



Synthesis

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GREAT STRIDES:
Higher Education Minister, Dato' Mustapa Mohamed with UPM Vice-Chancellor, Prof. Dr. Nik Mustapha during the UPM Research Awards 2005 function held recently.

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Highlights from the next issue –

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UPM focuses on High-technology Agriculture — Professor Abu Bakar Salleh speaks his mind.....



".....its time that our academics go out and meet the clients and explain what we have and what we can do", says Deputy Vice-Chancellor (Research & Innovation), Professor Dr. Abu Bakar Salleh

P is for Putra UPM is a University with diversity of strengths. Our strengths have been developed over a period of time and a stable and sustained platform is now built from which we can move forward. I think we should not dwell further on this issue but rather exploit our strengths and focus in beefing up the content in striving for excellence.

P is for Pertanian It is critical that UPM is seen to be responding to the call from the government that it focuses on agriculture. For some unknown reasons, UPM is considered to have left agriculture. Yet our record shows that ever since IRPA was launched the majority of funding received by UPM was on agriculture and agriculture oriented research. I think the public is still influenced by the traditional perception of agriculture. Agriculture now encompasses from the primary aspect of agriculture right up to the industrial sector. Being a university, UPM has to contribute to the development of

high technology agriculture based on the knowledge espoused by the academic experts available in UPM. We are looking at the development of new breeds of crop plants and animals that can resist diseases and provide high yields. We need to develop new planting techniques that require less land area, and demanding less human resource. It is very important with more products available that UPM research on high value added products that contribute to the income of the farmers, our strength in biotechnology would place UPM in good standing in practicing cutting edge research to solve these issues. Our experts in economics and management can support the burgeoning needs of new industries and expanding market.

P is for Pamimpin As a university research is an essential component. There is a need to develop and sustain a research culture and a culture of excellence. As we claim to be academics that champion scholarship, we must support our claims with real evidence. In any academic culture, the Professor must play their role in leading research. I look forward to greater commitment and involvement from the professors to ensure that we attain our vision. The professors must guide the younger lecturers and promote a spirit of collaboration and the love for knowledge.

P is for Performance Now there is a lot of talk about being excellent. Do we really mean what we seem to proclaim tirelessly. Who decides on what is excellence? No doubt there are certain benchmarks for excellence, but which one do we use? At the end of the day, it is our peers, our clients, or stakeholders that will determine our level of excellence. It is time to deliver. We must commit the general mass to the culture of excellence. We must be accountable on all our claims. We must look at our strengths and integrate human resources and expertise to handle clusters of excellence. Priority is content over form.

P is for Public After all, we work for the public. Whether we like it or not, we have to satisfy public demand. We cannot isolate ourselves in our ivory tower, and be oblivious to the changes around us. Research has moved up to a new level. Our sponsors demands results. They demand returns for their investments. And we cannot ignore all these. We know that any innovations or inventions must be supported by sound fundamental knowledge. So in our pursuit for academic excellence we must learn to balance the need of our sponsors and the need for quality products. It is time that our academics go out and meet the clients and explain what we have and what we can do. In the process we can also learn from them.

Say what we mean, and mean what we say.



Biochemical Markers for Resistance and Susceptibility to Fusarium Wilt Disease in Bananas

Maziah M., Sreeramanan S., Mohd Puad Abdullah, and Sariah, M.



Award Winner

Fusarium wilt caused by the fungus, *Fusarium oxysporum* f.sp. *cubense* is a major factor limiting commercial banana production in Malaysia. Field evaluation of banana plants for Fusarium wilt disease has not been effective as the infection period is slow and other variables such as distribution of inoculum concentration

is difficult to control. Generally, by the time the visible symptoms of the infection appear it is too late to prevent the disease from spreading. On the other hand, earlier detection using biochemical markers can to some extent control the disease.

■ Turn to Page Three



Managing our success!

Universiti Putra Malaysia (UPM) in Serdang began humbly as a School of Agriculture in 1931 before graduating to a College of Agriculture in 1947.


In 1969, the late Tun Abdul Razak suggested the setting up of an agricultural university, and in 1971 Universiti Pertanian Malaysia (UPM) was set up — the result of the merger between the College of Agriculture and University of Malaya's Faculty of Agriculture.

By July 1973, UPM had already established three foundation facilities—veterinary medicine and animal sciences, agriculture, and forestry – and in early 80s, the university expanded its scope to include science and technology in its area of studies.

In 1997, Universiti Pertanian Malaysia changed its name to Universiti Putra Malaysia, in line with its aspirations to become a more versatile and dynamic tertiary institution in the country.

Currently, the university has 16 faculties, 11 research institutes, 2 academies and several research centres with more than 25,000 undergraduates, and postgraduate students from more than 30 countries across the globe.

The university also has the most number of PhD holders in its academic fraternity compared with other universities in Malaysia. It has more than 2,400 academic staff including 150 professors, 350 associate professors, and almost 750 lecturers.

UPM has received the highest research allocation during the Seventh and the Eighth Malaysia Plan under the Intensification of Research in Priority Areas (IRPA) program from the Ministry of Science, Technology and Innovation, Malaysia. The University is now requesting funds under the Ninth Malaysia Plan to boost agriculture research and education by establishing several new research institutes and centres at the campus. 

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Towards a Research University!

To be a leader in innovation.....


"A research university seeks to actively participate in new adventures of ideas, experiment with innovative methods, and take intellectual initiatives to further discover and expand the frontiers of knowledge."

The elevation to research universities (RU) among existing universities having a strong research culture and track records in research activities and outputs will take Malaysia to the next level of development and be at par with the world bests. It will provide the necessary foundation towards improving the quality of life, economic well being and developing a competitive advantage. It is indeed a new impetus for the universities to actively participate in new adventures of ideas, experiment with innovative methods, and take intellectual initiatives to further discover and expand the frontiers of knowledge.

The RUs represent an engine of growth of the nation where scholars and students exchange ideas as well as conduct research in a conducive environment that nurtures exploration and creativity to discover knowledge and create wealth, leading towards an improved quality of life.

In order to operate successfully and achieve the stipulated goals and create the expected impact, a new system of governance, accreditation and incentives must be put in place. Additional financial allocations and other enabling resources must be provided. This will allow the universities to evolve to full fledged world class RUs.

The returns from the initiatives and investments will be significant. Some of these benefits are:

- RU will be able to attract foreign students for its undergraduate courses and research scientists for the post graduate courses. The universities will then be able to demand fees that are in the leagues of other top universities in the world. The universities could become potential foreign exchange earners to the country.
- There would be a reduction in Malaysian students seeking to pursue tertiary studies in Science overseas which would lead to considerable savings in foreign exchange.
- The enlarged pool of K-workers trained by RUs will attract foreign investments in setting-up manufacturing plants and research facilities in the high technology sectors.
- There would be better quality of life with increased quality of healthcare, environmental conservation and sustained development of natural resources with the involvement of more scientific technocrats in national development.
- Through the mastery of Science and Technology, Malaysia will be able to generate and utilise new technologies and introduce new services and products. We will no longer be merely consumers of new knowledge and technologies generated elsewhere. The new inventions and technology in partnership with the industries will transform our role from suppliers of human resources in manufacturing technology related products to knowledge-based enterprises. 

Managing Editor

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COMBAT Armor™ — Composite for Anti Ballistic Threat Armor Shield for Military and Law Enforcement Applications

A.M.S. Hamouda, Risby M.S., Khairul A.R, S.V. Wong, and Elsadig M.

Award Winner

Body armor can be made from a number of different types of woven or non-woven materials. One of the first fibers used for modern ballistic resistant material was Kevlar®, which is made by DuPont. Other types include Spectra®, which is made by Honeywell (formerly AlliedSignal); Twaron®, made by Accordis (formerly Akzo Nobel), Dyneema made by DSM, and Zylon®, made by Toyobo. However these materials are very expensive and are considered as controlled items in most countries. Hard (non-fabric) armor plates can be made from a number of materials which include metals, ceramics, and other composite materials. Ceramic and metal insert are used for higher threat level but is too cumbersome to wear.

Combat Armor™ is one of the innovative products developed by UPM Ballistic research group. Combat Armor™ is an interchangeable hybrid composite SAPI (Small Arms Protective Insert) plate which is made from coconut shell, resin system, aramid honeycomb core and aramid bullet resistance fabric (TWARON®) and resin system. This secret and innovative formulation of coconut-resin mixing and novel optimized design of honeycomb shapes is undergoing intensive investigation to make the product also anti-stabbing. Combat Armor™ is




Combat Armor Product Range



Certification by STRIDE

lightweight, low cost and reduces the dependency of using aramid material in typical body armor manufacturing process. Combat Armor™ has undergone a NIJ STANDARD

(United States) in order to be certified as a reliable armor material. These tests are performed at the Strategic Research Institute for Defence (STRIDE) ballistic testing facility, Batu Arang Division which is under the Malaysian Ministry of Defence (MINDEF). Combat Armor™ panels have been tested using 9mm and 7.52mm bullets for penetration resistance and also for blunt trauma assessment. Results proved that Combat Armor™ panels can successfully withstand shots of NIJ Level II and IIIA (at impacting velocity of 427 m/s). The product has commercial potential and discussions are underway with one of the world leaders in Body Armor manufactures to commercialize Combat Armor Products. 

SILVER – Biotechnology Asia 2005 Innovation Awards.

Reader Enquiry

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Biochemical Markers for Resistance and Susceptibility to...

From Page One




Banana plantation almost completely destroyed by *Fusarium wilt*.

A study was, therefore, carried out to develop bioassays for early and rapid susceptibility tests against Fusarium wilt disease in banana plantlets. The concentration of hydrogen peroxide (H_2O_2) and other enzyme activities such as phenylalanine ammonia lyase, chitinase, glucanase, peroxidase and polyphenol oxidase in infected roots of banana plants were

determined to relate to the levels of tolerance or susceptibility to Fusarium wilt disease. The results obtained showed that the use of these biochemical parameters has a potential to predict the levels of tolerance or susceptibility to Fusarium wilt disease in bananas. This technique can also be used for large scale screening of banana plants grown in plantation sectors. This finding will help to detect and control Fusarium wilt disease in the early stage, thus preventing heavy economic losses.

The results obtained indicated that the degree of tolerance is correlated with the level of enzyme activities and the H_2O_2 content.

The enzymes studied can be used to screen for susceptibility and tolerance to Fusarium wilt in bananas. Our studies have shown that the enzymes are also useful for detection of other diseases: Vascular streak dieback disease of cocoa. Fruit rot disease in chili. The

multiple enzyme marker system ensures no escapes in screening for susceptibility and tolerance to diseases. Can be used for large scale screening of banana planting materials. It prevents economic losses, reduce cost of replanting and disease control activities. The technology has been taken up for upscaling testing by Johor Plantech Sdn Bhd. 

GOLD – IPTA R&D Expo 2005.

Reader Enquiry

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Dual Frequency Multi-Purpose Microwave Liquid Moisture Sensor Based on Microstrip Antenna



Kaida Khalid, Mohamed Mustafa Ghredli, M. Hamami Sahri, Ionel Grozescu and Zulkifly Abbas

Award Winner

A dual frequency sensor system was developed to measure water content of diverse natural and agriculture products i.e. rubber latex, fresh milk, coconut milk, soya sauce, tomato ketchup, water-based paint etc. The experiment is based on taking large size sample measurements of near field reflection at two different frequencies in the X-band, 8.48 and 10.69 GHz. The replacement of the conventional open horn antenna with microstrip radiating patches will make the sensor more versatile and compact.

Using indirect calibration, water presence in the sample can be instantly determined. The sensor is interfaced to a laptop PC. Special software written in LabView® programming language, guides the user to calibrate the sensor, perform measurement, display results and save data. Internet-remote access, control and reading can be programmed efficiently if need arises. Temperature variations errors are eliminated by innovative calibration technique utilizing the versatility of dual frequency. The system is tested using rubber latex and coconut milk solutions and has predicted water contents with mean error $\pm 1.3\%$ compared to standard oven drying techniques.

The performance of the meter has a range of 40 – 100 % unit MC with an accuracy of 0.5 % unit MC at room temperature and 1.3



Dual Frequency Multi-Purpose Liquid Moisture Meter




Microstrip Antenna Sensor Head

% unit MC at 20 – 60°C. It only requires one minute to warm up with a power consumption of 110 mA Max, and works on a 9V DC adaptor, 200 mA Max (recharge battery 9V- 4 Ah).

This kind of instrument is suitable for rubber and food industries, quality control and

storage monitoring where water is a main parameter of concern.

The product has enormous commercial potential. 

GOLD – IPTA R&D Expo 2005.

Reader Enquiry

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Educational Software and Textbook: Teaching and Learning University Introductory Calculus

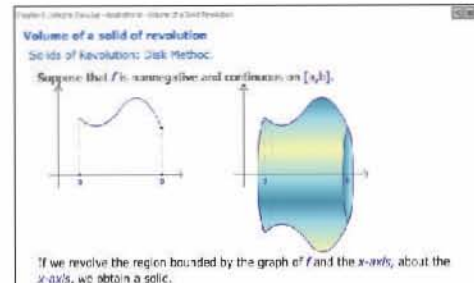
Kamel Ariffin Mohd. Atan and Rustem Sunchelev

Award Winner

The product is an animated university course in Introductory Calculus in which computer technology guides learning of the subject. The software developed provides descriptions and explanations of mathematical definitions, concepts and processes by animating them. An accompanying textbook gives quick references to topics discussed in the CD and provides exercises at the end of every chapter. This R&D product helps to overcome the difficulties in conjuring up mental visualization of mathematical definitions, concepts and processes especially at the initial stage of learning which if not overcome can lead to either erroneous interpretation and understanding of concepts or difficulty in understanding the subject at more advanced stage.


software and a textbook. Using professional softwares "Mathematica", "Mathlab", and "Flash", animations are created to help students develop mental models of mathematical concepts, understand them and use these visual images to understand abstract definitions and theorems. In this way, memorizing of isolated facts and formulae can be avoided. Instead, derivations of these facts and formulae can be done from well-developed "mental models" of the particular mathematical concepts.

With these unique features, the product becomes the first fully animated course known in the subject. With the CD and the textbook playing the supplementary role, it is capable of being used in all types of learning environment,



Solid of Revolution

Publishers and manufactures of this product will stand to gain from the explosion of demands for these products from the educational sectors and individuals as the computer technology becomes a necessary tool in everyday lives of humans.

The product has great potential to be marketed. This is due to the global awareness of every party concerned in the educational sector and private persons of the importance of finding the best methodology in teaching and learning be it in the schools or universities. The commercialization potential of this copyrighted product was further highlighted by representatives of the commercial sectors in every forum and exhibitions at which this product was exhibited, locally and internationally where recognitions were received in the forms of awards. 

GOLD – IPTA R&D Expo 2005.

GOLD – EXPO Science, Innovation & Technology (EXPO S&T 2004).

SILVER – International Exhibition of Inventions, New Techniques & Products (Geneva Palexpo 2005).

Bronze – International Exhibition for Inventions, Innovations, Technology & Industrial Design (ITEX 2004).

Bronze – UPM Invention and Research Exhibition 2002 (PRP2002).



Professional software "Mathematica", "Mathlab"—CD and textbook

The product resulted from research that began in 2002 under an IRPA research project entitled "Interactive and Animated Mathematics for Mathematics Education" which was initiated as an attempt towards closing the gap that exists between technology capabilities and their practical applications in the teaching and learning of mathematics. These capabilities are yet to be exploited to the fullest. Research undertaken resulted in the production of the

be it in the lecture rooms, group studies or in the privacy of one's home. This scenario will become common in the future when the invention of this product will spark similar research in other subject areas leading to the inventions of like products.

The use of these products will in turn revolutionize the methods of teaching and learning in the schools and universities.

Reader Enquiry

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Research Happenings

UPM Research Awards 2005 (23 March 2006)



UPM: Maximising the value of research at the varsity will benefit academics, the university and the country. Dato' Mustapa Mohamed, Minister for Higher Education congratulates Prof. Dr. Nik Mustapha, Vice-Chancellor, UPM while receiving a token of appreciation.



LEADING IN INNOVATION: Prof. Dr. Abu Bakar Salleh, Deputy Vice-Chancellor (Research & Innovation) being presented an award from Dato' Mustapa for receiving international recognition at International R&D exhibitions.



GOOD LEADERSHIP: Prof. Ir. Dr. Radin Umar Radin Bohadi, Deputy Vice-Chancellor (Academic & International Affairs) receives a special award from Dato' Mustapa for being bestowed with the prominent IRTE & Prince Michael International Road Safety Awards, U.K.



RESEARCH & INNOVATION: UPM strives to develop technologies relevant to the needs of industries — (from left) Prof. Dr. Zulkifli Idrus and Prof. Dr. Abu Bakar Salleh with Dato' Mustapa.



LAYING THE GROUNDWORK: Dato' Mustapa flips through Synthesis: UPM's prestigious R&D Bulletin and shows keen interest — the nexus of research, development and commercialization should always be kept intact to enable research findings to be readily moved to compete in the workplace.



A FEEL OF SUCCESS: UPM made great strides when almost 30 of its vibrant scientists were honored with special awards at the UPM Research Awards 2005 function held at Bengi Equatorial on 23 March 2006.



MAKING WAVES: Dato' Prof. Dr. Nik Abd. Majid (left) sharing his words of wisdom with Dato' Mustapa while Prof. Ir. Dr. Mohamed Daud smiles.

Malaysian Technology Expo (MTE 2006) (23-25 February 2006)



KEEPING ABBREAST: (from left) Assoc. Prof. Dr. Raha Abd. Rahim with Prof. Dr. Abdul Rani Bahaman at the MTE2006 exhibition.



CAPITALISING ON RESEARCH: Prof. Dr. Abdul Manaf Ali (right) won a Gold medal for his pioneering research, "A new monoclonal antibody against breast and colon cancer cells".



CREATIVE IDEAS: Researcher Assoc. Prof. Dr. Huseini Omar (centre) sharing his innovative ideas with Assoc. Prof. Dr. Raha and an other participant



TOWARDS BETTER QUALITY: YB Datuk Kong Cho Ha, Deputy Minister MOSTI touring R&D exhibits during his visit at the Malaysian Technology EXPO 2006.



MUTUAL INTERESTS: (from left) Prof. Dr. Dzokhifli Omar, Assoc. Prof. Dr. Raha Abd. Rahim and Prof. Dr. Abdul Manaf Ali.



PRO-ACTIVE: Prof. Dr. Mohd Azmi Lila explaining his pioneering and innovative R&D exhibit to the judges



WELL FOCUSED: Assoc. Prof. Dr. Raja Noor Zailha Raja Abd. Rahman showing keen interest in Prof. Dr. Abu Bakar Salleh's dialogue.

Expo Industri Asas Tani (EIAT 2006) (16-19 February 2006)



JOYOUS MOMENTS: UPM received a Special Recognition Award for the Best Exhibition Booth in the "government ministries, departments & agencies" categories.



UPM'S BOOSTING IMAGE: UPM Vice-Chancellor Prof. Dr. Nik Mustapha (centre) with Prof. Dr. Abu Bakar Salleh (left) and Assoc. Prof. Dr. Raha Abd. Rahim (right).



A WORLD OF DIFFERENCE: Ready to take the lead to be a pioneer in new areas — (from left) Prof. Dr. Zulkifli Idrus, Assoc. Prof. Dr. Maznah Ismail and Prof. Dr. Nik Mustapha.



PROMOTING INNOVATION: (from left) Prof. Dr. Abu Bakar Salleh, Prof. Dr. Nik Mustapha, Prof. Zulkifli Idrus and Assoc. Prof. Dr. Raha Abd. Rahim.



COMMITTED TO THE CAUSE: (from left) Dr. Jaleuddin Harun with Prof. Dr. Zulkifli Idrus and a member of the staff at the Expo Industri Asas Tani held from 16-19 February 2006.



REALISING DREAMS: (from left) Assoc. Prof. Dr. Raha Abd. Rahim, Dr. Foo Hooi Ling and Prof. Dr. Suhaila Mohamed



FRAMEWORK FOR SUCCESS: Prof. Abu Bakar Salleh converses new plans with Prof. Dr. Nik Mustapha, Assoc. Prof. Dr. Raha shows keen interest.

Down the Memory Lane (Newsmakers around the campus)



SERVING THE ACADEMIA: (from left) Prof. Dr. Abu Bakar Salleh, Prof. Dr. Nik Mustapha and Assoc. Prof. Dr. Azali Mohamed.



MARKING THE OCCASION: UPM's 5th Vice-Chancellor, Prof. Dr. Nik Mustapha Raja Abdullah (centre) at the swearing-in ceremony with the Minister for Higher Education, Datuk Dr. Shafie Salleh (left) and Th.H. Mohamad Ghazali (right).



FULFILLING CHALLENGE: UPM's Vice-Chancellor, Prof. Dr. Nik Mustapha wishes to push the university further into agricultural research and get more aggressively in commercializing the R&D — Datuk Dr. Shafie Salleh and Tan Seri Dato' Seri Zakul Ariff Hussein share their views as they glimpse through "Serdang Story".



TOWARDS BETTER LINKAGES: Prof. Dr. Nik Mustapha welcoming a foreign diplomat while Assoc. Prof. Dr. Azali Mohamed (right) looks on during a foreign ambassador's visit to UPM recently.



INTERNATIONAL REACH: UPM hopes that alliances with foreign universities will lead to more partnerships in academic activities.



PLAYING A ROLE: Dr. Abu Sofian Yaacob, College Master, Kolej Mohamad Rashid presenting a keepsake to the Vice-Chancellor, Prof. Dr. Nik Mustapha during the KMR College carnival.



STRENGTHENING TIES: UPM Vice-Chancellor Prof. Dr. Nik Mustapha accompanied by Professor Dr. Mohd Zamri Sead binding ties with Prof. Dr. Med. H. Purnihito, Rector, University Airlangga, Indonesia at the signing of an MoU.



EDUCATIONAL: YB. Datuk Dr. Adnan bin Baba, Parliamentary Secretary, Ministry of Higher Education, Malaysia receiving a token of appreciation at a workshop from Prof. Dr. Zulkifli Idrus, Director, Research Management Centre (RMC) while Prof. Dr. Muasa Abu Hassan, Director, PACE applauds with cheers.



ANNUAL AFFAIR: Prof. Dr. Nik Mustapha shaking hands with the PALAPES cadets during the PALAPES annual dinner.



Dynamic Rate-Based Virtual Clock Scheduler for Output Buffered IP Switches

S. Shamala, M. Othman, R. Johari and M. Y. Saman

Award Winner

In this research, an enhanced and improved version of the rate-based Virtual Clock scheduling algorithm is proposed and analyzed. The Virtual Clock scheduling tag constituting of the firewall and inverse bandwidth tag implements static bandwidth paradigm. However, the migration towards robust and adaptive network applications have complemented with dynamic resource reservation schemes are becoming dominant as the communication community increases. Thus, an enhancement of the Virtual Clock algorithm to sustain dynamic conditions is proposed in this research.

An acceleration concept in contexts of congestion prevention is implemented in the proposed scheduler. The proposed enhanced Virtual Clock scheme aims at fulfilling the requested level of Quality of Service (QoS) while simultaneously achieving high resource utilization via a versatile and dynamic resource reservation scheme. An enhanced scheduling tag is implemented in the research. The tag computation integrates an correlation index between utilization and the sustained average delay. The ACE algorithm constitutes of three interrelated components. The components are as follows: the pro-active packet discarding strategy; multi-tier dynamic resource reservation algorithm, and scheduler tag computation and implementation strategies.

The classical Virtual Clock assigns a tag to each arriving packet using Equation (1) and services packets in a non-decreasing order.

1.

$$VC_{tag} = \max\{VC_i, real_time\} + \frac{1}{\gamma}$$

Analysing the VCtag, it can be noted that the γ parameter is derived based on static resource reservation schemes. Thus, the scheduling tag is maintained throughout the transmission time span. In adaptive networks, transmission of multimedia traffic have substantial fluctuating characteristics.

Thus, the tag though idealistic for the guaranteed service platform, has limitations when implemented in predictive service platforms. The proposed ACE scheduler integrates the mechanisms of adaptive scheduling, as an effort to enhance the performance of the VCtag. The computation of the ACE scheduling tag and $(ED(\partial, \gamma, \lambda))$ derivations are as follows:

2.

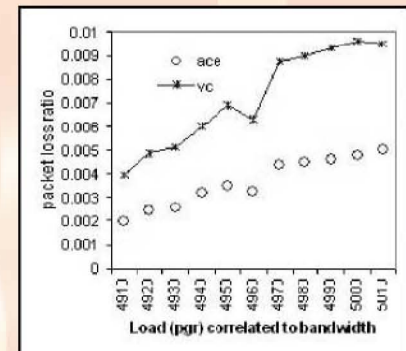
$$ACE(o_{\partial}) = \max\{ACE(o_{\partial}), real_time\} + \frac{1}{ED(\partial, \gamma, \lambda)}$$

where

3.

$$ED(\partial, \gamma, \lambda) = \frac{D_U}{e_{(U, \partial)}}$$

The results obtained through the extensive discrete-event simulation models have shown that the enhanced scheme has



significantly improved the average delay, average buffer utilization and for different traffic patterns.

The proposed scheme can be adopted for adaptive real-time traffic based applications to enhance the QoS in terms of better delay and improved resource utilization.

GOLD – IPTA R&D Expo 2005 (IPTA 2005).

GOLD – UPM Invention & Research Exhibition Award 2005 (PRPI 2005).

Reader Enquiry

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Award Winner



Malaysian Socio-Technical Disaster Model and Operational Guide

Aini Mat Said, Fakhru'l-Razi Ahmadun and Mohamed Daud

Since independence, the nation has progressed and developed at an unprecedented rate and has transformed herself from an agrarian to an industrialized nation. Corollary to the industrialization, man-made disasters associated with development and technology become more apparent. The nation has also experienced various socio-technical disasters such as structural collapse, fires and explosions. Some of these disasters were landmark disasters where various safeties, emergency acts and regulations were proposed, amended or introduced. Advancement in Science and Technology has led to the development of super carriers, mega high rise buildings, mammoth complexes, use of technologies with narrow margins for error and horrific consequences and emergence of mega cities. With this backdrop, it is predicted that on the global scene, we are inevitably faced with more and worse disasters in the future, coined with the terms such as super disaster, mega disasters and armageddon (Quarantelli, 1999; Mulhall, 2001; and Moore, 2001). The complexity and extensiveness of future disasters, the high probabilities of their occurrence and their protracted impacts make empirical research vital.

A multi strategy research was designed utilizing qualitative and quantitative approach to develop a socio-technical disaster model and operational guide for Malaysia. Using a grounded theory approach, disaster inquiry reports were used to identify the phases associated with the development of the socio-technical disasters and their latent errors. Disaster inquiry management system was formulated based on benchmarking of national and international disaster experts and organizations. Data obtained from both qualitative and quantitative study was then transferred into a Visual Basic 6.0 computer to form a disaster leaning and advise model.

Despite the differences of disasters involved and their technologies, disasters exhibited common characteristics. Analysis of the six disasters showed that events associated with socio-technical disasters encompasses three distinct periods namely pre-disaster, disaster and post-disaster consecutively. Within each period there exists different phases, each with its distinct features and characteristics.

- o Pre-disaster period is the time before the occurrence of the disaster and consisted of four phases namely *operation, incubation, forewarning* and *activation*.
- o The disaster period embraces two phases, namely *onset* and *rescue*, and *recovery*. The onset of the disaster is triggered by specific action or event identifiable directly to the



cause of the disaster. Rescue and recovery phase follows suit in order to save lives, properties and return to normalcy.

- o Post disaster period was found to consist of four phases: *inquiry and reporting; feedback; social justice; and social and legislation reform*. There is an establishment of social entity such as formation of specialized bodies, amendment and formulation of new legislations such as Uniform Building By Laws (UBBL), and formulation of policies such as the Land Disaster Management and Relief Policy (Directive 20).


The above findings demonstrate that socio-technical disasters are not sudden cataclysmic events but they evolved in phases with long developmental period. Underlying causes of the disasters were due to latent errors that are accumulated and get embedded in the system during the incubation period. Inside the organization, a complex set of managerial, procedural, training, safety and failure to learn factors interact with external factors of regulatory and human failures to produce the disasters. Organizational error and regulatory failures were found to be the main types of latent error that contributed significantly to the disasters with 53.6 and 37.0 percent respectively. The findings demonstrated that disasters are not caused by a single factor but social, organizational and administrative processes, in amalgamation systematically produced the disasters.

In order to enhance leaning from past disasters, Malaysian disaster experts had proposed the following:

- o There must be a guide as to what type of disaster inquiry to be set up following a disaster;
- o A setting up of counsel to the inquiry who acts as a guardian of public interest;
- o A general guide should be provided for report writing of inquiry into disaster;

- o The report of the inquiry should be published and made accessible to public;
- o Implementation of recommendations made by tribunal should be made mandatory;
- o There must be a mechanism to supervise the implementation of recommendations;
- o The organization responsible to take up recommendations should produce a report of their implement method and schedule;
- o An institution to be establish in order to collect, collate and analyze disaster data and disseminate lessons;
- o Establish appropriate channels and linkages to relevant industries, educational and training establishment and professional institutions for dissemination of lessons from disasters.

Identification of the root causes and phases of disasters revealed the patterns of disaster development in the country. This provides a tool for organizational and institutional diagnosis of vulnerability and risks. The findings can be used by Government and organizations to formulate new codes of practice, safety legislations and emergency management in the country. Learning and advise model of socio-technical disaster developed represents a useful tool for teaching at higher institutions, media of instructions for training institutions and industries, e-learning for professional development and operational guide for safety professionals. Future disasters are envisaged to have profound effect not only on the victims but also to the social, political and economic of a nation and other nations. Thus hindsight gained from these negative events could be utilized by Government and enterprises to design organizational structures that will help reduce the likelihood of disaster as nation progresses.

This product has won a number of awards and recognition, and has been filed for a patent. 

GOLD – IPTA R&D Expo 2005 (IPTA 2005).

SILVER – UPM Invention & Research Exhibition 2005 (PRPI 2005).

Best Journal Award – Literati Club 2003.

Reader Enquiry

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NewsBriefs

UPM Research Awards 2005

An evening at Bangi Equatorial on 23 March 2006 from 8 to 11pm was celebrated with pomp and splendour to mark the achievements of award recipients from UPM community. Their steadfast dedication in R&D was recognised with honour particularly for those who have pursued and achieved excellence in research and service with outstanding international and national awards. The event was officiated by Dato' Mustapa bin Mohamed, Minister for Higher Education, Malaysia, and was officially graced by Tan Sri Dato' Seri Dr. Zainul Ariff Hj. Hussain, Chairman, Board of Directors, UPM, Prof. Dr. Nik Mustapha Raja Abdullah, Vice-Chancellor, UPM, Prof. Dr. Abu Bakar Salleh, Deputy Vice-Chancellor (Research & Innovation), Prof. Ir. Dr. Radin Umar Radin Sohadi, Deputy Vice-Chancellor (Academic & International Affairs), Assoc. Prof. Dr. Azali Mohamed, Deputy Vice-Chancellor (Student Affairs & Alumni), Tuan Hj. Mohamad Ghazali Hj. Ali, Acting Registrar, UPM, Prof. Zulkifli Idrus, Director, Research Management Centre among other prominent UPM principal officers. Dato' Mustapa presented the awards to more than 30 recipients in various categories including prominent winners from both national and international exhibitions.

Turn to centre page for pictorial news.

Malaysian Technology Expo (MTE 2006)

The Malaysian Technology Expo 2006 in conjunction with the 5th Invention and Innovation Competition 2006 was held recently at the Putra World Trade Centre (PWTC) from 23-25th February 2006. MTE2006, an annual trade-focused exhibition aimed at providing the perfect platform of opportunities for the Science, Technology and Innovation industry in Malaysia was organised by the Malaysian Association of Research Scientists (MARS). It was endorsed by the Ministry of Science, Technology and Innovation (MOSTI) and supported by the Malaysian Institute for Nuclear Technology Research (MINT) and the nation's organisation for standardisation and quality, SIRIM Berhad.

MTE2006 aimed to promote the significance of science and technology and the importance of new inventions in research and development (R&D). The mega event drew participation from more than 10,000 trade visitors, policy makers, top Malaysian researchers and industry players from an array of expertise, including medical sciences, ICT, multimedia, electrical and electronics, robotics and biotechnology.

Forthcoming R&D Exhibitions

The forthcoming International and National R&D exhibitions scheduled for 2006 are as follows:

Exhibitions	Date	Venue
1. GENEVA- PALEXPO 2006: International Exhibition of Inventions, New Techniques & Products	Apr 5-9, 2006	Geneva, Switzerland
2. BioMALAYSIA 2006	Apr 28-29, 2006	PICC, Putrajaya
3. I- TEX 2006: International Invention, Innovation, Industrial Design & Technology Exhibition	May 19-21, 2006	Kuala Lumpur Convention Centre (KLCC)
4. INPEX 2006: Invention & New Products Exposition	Jun 7-10, 2006	Pittsburgh, USA
5. PRPI 2006: UPM Inventions, Researches & Innovations Exhibition	Jun/ July 2006	PKKSSAAS, UPM
6. BIOTECHNOLOGY ASIA 2006	Aug 9-11, 2006	Putra World Trade Centre (PWTC), Kuala Lumpur
7. NATPRO 2006: Asia Pacific Natural Product EXPO	Aug 17-19, 2006	Putra World Trade Centre (PWTC), Kuala Lumpur
8. BIS 2006: The British Invention Show	Oct 20-23, 2006	London, England
9. IENA 2006: International Exhibition of "Ideas- Inventions- New Products"	Oct 28-31, 2006	Nuremberg, Germany
10. EUREKA 2006: World Exhibition of Innovation, Research & New Technologies	Nov 16-20, 2006	Brussels, Belgium
11. SIIF 2006: Seoul International Invention Fair	Dec 7-11, 2006	Seoul, Korea

Previously known as Science & Technology Expo, the event was recognised by the Malaysian Book of Records in 2001 as 'Malaysia's largest Science & Technology Event'. This year, the three-day trade event had almost 200 exhibitors from the region and showcased over 250 latest inventions and innovations. Invention and Innovation Competition 2006 served as the perfect platform for Malaysia's top inventors and innovators to showcase their creativity and ingenuity. The competition was an avenue for participating companies to gain international recognition, business opportunities and increase awareness towards their inventions.

Out of 32 R&D exhibits that were displayed by UPM, 24 received awards comprising 5 gold, 9 silver and 10 bronze medals.

Prof. Dr. Shatri Mansor from Institute of Advanced Technology (ITMA) won two gold medals for his innovative research, "A New Robust Compressor for GIS Spatial Data Compression" and "Model Application for Severe Weather and Early Flood Forecasting". Dr. Zulkifly Abbas from Institute for Mathematical Research (INSPEM) won a gold medal for his novel research, "Oil Palm Bunch Ripeness Meter". Assoc. Prof. Dr. Raja Noor Zaliha Raja Abdul Rahman from the faculty of Biotechnology & Biomolecular Sciences also won a gold medal for her inventive research entitled, "TL Lipase for Industrial Applications: Isolation to Structure Elucidation". Last but not the least, Prof. Dr. Abdul Manaf Ali from IBS received yet another gold medal for his pioneering research, "A New Monoclonal Antibody against Breast and Colon Cancer Cells".

Turn to centre page for pictorial news.

Expo Industri Asas Tani (EIAT 2006)

The Expo Industri Asas Tani 2006 organised by the Ministry of Agriculture, with a theme, "Agriculture for Health and Wealth" was held from 16-19th February 2006 at the Tun Razak Hall 1,2 & Tun Hussein Onn Hall, Putra World Trade Centre (PWTC), showcasing the latest technologies and innovations in the agro-based industry. 18 R&D exhibits were showcased by UPM scientists.

UPM received a Special Recognition Award for the Best Exhibition Booth in the Government Ministries, Department & Agencies Category.

Turn to centre page for pictorial news. 

FactFile

For the record

1 Ms. Ramjitha Bala joined Research Management Centre as an Admin Assistant to assist the Publication, Promotion and Systems Unit with effect from 3rd January 2006. She replaces Ms. Nur Nasimi bt. Abd. Latif who left RMC on 31 December 2005 to explore the RMC outside world!



Ms. Ramjitha Bala, Publication, Promotion and Systems Unit, RMC

2 Ms. Haslida Hassan from the faculty of Design and Architecture has joined RMC as Senior Assistant Registrar with effect from 10th April 2006. She could be contacted via email at haslida@putra.upm.edu.my



Ms. Haslida Hassan, Senior Assistants Registrar, RMC

3 Mr. Jamali Jamib joined RMC with effect from 13 March 2006 to assist the Publications, Promotion and System Unit. Mr Jamib holds a MBA degree from Universiti Putra Malaysia and had been working as an admin officer with the Faculty of Economics and Management prior to being transferred to RMC. He could be contacted via email at jamali@putra.upm.edu.my



Mr. Jamali Jamib, Admin Officer, Publications, Promotion & System Unit, RMC

4 Due to expansion and restructuring of several units, the following personnel have either left RMC or have been relocated with in UPM, with effect from 31 December 2005:


- Nur Nasimi bte Abdul Latif — left
- Nur Haznita bte Mahmood — left
- Rozlina bte Yaakub — left
- Rizal bin Mustafa — left
- Saharia bte Mohd. Jani — relocated
- Mustapha Kamal bin Hj. Tahir — relocated

The management of RMC takes this opportunity to thank one and all for their valuable contributions in the making of Research Management Centre.

Have Your Say

If you have any comments about the content of the newsletter or any contributions that you may wish to make for the forthcoming issues, please send them to: The Managing Editor, Synthesis, Publication Promotion and System Unit, Research Management Centre, 4th Floor, Administration Building, 43400 UPM, Serdang, Selangor, Malaysia or via the Internet to ndeeps@admin.upm.edu.my. The editor reserves the right to edit articles for clarity and space before publication.

Check it out

UPM Research Directory, Part 1: Products, Services and Expertise, and Part 2: Staff Profile—Faces of Innovation, Edition 2005, published by the Publication, Promotion and System Unit, Research Management Centre, UPM. Editors: Nayan Deep S. Kanwal, Zulkifli Idrus and Raha Abd. Rahim. ISSN 1675-7823 is available for distribution. If you are interested for a copy, please contact the Publication division of the Publication, Promotion and System Unit, Research Management Centre at 03-8946 6191, or 6192 for further details. 

Read this — a call for contributions!!

If you have any contributions comprising feature articles or research write-ups that you would like us to publish in the esteemed columns of Synthesis or any suggestions that you may wish to make for the forthcoming issues, please send them to: The Managing Editor, Synthesis, Publication, Promotion and System Unit, Research Management Centre, 4th Floor, Administration Building, 43400 UPM, Serdang, Selangor, Malaysia or via the Internet to ndeeps@admin.upm.edu.my or rschinfo@admin.upm.edu.my. The editor reserves the right to edit articles for clarity and space before publication.

A Glance at Research Inventions & Innovations at UPM¹

Continued from Issue 11, 4th Quarter (Dec. 2005)...

No.	Faculty/ Institute	Researcher	Innovation	Research Cluster	Project Number	Allocation
292.	Science and Environmental Studies	Fudziah Ismail	Sequential and paralel solution of delay and algebraic differential equations and its application to the population growth modeling problem	ITM	09-02-04-0435 EA001	RM150,000
293.	Science and Environmental Studies	Gwendoline Ee Cheng Lian	Bioactive Acetogenins From Sarawak Annona, Disepalum and Goniothalamus species.	SAE	09-02-04-0279 EA001	RM214,000
294.	Science and Environmental Studies	Habshah Midi	Robust regression with both continuous and categorical variables with heteroiscedastic non-normal errors	BAB	09-02-04-0749-EA001	RM139,680
295.	Science and Environmental Studies	Hishamuddin Zainuddin	Quantum theory on punctured surfaces and related problems in many-body theory, quantum gravity and cosmology	SAE	09-02-04-0284 EA001	RM185,800
296.	Science and Environmental Studies	Idris Abd. Ghani	Aquaculture of green mussel: Improving productivity through transplanting method and multiple spat collecting techniques	AFF	01-02-04-0645-EA001	RM164,000
297.	Science and Environmental Studies	Ionel Valeriu Grozescu	Fotothermal Deflection Analyzer For Study Of Electrochemical Processes In Batteries and Fuel Cells During their Operations	BAB	09-02-04-0498 EA001	RM164,000
298.	Science and Environmental Studies	Imawati Ramli	Characterization and Catalytic Behavior of Mixed Metal Oxides Catalysts for Partial Oxidation of Propane	MEE	09-02-04-0286 EA001	RM216,800
299.	Science and Environmental Studies	Isa Daud	Statistical modeling of environmental time series	SAE	09-02-04-0287 EA001	RM180,680
300.	Science and Environmental Studies	Ismail Omar	Protein expression in freshwater fish liver by 2-dimensional electrophoresis2-dimensional electrophoresis	BAB	09-02-04-0288 EA001	RM93,500
301.	Science and Environmental Studies	Jambari Hj. Ali	The optimization of rice field productivity by integrating blue green algae, fishers and duck as biocontrol agent for weeds and pests	AFF	01-02-04-0040 EA001	RM136,000
302.	Science and Environmental Studies	Janna Ong Abdullah	Development of transgenic technology using antisense gene construct for flower colour in Melastome sp.	BAB	09-02-04-0548 EA001	RM204,000
303.	Science and Environmental Studies	Japar Sidik Bujang	Seagrass taxonomy, biology and habitat characteristics	AFF	09-02-04-0290 EA001	RM199,900
304.	Science and Environmental Studies	Johari Ramli	Metabolic effects of pesticides in Malaysia fresh water fish in relation to meat quality	AFF	09-02-04-0293 EA001	RM100,000
305.	Science and Environmental Studies	Juzu Hayati Arshad	Availability and Activity of CoenzymeQ1β in Malaysian Fresh Water Fish	AFF	09-02-04-0850-EA001	RM73,560
306.	Science and Environmental Studies	Juzu Hayati Arshad	Determination and extraction of essential fatty acids (omega fatty acids) and vitamin E from water fish	AFF	09-02-04-0294 EA001	RM95,000
307.	Science and Environmental Studies	Kaida Khalid	Development of Microwave - Assisted Processing (MAP) for Science, Industry and Technology Applications	SAE	09-02-04-0438 EA001	RM166,000
308.	Science and Environmental Studies	Karen Ann Crouse	Halogenation of Fatty Acids	BAB	09-02-04-0752-EA001	RM197,540
309.	Science and Environmental Studies	Karen Ann Crouse	Synthesis and Bioactivity studies of nitrogen-sulfur, nitrogen-oxygen-sulfur donor ligands and their complexes with transition and non-transition metals	SAE	09-02-04-0296 EA001	RM233,000
310.	Science and Environmental Studies	Khatijah Yusoff	Determination of the L gene sequence and intergenic regions of Newcastle disease virus strain	AF2240	AFF 01-02-04-0053 EA001	RM97,000
311.	Science and Environmental Studies	Khatijah Yusoff	Macromolecular interactions between different proteins of NDV	BAB	09-02-04-0753-EA001	RM197,680
312.	Science and Environmental Studies	Lee Choong Kheng	Utilization of waste materials for the removal of pollutants in aqueous environment	MEE	08-02-04-0665-EA001	RM138,400
313.	Science and Environmental Studies	Lee Choong Kheng	Preparation and characterization of bismuth-based oxide ion conductors as new sensor materials	MEE	09-02-04-0302 EA001	RM110,800
314.	Science and Environmental Studies	Mahiran Basri Enzyme	Catalyzed synthesis of palm-based wax esters	BAB	09-02-04-0306 EA001	RM211,000
315.	Science and Environmental Studies	Mawardi Rahmani	Development and structural modification of antimicrobial and anticancer coumarins and sulphones from Micromelum and Glycosmic Sp. (Rutaceae)	BAB	09-02-04-0431 EA001	RM158,680
316.	Science and Environmental Studies	Maziaah Mahmood	Development of rapid in vitro mass propagation techniques for commercially important fragrant orchid hybrids	AFF	01-02-04-0062 EA001	RM163,000

to be continued...

¹ Data presented IRPA RM-8 (as at Cycle 1, 2004); Total 416 EAR Grants, sorted by PTJ & Name.

[†]The description of the some of the above Inventions and Innovative research products available for commercialisation at UPM are contained in the books — "R&D at UPM: Creating New Frontiers of Innovative Research", First Edition, and "R&D at UPM: Research Snapshots", First Edition, ISSN. 1675-1248, Editors: Nayan Deep S. Karwal, Mohd. Shahwahid Hj. Othman and Sidek Hj. Abd. Aziz, Published by Research Management Centre (RMC), UPM, available from Publications, Promotion & System Unit, Administration Building, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor Darul Ehsan, Malaysia, Tel: +603 8946 6028 / 8946 6192, Fax: +603 8942 6539, e-mail: rschinfo@admin.upm.edu.my

Synthesis

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 - ▶ Vice-Chancellor's Fellowship Awards 2005
 - ▶ Down the Memory Lane – Nominations around the Campus

Letters to the Editor

If you have any comments about the content of the publication or any contributors that you may want to make for the forthcoming issue, please send them for the Managing Editor, *Synthesis*, Publication Promotion and System Unit, Research Management Centre, 4th Floor, Administration Building, 43400 UPM, Serdang, Selangor, Malaysia or via the Internet to research@adm.upm.edu.my. The editor reserves the right to edit articles for clarity and space before publication.

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Are you reading your own copy of the UPM R&D Digest?

Synthesis is the first and only quarterly R&D digest of Universiti Putra Malaysia published in March, June, September and December with the focus on award-winning innovations. It covers research happenings emerging from the various faculties and institutes across the university and provides a brief summary of some of the important research findings of the study conducted at UPM. It brilliantly features special topics that are of national interest in various fields and disciplines.

Scientists must be made aware of how important the impact of their work is and the possible applications on society and public opinion. It is hoped that this digest will provide the opportunity to interact particularly through feedback or direct mail to the scientist from either the private sector or by scientists from other government research institutions.

Synthesis is the official research bulletin of the University and is published by Research Management Centre. It is available free of charge to the academic community.

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