the necessary evidence to clearly make the case of contributions over the existing state of the art. All accepted and presented papers will appear in the conference proceedings.

A copy of the proceedings will be distributed to all participants at the Conference. Moreover, the CITA`15 conference provides additional opportunities for journal publication and best paper awards. Contacts are being established with an indexed journal for a special issue. Submissions imply that at least one of the authors has to register and to present the paper at the conference if the paper is accepted.

<http://www.cita.my>



Laboratoire d'Informatique de Grenoble,
France (LIG) / Sarawak Language Technology
Group (SaLT), UNIMAS



Taylor's University, Selangor



Man&Tel Co., Ltd. (Man&tel),
Korea



State Farmers' Organisation
Sarawak



Malaysian
Software Testing
Board (MSTB),
Kuala Lumpur
/ Independent
Data Services
(ASIA) Sdn. Bhd.
(IDS), Kuching
/ Swinburne
University of
Technology,
Sarawak
(SWINBURNE),
Kuching

Memorandum of Understanding

The faculty has been maintaining linkages with different international institutions and organizations to promote greater academic and research cooperation. This collaboration will foster good relationships and in recognizing the mutual interest and benefit in attaining excellence and leadership in education as well as in research.



Malaysian Software
Testing Board (MSTB),
Kuala Lumpur



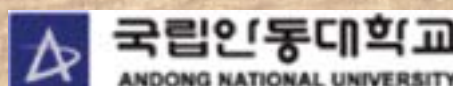
The Institute
of Electrical
and Electronics
Engineers,
Incorporated, New
York IEEE: acting
through Malaysia
Section C Chapter
/ CITA, UNIMAS



Stanford University (Stanford) acting
through its Stanford Linear Accelerator
Center (SLAC), Stanford, California, U.S.A.



International Islamic University Malaysia
(IIUM)



Andong National University (ANU)
Korea

Faculty of Computer Science and Information Technology
Universiti Malaysia Sarawak, 94300 Kota Samarahan
SARAWAK, MALAYSIA
Tel : +60 82 583762 / 3758 Fax : +60 82 583764
<http://www.fcsit.unimas.my>