



**FACULTY OF ELECTRICAL
ENGINEERING**

UNIVERSITI TEKNOLOGI MALAYSIA

**RESEARCH AND PUBLICATION
DIRECTORY**

2004

CONTENTS

Preface	2
Universiti Teknologi Malaysia	3
Faculty of Electrical Engineering	4
Introduction	4
Administration	5
Postgraduate Studies	5
Communication Engineering	6
Control and Mechatronics Engineering	18
Electronics and Computer Engineering	32
Power Engineering	41
Research Students	51
Awards	59

PREFACE

Dean, Faculty of Electrical Engineering

It is a great pleasure to welcome you to the 2004 Research and Publication Directory of the Faculty of Electrical Engineering, Universiti Teknologi Malaysia.

The purpose of this directory is to provide information regarding the research activities and publications of the academic staffs and researchers at the faculty to the local and international universities and research centres. This research and publication directory is divided into four main research areas in Electrical Engineering namely the Communication Engineering, Control and Mechatronic Engineering, Electronics and Computer Engineering and Power Engineering. Research activities including on-going research grants with summaries and research interests are provided. Over the last three years, the faculty managed to secure over RM 17 millions on research grants from both government and industries. In addition, over 220 publications including books, journals and conference papers were produced by the academic staffs in the years 2004. This shows the commitment of the faculty staff towards disseminating new knowledge through research and publication.

It is our vision to make this faculty a centre of excellence and a leader in the field of Electrical Engineering in Malaysia and at the international level. We hope that the directory would be informative and helpful.

Thank you.

Prof. Dr. Ahmad Darus
Dean
Faculty of Electrical Engineering
Universiti Teknologi Malaysia
Malaysia

UNIVERSITI TEKNOLOGI MALAYSIA (UTM)

UTM is a prestigious university at the frontier of technology with a vision to:

lead in the development of creative human resource and technology in line with aspiration of the nation.

UTM, one of Malaysia's leading universities for engineering and technology, has

- a mission to be world-class centre for academic and technological excellence through creativity;
- a reputation for innovative education and leading-edge research, educating the technologists and professionals;
- more than 20 specialist institutes and research centres, in addition to academic departments to service the technology, education and research needs;
- more than 25,000 students on campus in Johor, the southern state of Peninsular Malaysia and more than 4,500 in Kuala Lumpur campus, plus more than 5,000 students on distance learning programmes;
- more than 3,000 postgraduate students in various fields of specialisation;

UTM strives for academic excellence through creative learning and state-of-the-art technology. UTM has two campuses, the 1,222 hectare main campus in Skudai, Johor at the southern of peninsular Malaysia and an 18 hectare city campus in Kuala Lumpur. UTM is proud to be the centre of excellence through dedication to develop science and technology to compete in the global arena. UTM has produced more than 85,000 graduates including 6,026 postgraduates.

FACULTY OF ELECTRICAL ENGINEERING

INTRODUCTION

The FACULTY OF ELECTRICAL ENGINEERING is among the oldest and the largest in Universiti Teknologi Malaysia in terms of students and staff populations. It is one of the most active faculties in Universiti Teknologi Malaysia in terms of research grants and publications. The Faculty of Electrical Engineering, Universiti Teknologi Malaysia, was established in late 1974 in the Kuala Lumpur campus. In June 1995, the Faculty of Electrical Engineering moved to the main campus of the Universiti Teknologi Malaysia in Skudai, Johor.

The Faculty has the biggest concentration of academics and experts in the field of electrical engineering in Malaysia. The *graduate faculty*, which currently consists of a total of 47 professors, associate professors and lecturers with PhDs, provides extensive research competence and engineering expertise, to perform applied research addressing problems of the state, national and international importance. This *graduate faculty* is supported by another 100 lecturers and tutors, and 40 trained technicians. This staff strength, coupled with state-of-the-art research facilities in 40 computer and engineering laboratories, ensure the teaching, learning and research activities always maintain a high academic standards and of world-class quality. Research are funded by grants from both the government and industry. For the past three years, the faculty has succeeded in securing, on the average, a total of RM 6 million a year in research grants. The faculty also provides important educational services to industries, professions, and the general public. Short courses, conferences and workshops taught by the faculty provide valuable interactions among professionals in the electrical engineering field. The active research environment provides the academic staff, researchers and graduate students with the latest facilities and technology necessary for quality research work, relevant to today's electrical engineering field. Currently, undergraduate enrolment is around 3000, while postgraduate student enrolment is about 350, which should reach a target of about 500 in 2007. The faculty is organized into eight departments and three centres of excellence, as listed below.

Departments:

1. Department of Control and Instrumentation Engineering (CIED)
2. Department of Electrical Power Engineering (POWER)
3. Department of Electronic Engineering (INSEED)
4. Department of Energy Conversion Engineering (ENCON)
5. Department of Mechatronics and Robotic Engineering (MER)
6. Department of Microelectronics and Computer Engineering (MiCE)
7. Department of Radio Communications Engineering (RaCED)
8. Department of Optic and Telematic Communication Engineering (TOP)

Centres of Excellence

1. Institute of High Voltage and High Current (IVAT)
2. Centre for Artificial Intelligence and Robotics (CAIRO)
3. Wireless Communications Centre (WCC)
4. Biomedical Engineering Institute

ADMINISTRATION

Prof. Dr. Ahmad Darus
Dean, Faculty of Electrical Engineering

Prof. Ir. Dr. Abdul Halim Mohamed Yatim
Deputy Dean (Academic & Continuing Education)

Prof. Dr. Tharek Abdul Rahman
Deputy Dean (Research & Postgraduate Studies)

Zainul Rashid Abu Bakar
Deputy Registrar (Academic)

Maimunah Salleh
Assistant Registrar (Facilities/Human Resource)

Prof. Ir. Dr. Abdullah Asuhaimi Mohd Zin
Head, Dept. of Electrical Power Engineering

Prof. Dr. Abu Bakar Mohammad
Head, Dept. of Optic & Telematic Communication Engineering

Assoc. Prof. Dr. Jasmy Mohd Yunus
Head, Dept. of Electronic Engineering

Assoc. Prof. Dr. Mohamad Ngasri Dimon
Head, Dept. of Radio Communications Engineering

Assoc. Prof. Dr. Ruzairi Abd. Rahim
Head, Dept. of Control and Instrumentation Engineering

Assoc. Prof. Dr. Rosbi Mamat
Head, Dept. of Mechatronics and Robotic Engineering

Assoc. Prof. Dr. Ahmad Zuri Sha'ameri
Head, Dept. of Microelectronics and Computer Engineering

Assoc. Prof. Dr. Zainal Salam
Head, Dept. of Energy Conversion Engineering

Professor Dr. Hussein Ahmad
Director, Institute of High Voltage & High Current

Prof. Dr. Marzuki Khalid
Director, Centre for AI & Robotics

Prof. Dr. Tharek Abdul Rahman
Director, Wireless Communications Centre

Prof. Ir. Dr. Sheikh Hussain Shaikh Salleh
Director, Biomedical Engineering Institute

POSTGRADUATE STUDIES

The Faculty of Electrical Engineering offers postgraduate programs leading to the degrees of the Master of Engineering (M.Eng) and the Doctor of Philosophy (Ph.D) in Electrical Engineering. The programs are conducted in either one of three modes of study – research, taught course. The degrees offered are listed below.

- Ph.D (Electrical Engineering)
- M Eng (Electrical)
- M Eng (Electrical – Power)
- M Eng (Electrical – Electronics & Telecommunications)
- M Eng (Electrical – Mechatronics & Automatic Control)
- M.Eng (Computer & Microelectronics System)

Mode of Study

Research
Research
Taught Course
Taught Course
Taught Course
Taught Course

COMMUNICATION ENGINEERING

INTRODUCTION

The Communications Engineering group provides instruction, research and public service in the areas of Communication Networks, Telematics, Computer Networking, Photonics, Optical Communications, Radio Communications, Mobile and Wireless Communications, Antenna and Propagation, Micro Electro-Mechanical System (MEMS), Acoustics Engineering, RF and Microwave Engineering Design. The group, which currently consists of 2 professors, 6 associate professors, 22 lecturers provides extensive research competence and engineering expertise to perform applied research addressing problems of the state, national and international importance. This group is supported by another 6 tutors, 10 research officers and 5 trained technicians. This staff strength, complimented with the state-of-art research facilities in 8 engineering laboratories and a centre of excellence (Wireless Communication Centre), ensure the teaching, learning and research activities always maintain a high academic standards and of world class quality. Over the last three years, the group managed to secure over RM 5 millions on research grants from both government and industries. Over 60 publications including books, journals and conference papers were produced in 2004.

THE GRADUATE FACULTY

Dr. Abu Bakar Mohammad

PhD (Fibre Optic Video System) Bradford 1995
Professor
Photonics Technology (Photonics Switching and WDM Systems), Unguided Optical Fiber Communication and Radio Over Fiber, MEMS.

Dr. Tharek Abdul Rahman

PhD (Mobile Radio Communications) Bristol 1988
Professor
Wireless Communications, Mobile Propagation, RF Communications.

Dr. Abu Sahmah Mohd Supaat

MEng (Electrical Eng) UTM 2004
Associate Professor
Integrated Optics, Guided and Unguided Optical Communication, Optical Switching.

Dr. Jafri Din

PhD (Electrical Eng) UTM 1997
Associate Professor
Radiowave Propagation, Satellite Propagation, Satellite TV Broadcasting.

Dr. Mazlina Esa

PhD (EE) Birmingham 1996
Associate Professor
Antennas, Microwave/RF, Superconducting Passive Devices, Wireless ATM, Broadcasting, Wireless Power Transmission.

Dr. Mohamad Ngasri Dimon

PhD (Electrical Eng) UTM 2003
Associate Professor
Enclose Room Acoustics Modelling, Experimental and Numerical Modelling of Acoustic Material

Dr. Norazan Mohd. Kassim

PhD (Silicon Waveguides) Nottingham 1991
Associate Professor
Electromagnetic Field Theory, Optical Devices: Simulation; Fabrication and Measurement, Optical Communications.

Dr. Norsheila Fisal

PhD (Data Communications) Aston 1993
Associate Professor
Teletraffic Engineering: Network Management and Performance Study, Data Communication: Broadband ATM, Wireless ATM; Digital communication system; Internetworking, Mobile Computing.

Dr. Mohamad Kamal A Rahim

PhD (Electrical Eng) Birmingham 2003
Lecturer
Active and Passive Antennas, RF /Microwave Design.

Dr. Razali Ngah

PhD (Communication Eng) Northumbria 2004
Lecturer
Photonic Networks and RF Design.

Dr. Sevia Mahdaliza Idrus Sutan Nameh

PhD (Electrical Eng) Warwick 2004
Lecturer
Optical Communication Devices and Systems; Optical Receiver Design and Optimisation; Optical Wireless Communications; Engineering Management

PROJECTS/RESEARCH TOPICS OF INTEREST

* Note: This list is not an exhaustive list.

- Design of RF/microwave devices
- Digital modulation techniques
- IMT2000 applications
- Interference problems
- Microwave power transmission
- Mobile radio propagation
- Active printed antenna designs using metals and superconductors
- Broadband antenna design
- Rain attenuation studies in tropical regions
- Antennas and microwave circuits
- Terrestrial, mobile and satellite communications
- Bluetooth, broadband mobile application
- Switching technology
- Network security and internet applications
- CDMA multi-user detection
- Network performance study
- Teletraffic engineering
- Mobility management in wireless network
- ATM network
- Integration of wireless and fixed LAN
- MEMS
- Radio optical communication
- Photonic switching
- Optical access network
- Optical devices
- Unguided optical systems
- Acoustics engineering
- Acoustic material development
- Sound system modelling of enclosed room

RESEARCH GRANTS

Adaptive Power Control for Point-to-Point Microwave Link

Project Head: Assoc. Prof. Dr. Jafri Din

Period: February 2002 – February 2005

IRPA Code: 74500

Grant Amount: RM 1,890,000.

Summary

In tropical region, rain attenuation is the main degradation factor for microwave radio system. Numerous researches have been conducted for rain attenuation measurement and prediction, but suggestion and investigation for system performance improvement are quite limited. This project therefore presented a transceiver design with adaptive transmit power control (ATPC) for overcome the rain attenuation problem faced by point-to-point microwave link. Advanced Design System (ADS) is used to design and simulate the microwave transceiver system in 38 GHz and 23 GHz. The design is performed by analysed the non-linearity and bit-error-rate (BER) performance of the system. The designed system is compared with MINILINK E microwave system, in terms of typical specifications and link range with rain attenuation. The measured rain attenuation in previous research is used in the performance comparison. Subsystem of ATPC is developed and tested in experimental link as well. A set of design template is developed in ADS to simplify the system design process in the future. To achieve the same performance with different installation distance, the designed systems at 38 GHz show 45% and 47% improvement for BER 10⁻³ and 10⁻⁶ respectively. For 23 GHz system, the improvements are 19% and 21% for BER 10⁻³ and 10⁻⁶. This indicates that the rain attenuation for point-to-point microwave system can be improved by ATPC system, without drawbacks from installation distance and interference.

RF Front-End Design for Point-to-Point Microwave Link

Project Head: Assoc. Prof. Dr. Jafri Din

Period: February 2002 – February 2005

IRPA Code: 74502

Grant Amount: RM 1,846,928.

Summary

The rapid advancement in microwave communication technologies in telecommunication and broadcasting has resulted in congestion for frequencies below 10 GHz. This has forced the utilization of higher frequencies extending into the millimeter wavelength region. The need for systems with higher data rates and higher carrier

frequencies by providers of wireless services is increased. The first valuable niche market where, millimeter radio fits in, is the backbone network at 23 GHz, 26 GHz, and 38 GHz. This research project is comprised of RF front-end project, flat antenna and microwave prediction software projects at 23 GHz band. The RF front-end project presents the simulation of two transceiver prototypes. The first transceiver prototype is based on the component's specifications available in the markets. The second transceiver prototype is based on customized specifications. For the first prototype, every component performance is observed by measurement of the developed test sets and the results are compared to the simulation results. Performance of the second transceiver prototype is compared with the performance of the existing Ericsson MINILINK E. The system configurations are simulated using Advanced Design System (ADS) from Agilent's for simplifying the process of component specifications determination and performance analysis. For flat antenna or RLSA antenna is designed and developed in order to construct single layer RLSA antenna of linear polarization by using a theoretical and experimental approach. The developed antenna prototypes at the end of the project will have capability to transmitting and receiving microwave signal operating at 23 GHz (21.952 to 23.546GHz). The Microwave Prediction Software (MPS) is a utility for calculating signal characteristics of radio propagation paths. It runs on Windows 95, 98 and XP only and includes algorithms for line-of-sight, free space loss, atmospheric losses (etc. rain attenuation and gaseous attenuation) and through obstructed (diffracting) paths. This MPS software is able to predict link budget or performance for terrestrial link system in Peninsular Malaysia only. The development MPS software is done using Visual C++ and MATLAB software for calculation and display of the parameter models.

For the first designed system of RF front-end, the measurement for cascaded power amplifier and mixer give 23 dBm of output power. The measured output power drops about 2.5 dBm from the real value of 25.507 dBm. This loss is assumed as undetermined loss. The maximum transmitter power level for the second designed system is 7.576 dBm higher than the transmitter power level of MINILINK E. Both the transmitters' output powers do not exceed the specified limit transmitter power level.

Low Profile Antenna for In-door and Outdoor Application for Wireless Communication

Project Head: Prof. Dr. Tharek Abd Rahman

Period: February 2002 – February 2005

IRPA Code: 74501

Grant Amount: RM 3,306,928.

Summary

Low profile antennas will be designed and developed for two major purposes; indoor Wireless LAN and outdoor application particularly the point-to-point microwave link. In this research, indoor WLAN is considered based on the IEEE 802.11a standard, which is initially aimed for the 5 GHz UNII middle band (Unlicensed National Information Infrastructure). Whereas, the outdoor appliances are divided into two functions; the 23 GHz microwave link and WLAN bridge at (5.725-5.825) GHz. The antenna design for such applications must feature superior performance, low profile and cost-effective. This research will extend the technology developed for low profile antennas to these applications and finally commercialising the successful antenna packages. The research also involves fixed broadband wireless access (FBWA) propagation study, RF front-end design for FBWA.

Adaptive Power Control System for Microwave Communication

Project Head: Prof. Dr. Tharek Abd Rahman

Period: January 2003 – February 2004

IRPA Code: 74013

Grant Amount: RM 180,000.

Summary

The research work involves with system level design of transceiver with ATPC. The transceiver design cascades the system level components in achieving the design goals. Using computer aided design (CAD) tools, the communication system is developed and simulated. The specifications determined in every system component will be sent for prototype development. The system is designed to integrate with class 2 equipment as specified in European Telecommunications Standard Institute recommendations. The simulations are performed for 2xE1 capacity where E1 is the European digital line interface at 2.048 Mbps. In order to observe the power control capability of ATPC system, a subsystem is developed and tested in experimental link with real-time rain faded

signal. Microwave experimental links in Universiti Teknologi Malaysia (UTM), Skudai is setup for prototype testing purpose. Real time rain fade is sampled through the link and used in the testing.

Polymer Based Optical Waveguide

Project Head: Prof. Dr. Abu Bakar Bin Mohammad

Period: April 2004 – April 2006

IRPA Code: 74211

Grant Amount: RM 1,000,000.

Summary

The demand in optical networking for photonic components that meet performance criteria as well as economic requirements has opened the door for novel technologies capable for high yield low cost manufacturing while delivering high performance and enabling unique functions. The most promising new technologies are integrated optics. The demand for new and more efficient materials suitable for photonic applications has grown in recent times under the stimulus of information technologies. Much effort is being directed to the design and fabrication of devices base on innovative functional materials with improved performance or completely new properties. Polymeric materials are particularly attractive in integrated optics because of their ability to be processed rapidly, cost-effectively, and with high yields. Polymeric materials are allowed to form compact optical circuits by offering large refractive index contrasts. A new polymeric material: PhotoBCB Cyclotene 4024-40 from Dow Chemical had been studied and purchased for future development of optical integrated circuits. A basic setup for waveguide fabrication had been installed in UTM and being upgraded from time to time depending on the available fund. Various optical waveguides are being studied and simulated by wave optics approach. The fundamentals of electromagnetic waves and optical waveguides will be built up. The polymeric material is being studied continuously to proof its feasibility in waveguide fabrication

MEMS Based Optical Devices

Project Head: Prof. Dr. Abu Bakar Bin Mohammad

Period: April 2004 – April 2006

IRPA Code: 74211

Grant Amount: RM 600,000.

Summary

Microelectromechanical system (MEMS) is a new technology widely used for fabricating next generation optical devices. In this project, a MEMS fiber alignment and optical switch prototype has been developed using the Multi User MEMS Processes (MUMPS) surface micromachining process. The optical switch prototype features a 20 V operating voltage, low insertion loss (0.97 dB at 1550 nm), wavelength independent, low power consumption, high switching speed, compact size and low bulk fabrication cost through surface micromachining process. The switch also features an integrated fiber alignment capability for optimizing the assembly of fiber onto the device. The device consists of intersecting cantilevers and is electrostatically actuated. A fiber is put onto the cantilevers and by controlling the position of the fiber through actuation, switching operation can be achieved. The MEMS optical switch has applications in network protection switching and monitoring in which switching times in the millisecond range is commonly used. In addition, the same design presented in this paper can also be utilized as integrated passive or active fiber alignment microstructure, whereby it can be integrated onto the same target MUMPS optical MEMS chip or used as external submount for in-package optical MEMS packaging

Development of an FPGA Based Transceiver for Wireless LAN Network

Project Head: Assoc. Prof. Dr. Norsheila Fisal

Period: July 2003 – June 2005

IRPA Code: 74081

Grant Amount: RM 185,000.

Summary

The next generation of wireless personal communication networks (PCN) will be required to co-exist with fiber-optic based broadband communication network, which should be far more ubiquitous in the coming decade. In order to avoid mismatch between wireline and wireless network, it is crucial to design a broadband wireless network with similar service capabilities. This project is aimed at designing a baseband transmitter and receiver using Orthogonal Frequency Division Multiplexing (OFDM) that provides broadband communication in wireless LAN. Two main issues that arise from extending OFDM into the wireless environment is the design of the physical layer air interface and an additional access control for wireless environment. Problems associated with the design of such system are typically due to modulation, amplifier, frequency stabilization and synchronization, error control and contending mechanism that will provide efficient frequency utilization since bandwidth is a precious resource in a radio environment. The project includes the development of FPGA based transceiver that allows multi-carrier modulation. The baseband processing has been studied through the behavioral functions in MATLAB and the actual design will be implemented in FPGA. This allows programmable functions and fast processing. A more advanced behavioral function includes space time block coding (STBC) with multiple input and multiple out put (MIMO) antennas.

Programmable Mobile Network for Adaptive Internet Protocol Applications

Project Head: Assoc. Prof. Dr. Norsheila Fisal

Period: July 2002 – June 2005

IRPA Code: 74082

Grant Amount: RM 166,400.

Summary

As the demand for mobile multimedia services grows, high speed wireless extension to existing broadband and Internet technologies will be required to support the seamless delivery of voice, video, and data to mobile devices with sustained high quality. The wireless and mobile environment presents a number of technical challenges to this vision. First, the physical layer impairments contribute toward time-varying error characteristics and time-varying channel capacity as observed by mobile devices (define as wireless-QoS). Second, user mobility can trigger rapid degradation in the quality of the delivered signal. This can lead to transient service outages resulting in handoff dropping when a new access point is unable to accommodate new mobile device at its current level of service (define as mobile QoS). As a result, mobile applications can experience unwarranted delays, packet loss or loss of service. Existing mobile systems (e.g. mobile IP, mobile ATM etc.) lack the intrinsic architectural flexibility to deal with the complexity of supporting adaptive mobile applications in wireless mobile environment. . Thus there is a need to employ an adaptive technique to counter time varying wireless-QoS and mobile-QoS impairments. However, providing system-wide (i.e. end-system and network) adaptive QoS support for mobile multimedia is complex to realize in practice. It is believed that there is a need to develop alternative network architectures to deal with tremendous demands placed on underlying mobile signaling, adaptation management and wireless transport system in support of new mobile services. To address these issues a software-intensive active (programmable) mobile networking environment based on distributed technology is proposed. Programmable means that the programmable network interfaces are high level enough to allow new adaptive services to be built using distributed object computing technology. The distributed object technology dynamically exploits the intrinsic scalable properties of adaptive mobile applications.

Bluetooth Proximity Wireless Communication (Contract Research with BOKIA (M) Sdn. Bhd)

Project Head: Prof. Dr. Tharek Abdul Rahman

Period: March 2003 – March 2004

Code: 68304

Grant Amount: RM 120,000.

Summary

The Bluetooth wireless technology is a cable replacement technology that exploits the wireless interconnectivity that is possible with radio. It is a new wireless technology for low cost, low power, local radio communications. This technology is designed to be small enough to fit inside any electronic device, hence revolutionizing wireless connectivity by enabling many new and innovative services for its users. Several usage models and

applications are already being identified for various Bluetooth wireless mobile devices such as headsets, phones, computers, modems, and so forth. Bluetooth chips are already available and early applications include cordless connections from mobile phones to laptop computers and wireless headsets.

This project gives Bluetooth wireless solution to the cable replacement between Personal Digital Assistant (PDA) and Personal Computers (PCs)/Laptops with BSmart A300 Vehicle Tracker. BSmart A300 series is a wireless access device targeted to provide non-connected PDA and PCs/Laptops with wireless connectivity and navigation capability. BSmart A300 series also enabled remote control and monitor their vehicle activities. By integrating Bluetooth enabled BSmart A300 series to vehicle engine management system, user with Bluetooth enabled PDA and Bluetooth enabled PC/Laptop will therefore experience in-vehicle mobility services as well as control and monitor their vehicle performance wirelessly. Bluetooth wireless communication also support services such as Internet access capability, call in and out to/from GSM mobile phone and 2-way Short Messaging Services (SMS) capability.

Design and Development of Active Integrated Antenna for Wireless LAN Application

Project Head: Dr. Mohamad Kamal A. Rahim

Period: December 2004 – November 2006

IRPA Code: 74278

Grant Amount: RM 163,000.

Summary

Mobile radio is now well established; wireless techniques are gaining focus towards multi media and local network applications. For wireless local area networks (WLAN) the channel bandwidth is much higher than in current mobile networks while at the same time requiring much lower error rates. WLANs are useful in environments where flexibility in the physical relocation of network terminals are important such as in conferences, stock market, laboratories, terminal rooms, airport or office building. Two different sets of frequencies have been allocated to this wireless LAN system. One is at 2 GHz range and the other is at 5 GHz. Two different sets of frequencies have to be used for two different types of antenna. It can be solved by using one antenna for two different systems. The integration of two band of frequency can reduced the incompatibility to each other. The active devices can be embedded into the passive antenna in order to enhance the performance of both transmitter and receiver antenna. Active antenna elements are also a promising way to suppress the influence of cable losses thus thinner cables (less intrusive and expensive) can be used.

Technique to Improve the Bandwidth of Microstrip Antenna

Project Head: Dr. Mohamad Kamal A. Rahim

Period: July 2004 – June 2005

Code: 75142

Grant Amount: RM 46,000

Summary

Microstrip antenna has gain popularity because of their small size and lightweight. However a limitation of microstrip antenna is the narrow bandwidth of the basic element. The bandwidth of a basic patch element is usually 1-3%. The bandwidth of the antenna can be increased by reducing the substrate permittivity (ϵ_r) or increasing its thickness (h). However there are two problems associated with increasing the substrate thickness. One of the problems is the radiation and reactance associated with the feed junction. The other problem is an increase in surface wave effects. In order to avoid these problems, a number of different methods have been proposed to improve the bandwidth of the microstrip antenna. The aim of this project is study the characteristic of microstrip broadband antenna for future wireless communication system. Different methods to improve the bandwidth of the antenna such as multilayer, parasitic, log periodic and different shaped slot will be studied. The performance of the antenna will be analyzed in term of bandwidth, co and cross-polar isolation, gain, polarization and radiation pattern.

Study Of Miniaturisation Technique For Compacting Antenna Using Fractal Technology

Project Head: Noor Asniza Murad

Period: February 2004 – January 2005

Code: 75088

Grant Amount: RM 23,000.

Summary

Antenna is a transitional structure between guiding devices and free space. The size of the antenna basically depends on the wavelength. Benoit Mandelbrot had classified the fractal antenna geometries in 1975. However, the term fractal radiators or fractal antenna only appeared in publications in 1994. This project will study the miniaturisation technique offers by having fractal structures on a conventional patch. The fractal design introduced into the conventional patch shape is intended to reduce the frequency of operation. Hence, miniaturisation can be achieved. Simulations on designed antennas have been done using Ensemble SV and Sonnet software. The new antenna has been fabricated and tested using a bench setup available in the Advance Microwave Laboratory. Koch Island fractal structures show declination in resonant frequency for each iteration process. Space filling properties of the fractal structure allow electrically large features to be packed into smaller area. Another common property, self-similarity is an advantage in designing multiband antennas. Having identical copies of the element itself allow the antenna to operate in a similar way at several wavelengths. The fractal technology can be used in industries for designing compact antennas for many applications such as for Global Positioning System, Bluetooth, Wireless Least Area Network/indoor, and also in automotive solutions.

The Study of Normal Incidence Sound Absorption Coefficient of Wood Circular Perforated Panel Using Numerical Modelling Technique

Project Head: Assoc. Prof. Dr. Mohamad Ngasri Dimon

Period: July 2004 – June 2005

Code: 75117

Grant Amount: RM 33,500.

Summary

The Direct Piercing Carved Wood Panel (DPCWP) has been used as part of wall panel of an enclosed room particularly for mosques. Circular Perforated Panel (CPP) is the simplest form of DPCWP. Previously, the used of DPCWP as part of a wall panel such as in Masjid Al-Bukhary, Alor Setar Kedah and Masjid Putra, Putrajaya, mainly on aesthetics consideration. However, the property of DPCWP allowing sound to pass through, shows that DPCWP can act as sound absorption material. In this work, the sound absorption of wood CPP using numerical modelling technique based on Boundary Element Method (BEM) at 20%, 30% and 40% perforation ratio with 20 mm thickness will be investigated. Thereafter, sound absorption statistical regression model will be develop to enable prediction of sound absorption performance at other perforation ratio.

PUBLICATION

1. FATIMAH MOHAMAD, SITI ZALEHA ABDUL HAMID, ROZEHA A. RASHID and ABU SAHMAH MOHD SUPAAT, *Teori Medan Elektromagnet*, Faculty of Electrical Engineering, UTM, 2004.
2. ROZEHA A. RASHID, ALIAS MOHD, MOHAMAD KAMAL A. RAHIM, MOHAMAD RIJAL HAMID, KAMALUDIN MOHAMAD YUSOF and NOR HAFIZAH NGAJIKIN, *Prinsip Kejuruteraan Perhubungan*, Faculty of Electrical Engineering, UTM, 2004.
3. ABU SAHMAH MOHD SUPA'AT, ABU BAKAR MOHAMMAD and NORAZAN MOHD KASSIM, "Polymer Based Directional Coupler Thermo-optical Switch", *Jurnal Teknologi*, **40**(D), June 2004, pp. 1-8.
4. M.K.A. RAHIM and P. GARDNER, "Passive and Active Microstrip Log Periodic Antenna (LPA)", *Elektrika*, Dec. 2004, **6**(1), pp. 95-99.
5. MOHAMAD KAMAL A. RAHIM and PETER GARDNER, "Microstrip Bandwidth Enhancement Using Log Periodic Technique With Inset Feed", *Jurnal Teknologi*, **41**(D), Dec 2004, pp. 55-66.
6. MOHD HANIFF IBRAHIM, NORAZAN MOHD KASSIM, ABU BAKAR MOHAMMAD and SHEE YU GANG, "Modeling Of Rib Optical Waveguide Structure Using Effective Index Method", *Elektrika*, Dec. 2004, **6**(1), pp. 43-49.
7. A. ALI and N. FISAL, "Tracking for Location Aided Routing in Mobile Ad Hoc Network (MANET)", *M2USIC 2004*, Putrajaya, Malaysia, 7-8 October 2004.
8. A. ALI and N. FISAL, "Indoor Location Tracking Based on Geometry", *ISG 2004*, Kuala Lumpur, 21-23 September 2004.
9. ALI, L.A. LATIFF and N. FISAL, "GPS-Free Indoor Location Tracking in Mobile Ad Hoc Network (MANET) Using RSSI", *RF and Microwave Conference 2004*, Selangor, Malaysia, 5-6 Oct 2004.
10. A.N. HUSNA, S.Y. SHARIFAH KAMILAH, B. AMERUDDIN and E. MAZLINA, "Intercarrier Interference (ICI) Analysis Using Correlative Coding OFDM System", *Proc of 2004 Radio Frequency and Microwaves (RFM2004)*, Malaysia, 4-6 October 2004.
11. ABU BAKAR MOHAMMAD and ABU SAHMAH MOHD SUPA'AT, "Thermal Analysis of Thermo-optical Polymer Waveguides", *LEOS'2004*, UNITEN, Malaysia, 30 Sept. 2004
12. ABU BAKAR MOHAMMAD, ABU SAHMAH MOHD SUPA'AT and NORAZAN MOHD KASSIM, "Development Of 2x2 Asymmetrical Thermo-optical Switch", *Proceeding of ICECE 3rd. International Conference on Electrical & Computer Engineering*, Dhaka, Bangladesh, 28-30 December 2004, pp. 128-131.
13. ABU SAHMAH MOHD SUPA'AT, ABU BAKAR MOHAMMAD and NORAZAN MOHD KASSIM, "Design Of Polymer Based Directional Coupler Thermo-optical Switch", *Proceeding of ICECE 3rd International Conference on Electrical & Computer Engineering*, Dhaka, Bangladesh, 28-30 December 2004, pp. 135-138.
14. C.W. LEOW and A.B. MOHAMMAD, "MEMS On/Off and 1x2 Optical Switch with Integrated Fiber Alignment Capability", *2004 IEEE International Conference on Semiconductor Electronics (ICSE2004)*, Serdang, Malaysia, 7-9 December 2004, pp. 171.
15. H. LE-MINH, Z. GHASSEMLOOY, W.P. NG and R. NGAH, "TOAD Switch With Symmetric Switching Window", *Annual London Conf. on Commun.(LCS 2004)*, UCL, London, UK, Sep. 2004, pp. 89-92.
16. KAMARUL HAWARI GHAZALI and MAZLINA ESA, "High Power Amplifier Prototype for Wireless Power Transmission Reception", *Proc of 2004 Malaysia Science and Technology Congress (MSTC2004)*, Sg Besi, Malaysia, 5-7 October 2004.

17. M.A.M. BHUIYAN, A.B. MOHAMMAD, N.M. KASSIM and A.S.M. SUPAAT, "A Thermo-Optic Polymer Based 2x2 Optical Switch", *Proceeding of ICECE the International Conference on Electrical and Computer Engineering ICECE 2004*, Dhaka, Bangladesh, 28-30 December 2004, pp. 132-134.
18. M.K.A. RAHIM and P. GARDNER, "Active Microstrip Log Periodic Antenna", *RF and Microwave Conference 2004*, Selangor, Malaysia, 5-6 Oct 2004.
19. M.K.A. RAHIM and P. GARDNER, "Microstrip Log Periodic Antenna with Inset Feed", *10th International Symposium on Antenna Technology and Applied Electromagnetics and URSI Conference*, Ontario, Canada, 20-23 July 2004.
20. M.K.A. RAHIM and P. GARDNER, "The Design Of Nine Element Quasi Microstrip Log Periodic Antenna" *RF and Microwave Conference 2004*, Selangor, Malaysia, 5-6 Oct 2004.
21. M.K.A. RAHIM and P. GARDNER, "Wideband Active Integrated Log Periodic Antenna", *ISAP 04*, Sendai, Japan, 17-21 August 2004.
22. MAZLINA ESA and FARIDAH HANIM SHEIKH MD FADZULLAH, "Printed Microwave Wideband Passive Balun for Balanced-Unbalanced Transformation", *Proc of 2004 Malaysia Science and Technology Congress (MSTC2004)*, Sg Besi, Malaysia, 5-7 October 2004.
23. MAZLINA ESA and SUHAILA SUBAHIR, "Experimental Verification of The Mathematically Modelled Equal-Size Tri-Operation Multilayer L and S-Band Antenna", *Proc of 2004 Radio Frequency and Microwaves (RFM2004)*, Subang, Malaysia, 4-6 October 2004.
24. MAZLINA ESA, "Implementation of Cooperative Learning in Microwave Engineering of Electrical Engineering Undergraduates", *Proc of 2004 Conference on Engineering Education*, Kuala Lumpur, Malaysia, 14-15 December 2004.
25. MAZLINA ESA, "Implementation of Cooperative Learning in Network Analysis Undergraduate Subject – Towards a PBL Approach", *Proc of 5th Asia Pacific Conference on Problem-Based Learning: Pursuit of Excellence in Education*, Petaling Jaya, Malaysia, 16-17 March 2004.
26. MAZLINA ESA, "Interactive MathCAD-Based Computer Packages for Electrical Engineering Education", *Proc of 2004 Conference on Engineering Education*, Kuala Lumpur, Malaysia, 14-15 December 2004.
27. MAZLINA ESA, IKHWAN PERANGGI POHAN, JASMY MOHD YUNOS, NOOR ASNIZA MURAD and KAMARUL HAWARI GHAZALI, "S-Band Antenna Candidate for The Front-End Rectenna of the WPT Prototype Reception", *Proc of 2004 Malaysia Science and Technology Congress (MSTC2004)*, Sg Besi, Malaysia, 5-7 October 2004.
28. MAZLINA ESA, MOHD KHAIRUL HISHAM ISMAIL, NOOR ASNIZA MURAD and ROSMAWATI OTHMAN, "Experimental Investigation of Dual Operation EMC-Fed Antenna Having Dual-Perturbed Structures", *Proc of 2004 Radio Frequency and Microwaves (RFM2004)*, Subang, Malaysia, 4-6 October 2004.
29. MAZLINA ESA, NOOR ASNIZA MURAD, IKHWAN PERANGGI POHAN, ROSMAWATI OTHMAN and ADNALL BAKAR, "Modified Bifin Fractal Antenna with Size Reduction", *Proc of 2004 Radio Frequency and Microwaves (RFM2004)*, Subang, Malaysia, 4-6 October 2004.
30. MAZLINA ESA, THOH YEW HONG and FARIDAH HANIM SHEIKH MD FADZULLAH, "Interactive Direct-Coupled Cavity Bandpass Filter Based on Mathcad Software", *Proc of 2004 Malaysia Science and Technology Congress (MSTC2004)*, Sg Besi, Malaysia, 5-7 October 2004.
31. MIMI HARYANI HASSIM, MOHD KAMARUDDIN ABD HAMID, MOHD ARIFFIN ABU HASSAN, KHAIRIYAH MOHD YUSOF, SYED AHMAD HELMI SYED HASSAN and MAZLINA ESA, "Enhancing Learning Through Cooperative Learning: UTM Experience", *Proc of 2004 Conference on Engineering Education*, Kuala Lumpur, Malaysia, 14-15 December 2004.

32. MOHAMAD ZAINOL ABIDIN ABD AZIZ, JAFRI DIN and MOHAMAD KAMAL A. RAHIM, "Low Noise Amplifier Circuit Design", *RF and Microwave Conference 2004*, Selangor, Malaysia, 5-6 Oct 2004.
33. MULADI, S.K. YUSOF and N. FISAL, "Orthogonal Transmission of Block Turbo Coded MIMO Systems with Iterative Decoding", *RF and Microwave Conference 2004*, Selangor, Malaysia, 5-6 Oct 2004.
34. MULADI, S.K. YUSOF and N. FISAL, "Product Codes for Space-Time Systems with Orthogonal Transmission", *Sixth Industrial Electronics Seminar*, Surabaya, Indonesia, 12 October 2004.
35. NORAZAN MOHD KASSIM, ABU BAKAR MOHAMMAD, ABU SAHMAH MOHD SUPA'AT, MOHD HANIFF IBRAHIM and SHEE YU GANG, "Polymer Material for Optical Devices Application", *Proc. 2004 RF and Microwave Conference (RFM 2004)*, Subang, Malaysia, October 2004.
36. NORAZAN MOHD KASSIM, ABU BAKAR MOHAMMAD, ABU SAHMAH MOHD SUPA'AT, MOHD HANIFF IBRAHIM and SHEE YU GANG, "Single Mode Rib Waveguide Modeling Techniques", *Proc. 2004 RF and Microwave Conference (RFM 2004)*, Subang, Malaysia, October 2004.
37. OOI CHIA CHING and N. FISAL, "Implementation of Real World Testing of Geocast-Enhanced AODV-bis Routing Protocol", *International Conference on Computer Systems*, Taipei, Taiwan, 15-17 December 2004.
38. OOI CHIA CHING and N. FISAL, "Implementation of Real World Testing of Geocast-Enhanced AODV-bis Routing Protocol", *TECHPOS 2004*, Kuala Lumpur, Malaysia, 15-16 December 2004.
39. OOI CHIA CHING and N. FISAL, "Implementation of Geocast-Enhanced AODV-bis Routing Protocol in MANET", *IEEE Tencon 2004*, Chiang Mai, Thailand, 21-24 Nov 2004.
40. OOI CHIA CHING and N. FISAL, "Implementation of Real World Testing of Geocast-Enhanced AODV-bis Routing Protocol", *WITSP 2004*, Adelaide, Australia, 20-22 December 2004.
41. R. NGAH and Z. GHASSEMLOOY, "BER Performance of an OTDM Demultiplexer Based on SMZ Switch", *Postgraduate Research Conference in Electronic, Photonics, Communication & Networks, and Computing Science*, Hertfordshire, UK, 5-7 April 2004, pp. 228 –229.
42. R. NGAH and Z. GHASSEMLOOY, "Bit Error Rate Performance of All-Optical Router Based on SMZ Switches", *First IFIP International Conference on Wireless and Optical Communications Networks (WOCN 2004)*, Oman, 7-9 June 2004, pp. 110-113.
43. R. NGAH and Z. GHASSEMLOOY, "Noise and Crosstalk Analysis of SMZ Switches", *International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP 2004)*, University of Newcastle, UK, 20-22 July 2004, pp. 160-163.
44. R. NGAH and Z. GHASSEMLOOY, "Simulation of Simultaneous All-Optical Clock Extraction and Demultiplexing for OTDM Packet Signal Using SMZ Switches", *9th European Conference on Networks & Optical Communications (NOC 2004)*, Eindhoven, Holland, 29 June-1 July 2004, pp. 437-442.
45. R. NGAH and Z. GHASSEMLOOY, "The Performance of an OTDM Demultiplexer Based on SMZ Switch", *IEE Seminar on Future Challenges and Opportunities for DWDM and CWDM in the Photonic Networks*, University of Warwick, UK, 11 June 2004.
46. S.H. CHOO, SHAMSUDIN H.M. AMIN, N. FISAL, and C.F. YEONG, "Multiple Mobile Robots Communication Using Bluetooth Transceiver", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 610-616.
47. S.H.S. ARIFFIN, and J. A. SCHORMANS, "Efficient Accelerated Simulation Technique for Packet Switched Networks: A Buffer with Two Priority Inputs", *IEEE International Conference on Communication*, Paris, June 2004.
48. S.M. IDRUS and R.J. GREEN, "Performance Analysis of the Photoparametric Up-converter Using Harmonic Balance Techniques", *9th IEEE HFPC Conference*, UMIST, Sept. 2004, pp. 23-28.

49. S.M. IDRUS and R.J. GREEN, "Performance Characterisation of a Photoparametric Up-converter", *2nd IEEE-GCC Conference*, Panama, Bahrain, Nov. 2004.
50. SHAMSUDIN H.M. AMIN, N. FISAL, C.F. YEONG, S.H. CHOO, and H.L. WONG, "Intelligent Human Robot Interaction for Multiple Partner Robots", *Invited Paper Proc. International Conference on Mechatronics Technology (ICMT2004)*, Hanoi, Vietnam, pp. 75-80.
51. SHEE YU GANG, ABU BAKAR MOHAMMAD, NORAZAN MOHD KASSIM and MOHD HANIFF IBRAHIM, "Fabrication of Polymeric Optical Waveguides", *Proc. 2004 RF and Microwave Conference (RFM 2004)*, Subang, Malaysia, October 2004.
52. SHEE YU GANG, NORAZAN MOHD KASSIM, ABU BAKAR MOHAMMAD and MOHD HANIFF IBRAHIM, "Fabrication of Polymeric Optical Waveguides By B-Staged Bisbenzocyclobutene (BCB)", *Proceedings of ICSE2004 2004 IEEE International Conference On Semiconductor Electronics*, Kuala Lumpur, Malaysia, 7-9 December 2004.
53. TANG MIN KEEN and THAREK ABD. RAHMAN, "BER Performance for LOS Environment for FBWA", *ICETE2004*, Portugal, August 2004.
54. TANG MIN KEEN and THAREK ABD. RAHMAN, "Measurements at 5.8GHz", *ITST2004*, Singapore, July 2004.
55. THAREK ABD. RAHMAN and KANG HENG PUH, "Bit Error Rate Measurements on WCDMA for Multipath Channel", *ICTTA04*, Syria, April 2004.
56. THAREK ABD. RAHMAN and TANG MIN KEEN, "BER Performance Simulation for FBWA in NLOS Environment", *WPMC2004*, Italy, August 2004.
57. THAREK ABD. RAHMAN and TANG MIN KEEN, "Propagation Studies for Fixed Wireless Access", *WOCN04*, Oman, June 2004.
58. THAREK ABD. RAHMAN and TANG MIN KEEN, "Propagation Prediction based on Measurements at 5.8GHz for FWA", *ICT2004*, Brazil, August 2004.
59. YEONG CHE FAI, SHAMSUDIN H.M AMIN, NORSHEILA FISAL and CHOO SUI HONG, "Development of Bluetooth Enabled Mobile Robot (BeMR) – an Approach on Developing Human-Robot Interface Device on BeMR Using Any Portable Device", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Kota Kinabalu, Malaysia, 3-5 August 2004, pp. 628-634.
60. Z. ABU BAKAR and R.J. GREEN, "Channel Assignment based on Control Handshake Signal Codes for Wireless Infrared Ad Hoc Networking", *Proceedings PGNET 2004*, Liverpool, 28-28 June 2004, pp. 365-369.
61. Z. ABU BAKAR and R.J. GREEN, "Medium Access Control (MAC) for Directional Optical Wireless Transceivers for Indoor Ad-Hoc Networking", *Proceedings LCS 2004*, London, 13-14 September, pp. 233-236.
62. Z. ABU BAKAR and R.J. GREEN, "Realising Indoor Infrared Ad Hoc Networking", *Proceedings PREP 2004*, Hertfordshire, 5-7 April 2004, pp. 15-16.

CONTROL AND MECHATRONICS ENGINEERING

INTRODUCTION

The research group is one of the biggest and active group in Malaysia in the area of Control, Robotic and Mechatronic Engineering. The group has a total of 3 professors, 7 associate professors and 20 lecturers. The group's research interest encompasses several broad areas: robotics, adaptive and robust control, artificial intelligence, process control, process tomography and control applications in mechatronic systems. Over the last three years, the group managed to secure over RM 5 millions to fund its research activities. In addition, over 80 publications including books, journals and conference papers were produced in 2004. 8 laboratories dedicated for research and teaching in the area of control, robotic and mechatronic engineering are equipped with sophisticated and modern facilities. The group has also successfully produced a number of postgraduate students.

THE GRADUATE FACULTY

Dr. Johari Halim Shah Osman

Ph.D (Control-Robotics) City Univ. 1991
Professor
Robotics, Robust Control of Uncertain System, Large Scale Systems, Advanced robot control, Adaptive Control Techniques, Decentralized and Hierarchical Control.

Dr. Marzuki Khalid

PhD (Control) Tokushima Univ. 1994
Professor
Intelligent Control, Neural Networks, Fuzzy Logic, Genetic Algorithms.

Dr. Shamsudin Hj. Mohd. Amin

PhD (Robotics) Sheffield 1990
Professor
Multi-agent, Autonomous Mobile Robot, Robot control, Design of Robotic Devices, Intelligent Robotics.

Dr. Mohamad Noh Ahmad

PhD (Electrical Eng.) UTM 2003
Associate Professor
Robust Control, Robot Control, Automation.

Dr. Mohd. Fua'ad Rahmat

PhD (Instrumentation) Sheffield Hallam 1996
Associate Professor
Flow measurements in Process, Tomography, System Identification, Process Control.

Dr. Rosbi Mamat

Ph.D (Control Eng.) Sheffield 1996
Associate Professor
Process Control, Real Time Embedded System, Hardware & Software Co-Design of Mechatronics Systems.

Dr. Rubiyah Yusof

PhD (Control) Tokushima Univ. 1994
Associate Professor
Adaptive Control Techniques, System Identification, Intelligent Systems, Virtual Lab. Systems, Intelligent Tutoring Systems.

Dr. Ruzairi Abd. Rahim

PhD (Instrumentation) Sheffield Hallam 1996
Associate Professor
Flow Measurement and Instrumentation, Process Tomography, Advanced Sensor Applications.

Dr. Yahaya Md. Sam

PhD (Electrical Eng.) UTM 2004
Associate Professor
Automotive Control, Robust Control.

Zamani Md. Zain

M.Sc (Control) Sheffield 1985
Associate Professor
Process Control, AI Applications, Network-Based Management Software.

Dr. Sallehuddin Ibrahim

PhD (Tomography) Sheffield Hallam 2000
Lecturer
Flow Measurement, Process Tomography, Optical Sensors.

Dr. Mohd Fauzi Othman

PhD (Control Eng.) Sheffield 2004
Lecturer
Intelligent control, Soft Computing, Fault Detection and Accommodation, Power System Operation and Control.

Dr. Shahrum Shah Abdullah

PhD (Control Eng.) Imperial College 2003
Lecturer
Optimisation, Intelligent Control, Active Noise Control.

Dr. Zaharuddin Mohamed

PhD (Control Eng.) Sheffield 2003

Lecturer

Command Shaping Control, Active Vibration Control, Control of Flexible Structures, Mechatronics.

PROJECTS/RESEARCH TOPICS OF INTEREST

* Note: This list is not an exhaustive list.

- Computer control systems
- Co-Design of embedded systems
- Real-time software engineering for mechatronic systems
- Design of robots and robotics work cells
- Application of advanced control in robotics
- Multi-agent intelligent mobile robots
- Internet-based telerobotics
- Biologically inspired robots
- Industrial automation and computer integrated manufacturing
- Identification and control of Industrial Processes
- Advanced transducer application
- Sensor technology
- Process tomography for flow measurement
- Vision systems
- Neural network, fuzzy logic and genetic algorithms
- Intelligent control systems
- Artificial Intelligence applications
- Control of flexible structures
- Input command shaping control
- Active vibration control
- Optimisation
- Control of power systems
- Control of High Speed Trains
- Automotive Control
- Robust Control of Uncertain Systems

RESEARCH GRANTS

Design and Development of an Intelligent License Plate Recognition System

Project Head: Prof. Dr. Marzuki Khalid

Period: February 2002 – January 2005

IRPA Code: 74041

Grant Amount: RM 141,100.

Summary

With the rapid growth in the number of vehicles in Malaysia, there is a need for an intelligent online identification of vehicles. Among the main reasons on the need for vehicle online identification are for enforcement, for security, for parking and also for entry. The cheapest and most effective way for vehicle identification is through the recognition of the vehicle's license plates. Currently, there is no such system available locally. There are a number of such products developed overseas, however, they are not readily used in Malaysia as Malaysian license plates are of various different fonts and styles; moreover these imported products are very expensive, need to be customized and have not been proven to be effective.

This project intends to design an intelligent system for the online identification and recognition of Malaysian vehicle licence plates. With the availability of this system, it can be used in a variety of applications such as electronic toll collection, security, parking control, speed detection, law enforcement, etc. not only in Malaysia but also overseas. This is because of the fact that Malaysian licence plates are more complex due to the various shapes and styles; and thus once it is applicable in Malaysia, it can be sold to many other countries. This intelligent vehicle licence plate recognition system will be designed using sophisticated state-of-the-art techniques of image processing and artificial intelligence (AI) such that it can solve even difficult problems of high-speed recognition and blurred images.

Design of PC-Based Vision System Engine for Multi-Purposes Applications

Project Head: Prof. Dr. Marzuki Khalid
Period: February 2002 – January 2004
IRPA Code: 74503
Grant Amount: RM 2,036,000.

Summary

Automatic visual inspection is largely needed in almost all kinds of manufacturing industries, the agricultural sector and also many other specialised applications. In manufacturing, vision is needed in identifying, locating, testing and also grading of components where as in the agricultural sector vision is used largely in grading of farm produce. The need to automate such processes involves the use of high technology products such as sophisticated vision systems, robotics and automation. Malaysia is very much lacking in producing these high technological products and almost 95% of such products and technology are imported currently. This leads to large amount of the country's revenues being lost due to the purchase of these much needed technology. Moreover such technologies are very expensive and thus many Malaysian industries do not acquire such technology and still depend largely on human labour. The development of this technology is, however, not meant mainly for local industries but also for export.

In this research, a group of researchers from leading universities and research institutions in Malaysia and also from several industries will be jointly working together in developing a universal vision system engine for a variety of applications, namely, semiconductor quality, licence plate recognition, face recognition and wood recognition. This research will lead to the development of high technological products based on vision systems and automation which are lacking in Malaysia. Commercialisation and business opportunities as a result of this research is highly possible as such products are highly expensive and its market is very wide, not only in Malaysia but also worldwide.

Development of Neural Network Assisted Industrial PID Controllers Auto-Tuner

Project Head: Assoc. Prof. Dr. Rosbi Mamat
Period: February 2002 – January 2004
IRPA Code: 74040
Grant Amount: RM 280,000.

Summary

The Proportional, Integral and Derivative (PID) controller is widely used in the process industry. It offers a robust performance over a wide range of operational conditions. A recent survey has reported that about 90% of industrial loops are controlled by PID-type controllers. Although it has only three terms and is suitable for manual tuning, accurate tuning can be time-consuming and regular retuning is often required as a result of process changes or ageing. The large number of PID controllers commonly occurring in process plants compounds this burden and automating these tuning methods are of great practical importance. Significant economic and environmental advantages will be gained from an effective method of tuning industrial PID controllers automatically in situ on the plant. These advantages include the time saved from automatic tuning as opposed to manual tuning, and increased product quality due to improved control performance from the better tuned PID controllers. Many researchers are currently applying artificial intelligence technology for PID auto-tuning. Except for some commercial implementations, none of these auto-tuning techniques addresses the applicability and the suitability of their techniques to existing commercial industrial PID controllers. This motivated the development of the new PID auto-tuning scheme, proposed here, which can be used with existing commercial PID controllers.

The main objective of this project are to design and develop a practical scheme for on-line automatic tuning of existing industrial PID controllers with the assistance of a neural network and to investigate methods for integrating this scheme with existing technology.

Design of an Intelligent Vision Inspection System for Quality Control in Semiconductor Industry

Project Head: Prof. Dr. Shamsudin Hj. Mohd Amin
Period: February 2002 – January 2005
IRPA Code: 03-02-06-0051 PR PR0022/04-02
Vot No. 74504
Grant Amount: RM 1,570,000

Summary

Quality has always been a key focus in semiconductor manufacturing process. Therefore, this project aims to design and develop such a vision system and enhance it with the application of Artificial Intelligence techniques in the area Marking and Symbol Verification, Lead Inspection, Die and Package Inspection. Artificial Intelligence based Optical Character Recognition on Semiconductor IC's would be first of its kind in the industry, thus providing a distinctive advantage for commercialisation in Malaysia and overseas. The program would also serve to enhance local design and development knowledge in the field of vision systems. In addition, maintenance services of a local expert would prove to be more efficient and cost effective for customers of such systems locally.

Development of a Biologically Inspired Mobile Robot With Reactive Behaviour

Project Head: Prof. Dr. Shamsudin Hj. Mohd Amin

Period: February 2002 – January 2005

IRPA Code: 09-02-06-0026 EA156

Vot. No. 74043

Grant Amount: RM 269,500.

Summary

Biologically inspired robotics is a field that combines the study of animals and implementation of biomimetics on machines. So far the physiology of locomotion of creatures (drives and mechanics) is largely different compared to machines constructed. Compared to electric motors with different kinds of gearings or to pneumatic and hydraulic drives, the use of muscles in nature has the advantage of a better efficiency concerning energy consumption combined with reduced weight. In this project, issues of biologically inspired locomotion and intelligence are investigated, with the aim of emulating and implementing it on newly constructed mobile robots. Legged locomotions and the reactive behaviours of biological systems are investigated to determine behaviours suitable for mobile robot navigation in structured and unstructured environments.

Robocon UTM

Project Head: Prof. Dr. Shamsudin Hj. Mohd Amin

Period: 2002 -

Vot. No. 73204

Grant Amount: RM 505,000.

Summary

Funding is for the development of competition robots for Race for Mount Fuji in 2002, Takraw Space Conqueror in 2003, and Reunion of Separated Lovers in 2004. Each year the Robocon Team developed several different robots for national and international competitions. The robots were developed by students, under supervision by faculty staff.

System Identification Of A Quarter-Vehicle Passive Suspension System

Project Head: Assoc. Prof. Dr. Mohd Fua'ad Hj. Rahmat

Period: November 2002 – October 2005

IRPA Code: 74112

Grant Amount: RM 140,000.

Summary

This study treats the development of mathematical model of quarter car passive suspension using system identification technique. The system components considered are the sprung (body) mass, unsprung (wheel) mass, coil spring and shock absorber of a quarter car. The structure of the model is first determined from physical modelling using Newton's Law. Then, set of input-output data was collected using a data acquisition software & hardware. The hardware consists of seven components. Some of the component must be developed and fabricated before data measurement can be performed. The Generalized Poisson Moment Functionals

(GPMF) approach based on Instrumental Variable (IV) algorithm was used to estimate the model parameters from the input-output data. The interested was in the form of continuous-time transfer function. An integrated Graphical User Interface (GUI) based on MATLAB was developed to ease the task of developing the model. The GUI consisted of data pre-processing, parameter estimation, model validation and model simulations. A validation process implemented using cross validation process. Simulation based on the estimated mathematical model was performed to validate the dynamic behaviours of the model. From the simulation result and analysis, it could be concluded that the model is reliable and the hardware developed can be applied to any quarter car suspension system. The need for such model is for control design of active suspension system.

Fuzzy Modelling and Control of Non-linear System: Distillation Column

Project Head: Assoc. Prof. Dr. Rubiyah Yusof

Period: January 2003 – December 2004

IRPA Code: 74157

Grant Amount: RM 202,000.

Summary

Distillation column is non-linear and complex chemical process equipment. The modelling and control of the distillation column is indeed a challenging task. Fuzzy modelling is a new modelling paradigm for non-linear systems. Fuzzy models are non-linear dynamic models. Compared with conventional black box modelling techniques, linear or non-linear, which can only utilize numerical data, fuzzy modelling approach is unique in its ability to utilize both qualitative and quantitative information. Qualitative information is human modelling expertise and knowledge, which are captured and utilized in the form of fuzzy sets, fuzzy logic, and fuzzy rules. The expertise and knowledge are actually non-linear structures of physical systems, and the structures are represented in an implicit and linguistic form rather than explicit and analytical form, as dealt with by the conventional system modelling methodology. In this project we will concentrate in developing a fuzzy model for a distillation column. Having obtained the model, a controller based on fuzzy logic will be designed at various parts of the process to improve the efficiency of the process. The distillation column is already available in one of the laboratory in UTM. The distillation column in UTM is used as a test bed to test the new methods.

Development of an Intelligent Fault Diagnosis and Isolation for Electro Mechanical System

Project Head: Assoc. Prof. Dr. Rubiyah Yusof

Period: January 2003 – December 2004

IRPA Code: 74162

Grant Amount: RM 2,117,000

Summary

This research application is intended to develop a method of fault detection, diagnosis and isolation using artificial intelligence technique. It is also intended to develop an intelligent knowledge based system based on the method developed which is able to detect faults resulting from common components in an electromechanical systems such as sensor faults, actuator faults arising from damaged bearings, deficiencies in the form of momentums, defect in gears, ageing effects, etc. The electromechanical system chosen is a single-phase induction motor. Induction motor is chosen because it a popular kind of motor used in the industries. It was reported that 90% of the industrial application uses induction motors. To this end, a lot of research effort is being centred upon fault diagnosis of induction motors. In fact manufacturers of induction motors are contemplating of including fault diagnosis module in their induction motors manuals. Experiments and tests have to be done on the induction motors to develop the knowledge-based systems. Several faults have to be simulated and experimented on the system. The intelligent knowledge based system for fault detection and diagnosis can be used by industries as a guideline for early detection of possible faults in their induction motors.

Tomographic Imaging Instrumentation Pneumatic Particle Conveying Using Optical Fibre Sensors

Project Head: Assoc. Prof. Dr. Ruzairi Abd Rahim

Period: February 2002 – January 2005

IRPA Code: 74039

Grant Amount: RM 233,000

Summary

Pneumatic conveying involves the transportation of a wide variety of dried powdered and granular solids in a gas stream. In most cases the gas is normally air. Pneumatic conveying offers the users many advantages, among them are dust free transportation of a variety products, flexibility in routing, allowing distributing and pick up at many different areas in a plant, low maintenance and low power costs. It can also be used for transportation of a variety of products using the same pipeline and as good security such that pipelines can be used to convey high-value products. This technique is now used in many industries where materials are moved in bulk. Common examples are coal, cement powders, flour and grain. Any product-based system requires some term of control and should be provided with a measurement system. Measurement of solid-gas flow in pneumatic conveyor is difficult and commercial instruments are rare. This project aims to investigate a new approach to measurement in such systems using tomographic imaging techniques

High Speed Data Acquisition System for Computer Tomographic Imaging Instrumentation

Project Head: Assoc. Prof. Dr. Ruzairi Abd Rahim

Period: April 2003 – March 2006

IRPA Code: 74188

Grant Amount: RM 259,000

Summary

Process tomography is a non-invasive technique to imaging the internal behaviour of conveying pipeline by using sensor. One of the famous applications is to imaging the flow of pneumatic conveying that involves the transportation of a wide variety of dried powdered and granular solids in air stream. Industries applications are start to grope for solution of mass flow rate measurement and control instrument for solid flow in pneumatic conveyor. Due to request of non-invasive technique, the unique and inimitable characteristic of process tomography instrument precedes over all commercial instruments. However, the high costing of process tomography instrument has been a stumbling block of industrial application. Therefore, costing down the instrument while maintaining the precision and performance is in demand. Basically, a standard tomography instrument consist three operation paths, these are sensors and signal condition circuits, data acquisition system and computer programming. Data acquisition system has played an important role to establish connection between analog world and digital world. Due to complexity of design and development, most of the process tomography instrument utilizes the available system to perform this task. However, most of the functions provide by those system are wasted because a common need of process tomography instrument is only one-way bulk data transportation. Furthermore, the needed function always operates under the aim of designed instrument due to available resource and instrument cost. This project is aims to develop a low cost data acquisition system as completion path of process tomography instrument to achieve the design aim and performance.

Real Time Velocity and Mass Flow Meter Design For Solid, Liquid and Gas Flow In Industrial Pipelines

Project Head: Assoc. Prof. Dr. Mohd Fua'ad Hj. Rahmat

Period: February 2002 – January 2005

IRPA Code: 74042

Grant Amount: RM 108,000.

Summary

Particulate matter has been extensively used in many industrial processes such as foodstuff and pharmaceutical industries. Since the labour and the transportation costs have increased, the pneumatic conveyance through pipeline becomes popular. In this study, the technique of generating velocity profile for dry solids conveying system in an industrial pipeline will be explored and discussed. The velocity measurement technique implements the process tomography and the cross-correlation function. An electrical charge tomographic sensing system is selected for performing the measurement in real-time. Tomography is a process of image reconstruction that is aided with several sensing devices located around the pipe circumference as to collect sufficient information about the flow in that pipeline. The application of process tomography is not limited to the image reconstruction, but it is also applicable for measuring the flow velocity and the mass-flow rate in any industrial pipeline. This project focuses on generating velocity profile from the information given by the

sensing system. The results of the velocity profile have been represented using image mapping, which were displayed on the computer screen in real-time.

Robust Control of Active Suspension System for a Quarter Car Model

Project Head: Assoc. Prof. Dr. Yahaya Md Sam

Period: Dec 2004 – Nov 2006

IRPA Code: 74283

Grant Amount: RM 40,000.

Summary

This project involves the modelling, controlling and visualizing the behaviours of the quarter car hydraulically active suspension system. The active suspension will be modelled as a non-linear mathematical model, whereby all the non-linear factors in the system will be considered. Therefore, such model represents real behaviours of the actual quarter car active suspension. In order to control the hydraulic actuator movement continuously, a specific control scheme has to be designed. Furthermore, the control scheme must be able to eliminate any disturbances that occurred in the system. Therefore, a robust control scheme will be utilized to carry out this task. The real 'movement' of the quarter car hydraulic active suspension system will be visualized in 3D form by using the SIMULINK/SIM MECHANICS software.

Design of a Fault Diagnostic Engine for Power Transformer Using data Mining

Project Head: Abdul Rashid Husain

Period: Dec 2004 – Nov 2006.

IRPA Code: 74286

Grant Amount: RM 89,000.

Summary

A power transformer is an important component in an electrical system. Failure of these transformers may not only cause disruption in electricity supply but also can cause large revenue losses to the utilities company. The software ADAPT which was previously developed to interpret the transformer condition will be further enhanced. The focus of this project is to design and develop a Data Mining method in order to discover new insights based on the past Dissolved Gas Analysis test result. The Data Mining will be used to discover new rules and patterns based on the DGA test and the newly discovered rules and patterns will be integrated into the existing fuzzy based engine in ADAPT software which can yield a more accurate interpretation of transformer fault.

PUBLICATION

1. HERLINA ABDUL RAHIM and RUZAIRI ABDUL RAHIM, *Pengenalan Kepada Kejuruteraan Sistem Kawalan*, Penerbit UTM, 2004.
2. M. SHUKRI ZAINAL ABIDIN, MARZUKI KHALID, RUBIYAH YUSOF and MOHD. SHAFAWI, "Induction Machine Diagnostic Using Adaptive Neuro Fuzzy Inferencing System", *Lecture Notes in Computer Science (LNCS)*, Springer-Verlag Heidelberg, **3215**, 2004, ISSN 0302-9743, p. 380.
3. M.O. TOKHI and Z. MOHAMED, "Command Shaping Vibration Control Of Flexible Robot Manipulators", *Recent Developments in Sound and Vibration*, Transworld Research Network, 2004.
4. TAN CHEE KWONG, SHAMSUDIN H.M. AMIN, ROSBI MAMAT, and IMRE J. RUDAS, "An Intelligent Voting Technique in Behavior-based Autonomous Mobile Robot for Goal-Directed Navigation", *Current Trends in Artificial Intelligence and Application*, UMS Publications, 2004, ISBN 983-2369-14-2, pp. 249-256.
5. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "A Study On Lower Bound Of Direct Proportional Length-Based DNA Computing For Shortest Path Problem", *Lecture Notes in Computer Science (LNCS)*, Springer-Verlag, **3314**, 2004, pp. 71-76.
6. BABUL SALAM KSM KADER IBRAHIM, MOHAMAD NOH AHMAD and JOHARI H.S. OSMAN, "An Integral Sliding Mode Control for a 2 DOF Direct Drive Robot Arm", *Elektrika*, Dec. 2004, **6**(1), pp. 50-56.
7. MOHD FUA'AD RAHMAT and DIRMAN HANAFI, "Nonlinear Mathematical Model of a Quarter Car Passive Suspension System", *Jurnal Teknologi*, **41**(D), December 2004, pp.
8. MOHD FUA'AD RAHMAT and HAKILO AHMED SABIT, "Flow Regime Identification Using Neural Network Based Electrodynamics Tomography System", *Jurnal Teknologi*, **40**(D), June 2004, pp. 109-118.
9. MOHD FUA'AD RAHMAT and YAW WEE LEE, "Electrostatic Sensor for Real Time Mass Flow Rate Measurement of Particle Conveying in Pneumatic Pipeline", *Jurnal Teknologi*, **41**(D), December 2004, pp.
10. MOHD FUA'AD RAHMAT and YAW WEE LEE, "Velocity Measurement of Particle Conveying in Pneumatic Pipeline Using Electrostatic Sensors", *Elektrika*, Dec. 2004, **6**(1), pp. 16-22.
11. P.L. LEOW and N.A. AZLI, "SVM Based Hysteresis Current Controller For a Three Phase Active Power Filter", *Elektrika*, Dec. 2004, **6**(1), pp. 88-94.
12. R. ABDUL RAHIM and K.S.CHAN, "Optical Tomography System for Process Measurement Using LED as a Light Source", *Journal Optical Engineering*, SPIE, **43**(5), May 2004, pp. 1251-1257.
13. RUZAIRI ABDUL RAHIM, MOHD HAFIZ FAZALUL RAHIMAN, NG WEI YAP and CHAN KOK SAN, "Initial Result on Monitoring Liquid/Gas Flow Using Ultrasonic Tomography", *Jurnal Teknologi*, **40**, June 2004, pp. 77-88.
14. RUZAIRI ABDUL RAHIM and K.S. CHAN, "Application of Optical Tomography in Real Time Monitoring for Solid Particles", *Elektrika*, Dec. 2004, **6**(1), pp. 28-33.
15. RUZAIRI ABDUL RAHIM, TAN CHING TAT, CHAN KOK SAN, PANG JON FEA and LEONG LAI CHEAN, "Capacitance Tomography Techniques For Imaging A Mixture Of Water And Oil", *SIRIM Journal Industrial Technology*, **13**(2), 2004, pp. 17-38.
16. SALLEHUDDIN IBRAHIM and MOHD AMRI MD YUNUS, "Preliminary Results For Infrared Tomography", *Elektrika*, Dec. 2004, **6**(1), pp. 1-4.

17. Y. TOYOURA, J. WATADA, M. KHALID and R. YUSOF, "Formulation of Linguistic Regression Model Based On Natural Words", *Soft Computing*, **8**(10), Nov. 2004, pp. 681-688.
18. YAHAYA MD. SAM and JOHARI HALIM SHAH OSMAN, "A Robust Controller Design for Performance Improvement of the Active Suspension Systems", *Elektrika*, Dec. 2004, **6**(1), pp. 67-75.
19. YAHAYA M. SAM, JOHARI H.S. OSMAN and M.R.A. GHANI, "A Class of Proportional-Integral Sliding Mode Control with Application to Active Suspension System", *Systems and Control Letters*, **51**(3-4), 2004, pp. 217-223.
20. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "Direct-proportional Length-Based DNA Computing For Shortest Path Problem", *International Journal of Computer Science and Application (IJCSA)*, **1**(1), 2004, pp. 46-60.
21. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "DNA Computing For An Absolute 1-Center Problem: An Evolutionary Approach", *International Journal of Computational Intelligence (IJCI)*, **1**(4), 2004, pp. 9-17.
22. ZUWAIIRIE IBRAHIM and SYED ABD. RAHMAN AL-ATTAS, "Wavelet-Based Printed Circuit Board Inspection System", *International Journal of Signal Processing (IJSP)*, **1**, 2004, pp. 65-71.
23. Z. MOHAMED and M.O. TOKHI, "Command Shaping Techniques For Vibration Control Of A Flexible Robot Manipulator", *Mechatronics*, **14**(1), 2004, pp. 69-90.
24. ABDUL FADLIL, MARZUKI KHALID and RUBIYAH YUSOF, "Holistic Features for Online Cursive Handwriting Cheque-Word Recognition", *Malaysian Science and Technology Congress 2004 (MSTC2004)*, Selangor, Malaysia, 5-7 October 2004.
25. ABDUL FADLIL, MARZUKI KHALID and RUBIYAH YUSOF, "Online Handwritten Character Recognition Based On Online-Offline Features Using BP Neural Network", *National Conference On Computer Graphics & Multimedia (CoGRAMM'04)*, Universiti Kebangsaan Malaysia, Selangor, Malaysia, 8-10 December 2004.
26. ABDUL RAHIM AHMAD, CHRISTIAN VIARD-GAUDIN, MARZUKI KHALID and RUBIYAH YUSOF, "Online Handwriting Recognition using Support Vector Machine", *International Conference on Artificial Intelligence in Engineering & Technology (iCAiET 2004)*, Sabah, Malaysia, 3-5 August 2004.
27. ANDI ADRIANSYAH and SHAMSUDIN H.M. AMIN, "Designing Behavior-Based Mobile Robot with Genetic Fuzzy System", *Quality in Research QiR 2004*, Universiti Indonesia, Jakarta, 3-4 August 2004, pp. 1-6.
28. ANDI ADRIANSYAH and SHAMSUDIN H.M. AMIN, "Designing Intelligent System for Motion Planning of Mobile Robot", *Seminar on Intelligent technology and Its Application SITIA 2004*, ITS, Surabaya, 4-5 May 2004, pp. 39-44.
29. CHIAM KOK THIAM, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Digital Sensors for Masking Purpose in Parallel Beam optical Tomography System", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
30. CHIAM KOK THIAM, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Micro Controller Based Signal Generator and LED Controller for Fan Beam optical Tomography System with Remote Computer Control", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
31. DAYANG NORHAYATI ABANG JAWAWI and ROSBI MAMAT, "An Evaluation of Embedded Real-Time Component Model for Autonomous Mobile Robot Software Development", *IEEE Real-Time Techniques and Applications Symposium (RENTAS)*, Serdang, Malaysia, 24-25 November 2004.
32. DAYANG NORHAYATI ABANG JAWAWI and ROSBI MAMAT, "Development of Software Analysis Patterns for Components Based Development of Embedded Real-Time Mobile Robot Software", *IEEE Real-Time Techniques and Applications Symposium (RENTAS)*, Serdang, Malaysia, 24-25 November 2004.

33. EILEEN LEW YI LEE, MARZUKI KHALID and RUBIYAH YUSOF, "Design of a Wood Recognition System Based on Grey Level Co-occurrence Matrix (GLCM) Feature Extraction Technique and BP-Based Neural Network", *International Conference on Artificial Intelligence in Engineering & Technology (iCAiET 2004)*, Sabah, Malaysia, 3-5 August 2004.
34. EILEEN LEW YI LEE, MARZUKI KHALID, RUBIYAH YUSOF, LIM CHEE SENG and TAN YU ENG, "Design of an Intelligent Wood Recognition System for Classification of Tropical Wood Species", *Malaysian Science and Technology Congress 2004 (MSTC 2004)*, Selangor, Malaysia, 5-7 October 2004.
35. GAN TECK HUI, MARZUKI KHALID and RUBIYAH YUSOF, "Generation of an Optimal JSSP Solution Using Genetic Algorithm With Parallel Computing", *International Conference on Artificial Intelligence in Engineering & Technology (iCAiET 2004)*, Sabah, Malaysia, 3-5 August 2004.
36. GOH CHIEW LOON, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Application of Ethernet Technology on Data Acquisition System of Optical Tomography System", *Conference on Automation and Computer Networks (CACN) 2004*, 22-23 July 2004.
37. GOH CHIEW LOON, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Low Cost Microprocessor and Ethernet Controller Based Data Acquisition System in Optical Tomography System", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
38. HAIRUL IZWAN, MARZUKI KHALID and RUBIYAH YUSOF, "Neuro-Fuzzy Control of an Inverted Pendulum", *Malaysian Science and Technology Congress 2004 (MSTC 2004)*, Selangor, Malaysia, 5-7 October 2004.
39. HERLINA ABDUL RAHIM, SHAFISHUHAZA SAHLAN and RUZAIRI ABDUL RAHIM, "Peranan Wanita yang Terhad di Bidang Kejuruteraan", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, Malaysia, 14-15 Dec. 2004.
40. HEMA R.C., R. NAGARAJAN, SAZALI YAACOB. PAULRAJ PANDIAN, SHAMSUDIN AMIN and MARZUKI KHALID, "SVD Based Distance Measurement of Objects in a Stereo Vision System", *International Conference on Image Processing (ICIP 2004)*, Singapore, October 2004.
41. L.P. LING and N.A. AZLI, "SVM Based Hysteresis Current Controller for a Three Phase Active Power Filter", *Proceedings of National Power & Energy Conference (PECON) 2004*, Shah Alam, Malaysia, 29-30 Nov 2004, pp. 132-136.
42. LEONG LAI CHEN, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Investigating Multi-projection Technique Using Optical Fibre Sensor in Process Tomography", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
43. M.N. AHMAD and JOHARI H.S. OSMAN, "A Full Order Sliding Mode Tracking, Controller for Direct Drive Robot Manipulators", *Proc. 5th. Asian Control Conference (ASCC2004)*, Melbourne, Australia, 20-23 July 2004, pp. 591-596.
44. M.N. AHMAD, S.W. NAWAWI and J.H.S. OSMAN, "A Full Order Sliding Mode Tracking Controller for a Class of Uncertain Dynamical System", *Proc. International Conference on Control, Automation and Systems (ICCAS'04)*, Bangkok, Thailand, 25-27 August 2004, pp. 1853-1858.
45. M.O. TOKHI, M.Z. MD ZAIN, M.S. ALAM and Z. MOHAMED, "An Iterative Learning Control Approach For Vibration Suppression Of Flexible Manipulators", *Proceedings of UKACC International Conference on Control-2004*, Bath, UK, 06-09 September 2004.
46. M.Z. MD ZAIN, M.O. TOKHI AND Z. MOHAMED, "Hybrid Learning Control With Input Shaping For Input Tracking And Vibration Suppression Of A Flexible Manipulator", *Proceedings of ESDA2004: 7th Biennial ASME Conference on Engineering Systems Design and Analysis*, Manchester, UK, 19-22 July 2004.

47. M.Z. MD ZAIN, M.O. TOKHI, Z. MOHAMED and M. MAILAH, "Hybrid Iterative Learning Control Of A Flexible Manipulator", *Proceedings of MIC2004: The 23rd IASTED International Conference on Modelling, Identification and Control*, Grindelwald, Switzerland, 23-25 February 2004, pp. 313-318.
48. MARZUKI KHALID, SEE CHIN LIANG and RUBIYAH YUSOF, "Control of a Complex Traffic Junction using Fuzzy Inference", *5th Asian Control Conference (ASCC 2004)*, Melbourne, Australia, 20-23 August 2004.
49. MOHD. FAISAL IBRAHIM, RUBIYAH YUSOF and MARZUKI KHALID, "Fuzzy Modeling for Nonlinear System", *Malaysian Science and Technology Congress 2004 (MSTC 2004)*, Selangor, Malaysia, 5-7 October 2004.
50. MOHD FUA'AD RAHMAT and A.H.M. YATIM, "Kajian Persepsi Majikan Terhadap Graduan Program Separuh Masa Kursus Sarjana Muda Kejuruteraan Elektrik UTM", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, 14-15 Dec. 2004.
51. MOHD FUA'AD RAHMAT and DIRMAN HANAFLI, "System identification of Nonlinear Model of a Quarter Car Passive Suspension Systems Using Recurrent Weighted Least Square Neural Networks", *International Conference on Artificial Intelligence in Engineering and Technology 2004 (iCAiET 2004)*, Kota Kinabalu, Sabah, Malaysia, 3-5 August 2004.
52. MOHD FUA'AD RAHMAT and HAKILO AHMED SABIT, "Use of Artificial Neural Network (ANN) in Electrical Charge Tomography as Flow Regime Identifier of Particulate Flow in Industrial Pipeline", *International Conference on Artificial Intelligence in Engineering and Technology 2004 (iCAiET 2004)*, Kota Kinabalu, Sabah, Malaysia, 3-5 August 2004.
53. MOHD. HAFIZ FAZALUL RAHIMAN, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Monitoring Liquid/Gas Flow using Ultrasonic Tomography", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
54. NG WEI YAP, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Composition Determination of Water and Oil Flow using Ultrasonic Tomography", *S-SPEC (Shell Inter-Varsity Student Paper Presentation Contest) 2004*, UTM, 14-15 February 2004.
55. NG WEI YAP, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Water and Oil Flow monitoring System Using Ultrasonic Tomography", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
56. PANG JON FEA, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Infrared Tomography Sensor Configuration Using Four Parallel Beam Projections", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
57. PANG JON FEA, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Real Time Image Reconstruction System Using Two Data Processing Unit in Optical Tomography", *International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
58. PANG JON FEA, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Real Time Mass Flow Rate in Solid-Gas Measurement Using Optical Tomography Technique", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
59. PANG JON FEA, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Real Time Velocity Profile Measurement Using Pixel-to-pixel velocity method in optical tomography Instrument", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
60. R. NAGARAJAN, SAZALI YAACOB, PAULRAJ M. PANDIAN, SHAMSUDIN AMIN, MARZUKI KHALID and HEMA C.R., "Singular Value Features based Object Distance Measurement Using Functional Link Network For Stereo Vision Systems", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAiET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 263-266.

61. R. NAGARAJAN, SAZALI YAACOB, PAULRAJ PANDIAN, M. KARTHIGAYAN, SHAMSUDIN H.M. AMIN and MARZUKI KHALID, "IC Chip Marking Inspection Using Neural Network and Fuzzy Logic", *8th Pacific Rim International Conference on Artificial Intelligence (PRICAI 2004)*, Auckland, New Zealand, 9-13 August 2004.
62. R. NAGARAJAN, SAZALI YAACOB, PAULRAJ PANDIAN, M. KARTHIGAYAN, SHAMSUDIN AMIN and MARZUKI KHALID, "Classification of IC Chip Marking Using Neuro-Fuzzy", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 275-279.
63. R. NAGARAJAN, SAZALI YAACOB, PAULRAJ PANDIYAN, SHAMSUDIN AMIN, MARZUKI KHALID, and HEMA R.C., "Features Extraction Using Singular Value Decomposition for Object Recognition", *7th International Conference on Working with Computer Systems (WWCS2004)*, Kuala Lumpur, Malaysia, July 2004.
64. RUBIYAH YUSOF, MOHD FAISAL IBRAHIM and MARZUKI KHALID, "Fuzzy Modeling for Reboiler System", *TENCON 2004*, Chiang Mai, Thailand, 21-25 November 2004.
65. S.H. CHOO, SHAMSUDIN H.M. AMIN, N. FISAL, and C.F. YEONG, "Multiple Mobile Robots Communication Using Bluetooth Transceiver", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 610-616.
66. S. SUDIN and P.A. COOK, "Two-vehicle Look-ahead Convoy Control Systems", *59th IEEE Vehicular Technology Conference*, Milan, Italy, 17-19 May 2004.
67. SALEHUDDIN IBRAHIM, "Optical Tomography System Using Infrared Sensors", *EMAP 2004*, Penang, Malaysia, 5-7 December 2004.
68. SHAMSUDIN H.M. AMIN, N. FISAL, C.F. YEONG, S.H. CHOO and H.L. WONG, "Intelligent Human Robot Interaction for Multiple Partner Robots", *Invited Paper Proc. International Conference on Mechatronics Technology*, Hanoi, Vietnam, pp. 75-80.
69. TEE ZHEN CONG, RUZAIRI ABDUL RAHIM and CHAN KOK SAN, "Electrical Capacitance Tomography Using Universal Serial Bus Technology", *3rd International Symposium on Process Tomography*, Lodz, Poland, 9-10 September 2004.
70. TOMOHIKO NUKANO, MINORU FUKUMI and MARZUKI KHALID, "Vehicle Licence Plate Recognition by Neural Networks", *International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS 2004)*, Seoul, Korea, 18-19 Nov. 2004.
71. WAI TAI KUAN and SHAMSUDIN H.M. AMIN, "Development of Visual Based Obstacle Avoidance for Mobile Using Optical Flow", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 21-26.
72. WONG HWEE LING, SHAMSUDIN H.M. AMIN and EILEEN LEW YI LEE, "Face Detection on Mobile Robot For an Intelligent Human-Robot Interaction", *Second International Conference on Artificial Intelligence in Engineering and Technology (ICAIET2004)*, Sabah, Malaysia, 3-5 August 2004, pp. 358-364.
73. Y.M. SAM and J.H.S. OSMAN, "Hydraulically Actuated of Half Car Active Suspension Systems", *Proc. Int. Conference on Control, Automation and Systems*, Bangkok, Thailand, 25-27 August 2004, pp. 1721-1726.
74. Y.M. SAM and J.H.S. OSMAN, "Robust Controller for Active Suspension with Hydraulic Dynamics", *Proc. of the 5th Asian Control Conference*, Melbourne, Australia, 20-23 July 2004, pp. 597-602.
75. YEONG CHE FAI, SHAMSUDIN H.M. AMIN, NORSHEILA FISAL and CHOO SUI HONG, "Development of Bluetooth Enabled Mobile Robot (BeMR) – an Approach on Developing Human-Robot Interface Device on BeMR Using Any Portable Device", *Second International Conference on Artificial*

Intelligence in Engineering and Technology (ICAIET2004), Sabah, Malaysia, 3-5 August 2004, pp. 628-634.

76. Z. IBRAHIM, O. ONO, M. KHALID and Y. TSUBOI, "DNA Computing For An Absolute 1-Center Problem: An Evolutionary Approach", *Proc. of the Ninth International Symposium on Artificial Life and Robotics (AROB2004)*, Oita, Japan, 28-30 January 2004, pp. 241-244.
77. Z. IBRAHIM, O. ONO, Y. TSUBOI and M. KHALID, "Length-based DNA Computing For 1-Pair Shortest Path Problem", *Proc. of the Ninth International Symposium on Artificial Life and Robotics (AROB2004)*, Oita, Japan, 28-30 January 2004, pp. 299-302.
78. Z. IBRAHIM, S.A.R. AL-ATTAS, O. ONO and M.M. MOKJI, "A Noise Elimination Procedure For Wavelet-Based Printed Circuit Board Inspection System", *The 5th Asian Control Conference (ASCC2004)*, Melbourne, Australia, 20-23 July 2004, pp. 874-879.
79. Z. IBRAHIM, Y. TSUBOI and O. ONO, "Solving Unconstraint Assignment Problem By A Molecular-Based Computing Algorithm", *2004 IEEE International Symposium on Industrial Electronics (ISIE2004)*, Ajaccio, France, 4-7 May 2004, pp. 1473-1478.
80. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "A Preliminary Study On Lower Bound Of Direct Proportional Length-Based DNA Computing For Shortest Path Problem", *Preliminary Proceeding of the 10th International Meeting on DNA Computing (DNA10)*, Milan, Italy, 7-10 June 2004, pp. 430.
81. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "A Study On Lower Bound Of Direct Proportional Length-Based DNA Computing For Shortest Path Problem", *International Symposium on Computational and Information Sciences (CIS04)*, Shanghai, China, 16-18 December 2004, pp. 71-76.
82. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "Finding All The Shortest Paths of a Graph by a DNA-Based Computing Algorithm", *Joint 2nd International Conference on Soft Computing and Intelligent Systems and 5th International Symposium on Advanced Intelligent Systems (SCIS&ISIS2004)*, Yokohama, Japan, 21-24 Sept. 2004.
83. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "Finding N-Shortest Paths Of A Graph By A DNA-Based Computing Algorithm", *International Workshop on Fuzzy Systems and Innovational Computing (FIC2004)*, Kitakyushu, Japan, 2-3 June 2004, pp. 144-149.
84. Z. IBRAHIM, Y. TSUBOI, O. ONO and M. KHALID, "Molecular Computation Approach To Compete Dijkstra's Algorithm", *The 5th Asian Control Conference (ASCC2004)*, Melbourne, Australia, 20-23 July 2004, pp. 634-641.

ELECTRONICS & COMPUTER ENGINEERING

INTRODUCTION

Electronics and Computer Engineering research group is responsible for the research and development as well as the consultancy in the field of electronics, microelectronics, digital signal processing, computer technology, instrumentation electronics, industrial electronics and biomedical electronics. Currently, the group has a total of 3 professors, 8 associate professors and 23 lecturers. The group has successfully produced a number of postgraduate students. Research activities are also supported by industries including Intel, Motorola, Texas Instrument, Altera and Telekom. For the last three years, research grants over RM 3 millions were secured from both the government and industries. In 2004, over 30 publications were published in journals and conference proceedings.

THE GRADUATE FACULTY

Dr. Mohamed Amin Alias

PhD (Laser App - Photoacoustic) Wales 1984
Professor
Industrial Electronics and Instrumentation, Commercialization of R&D, Application of Electronics in Medicine and Security System.

Dr. Mohamed Khalil Hj. Mohd. Hani

PhD (Elec & Computer Eng) Washington St. 1992
Professor
Digital System and VHDL; FPGA, VLSI and SoC; Microprocessor and Computer Architecture; Encryption Hardware; Fuzzy Expert Systems, Neurohardware.

Ir. Dr. Sheikh Hussain Shaikh Salleh

PhD Edinburgh 1997
Professor
Electronics, Neural Network, Microprocessor, Speech Processing, Digital Signal Processing.

Dr. Abu Khari A'ain

PhD (Microcircuit) Lancaster 1996
Associate Professor
Analog IC Design and Test, Deep Submicron FA, Macro-Modelling, Microelectronics, Manufacturing Feasibility Study.

Dr. Ahmad Zuri Sha 'ameri

PhD (Electrical Eng) UTM 2000
Associate Professor
Signal Theory, Wirelless Data Communications, Machine Condition Monitoring, Information Security.

Hj. Harun Ismail

MSc (Digital Systems) Brunel 1982
Associate Professor
Computer Interfacing and Networking, Digital Electronics, Microprocessors.

Dr. Jasmy Yunus

PhD (Electronics) Kent 1992
Associate Professor
Digital Systems, Rehabilitation Engineering, Medical Electronics.

Muhammad Mun'im Ahmad Zabidi

MSc (Comp. Eng) Bridgeport
Associate Professor
Microprocessors, Processor Clustering, Digital Systems, System Software, Internet: DHTML, AV Streaming Server.

Dr. Razali Ismail

PhD (Microelectronics) Cambridge 1989.
Associate Professor
Semiconductor Physics, Devices and Technology, Microelectronics, IC Fabrication Process Modelling and Simulation.

Dr. Sulaiman Mohd. Nor

PhD (Electrical Eng) UTM 1996
Associate Professor
Computer System, Computer Network and Protocols, Microprocessor and Digital Systems.

Dr. Syed Abdul Rahman Syed Abu Bakar

PhD Bradford 1997
Associate Professor
Digital Signal Processing, Image Processing, Stereo Vision Analysis, Motion Detection.

PROJECTS/RESEARCH TOPICS OF INTEREST

* Note: This list is not an exhaustive list.

- 1) Microelectronics devices and technology
- 2) Low voltage IC test techniques
- 3) Embedded system design
- 4) System-on-chip (SoC) technology
- 5) ASIC design and system level design
- 6) CAD techniques and tool development
- 7) JAVA technologies
- 8) Encryption processors and cryptosystems
- 9) Neural network applications and neurohardware
- 10) Fuzzy expert system hardware
- 11) Multimedia networking design and hardware
- 12) Network troubleshooting & performance analysis
- 13) Internet and web technology
- 14) Smartcard technology
- 15) Microprocessing and microcontrollers
- 16) Speech recognition and synthesis
- 17) Multimedia signal encoding
- 18) Analysis and classification of heart sounds
- 19) Spread spectrum and military communication
- 20) Image analysis and computer vision
- 21) Real-time wavelet analysis
- 22) Lasers and optical devices
- 23) Speech therapy in rehabilitation
- 24) Computer-based training system
- 25) Computer-aided rehabilitation engineering
- 26) Biomedical imaging
- 27) Medical instrumentation and telemedicine

RESEARCH GRANTS

Web-Based Visual Intelligence Surveillance and Security System

Project Head: Assoc. Prof. Dr. Syed Abd. Rahman Syed Abu Bakar

Period: July 2002 – June 2004

IRPA Code: 74072

Grant Amount: RM 189,400.

Summary

With the current ever-expanding demands on internet-based system, the primary objective of this project is to offer a new dimension of the Internet technology in surveillance and security system. In addition, the surveillance system will be equipped with advance features such as moving object detection as well as moving object tracking. Instead of the customary single control room for the surveillance, the proposed system will be linked to the world wide web (www) so that the monitoring can be done from any place as long as there is access to the Internet. In this way, monitoring can be done not only in one room or one building but also from any room that has connection to the Internet. Moreover, the monitoring need not only be done from the building where the system is but from any building which includes even from homes as long as one has accessed to the internet. Hence, one of the main advantages of such a system is that this surveillance and security system can now be brought to offices, shops, and even individuals homes and the monitoring can be done from far away by mean of the Internet technology.

In order to make the system more attractive and having some form of intelligent module, the proposed system will be incorporated with moving object detection feature. With this module, the system will activate its recording system when it senses any significant motion that comes into the camera field of view. The algorithm for this module has been designed and ready to be incorporated to the proposed system. The system can be further extended to have more extra features such as zooming into the moving object and further perform some recognition process as to identify the object. Another extra feature that will also be incorporated into the proposed system is the ability to track the moving object once it has been detected. This feature will control the positioning of the camera so that any moving object detected will be tracked over a limited angle. This extra feature is to ensure that the recording process of any activity is being recorded with sufficient amount of time

Secured HF Image Transmission System

Project Head: Assoc. Prof. Dr. Ahmad Zuri Sha'ameri

Period: November 2002 – October 2005

IRPA Code: 74114

Grant Amount: RM 276,000.

Summary

The HF (High Frequency) radio frequency spectrum refers to frequency band from 3 to 30 MHz. Prior to satellite communication, the HF communication is the only means for long distance communication. It makes use of the refractive properties of the ionosphere by skywave propagation. At present, the frequency spectrum is still utilized by diplomatic services, amateur radio operators, military and shipping. The major shortcoming is the multipath fading phenomena due to the variation in the ionosphere that limits the data symbol rate and increase the bit-error rate. However, the reliability of communication has improved in parallel to the advances made in digital communications, digital signal processing and microelectronics.

The main objective of this project is to look into the development of a secured digital image transmission system over the HF radio frequency spectrum. A target area of application is in defense specifically for maritime applications. The project can be divided into three parts : HF modem, information security and image compression. For the HF modem, research will be done on multiphase, multifrequency and multicarrier modulation with error control using either ARQ (Automatic Repeat Request) or FEC (Forward Error Correction). Encryption algorithms are employed to ensure integrity and confidentiality during transmission. For integrity, the AES (Advanced Encryption System) algorithm is used with 256 key length security. Confidentiality is ensured by designing proprietary stream cipher algorithms based on the linear feedback shift register with key length of at least 64 bits. Image compression algorithm that will be adopted is the JPEG algorithm with the possibility of employing the JPEG 2000. This will ensure that the system can be used with of the shelf digital camera technology. Once completed, the individual parts of the project will be integrated to produce a demonstrable prototype. Field testing will be done over an HF radio link in maritime environment to assess the practicality and reliability of the system

Development of Voice Verification System

Project Head: Prof. Ir. Dr. Sheikh Hussain Shaikh Salleh

Period: July 2002 – June 2005

IRPA Code: EAR74073

Grant Amount: RM 119,175.

Summary

A hybrid neural network is proposed for speaker verification. The basic idea in this system is the usage of vector quantisation preprocessing as the feature extractor. The experiments were carried out using a neural network model with frame labeling performs from a client codebook known as NNM-C. The work also examines how the Neural Network Model with enhances features from the client barcode compares to NNM client codebook with Linear Time Normalization (LTN). Improved performance for NNM with more inputs and proper alignment of the speech signals supports the hypothesis that a more detailed representation of the speech patterns allows an equal error rate (ERR) of 0.62% on a single isolated digit and 1.9% on a sequence of 12 isolated digits. Theoretically, we are able to prove that a 1.9% EER performance on a sequence of 12 isolated digits. In order to put into applications certain engineering design has to be in place. This in clued pre-amplifier circuit, filtering circuit, analog to digital and digital to analog conversion. Most importantly the TMS microprocessor minimum system design to be interface with the above circuit. Simulation based a C programming will validate the algorithm and real-time application requires the TMS microprocessor.

Development of a Prototype Intelligent Diagnostic Systems of Heart Diseases Based on the ECG Waveform

Project Head: Prof. Ir. Dr. Sheikh Hussain Shaikh Salleh

Period: January 2003 – December 2005

IRPA Code: EAR74073

Grant Amount: RM 185,000.

Summary

Diagnosis of heart failure is rapidly developed in order to determine its severity. Electrocardiogram (ECG) is a test that records the electrical activity of heart through 12 small electrode patches attached to the skin. The ECG is a surface measurement of the electrical potential generated by electrical activity in cardiac tissue. Current flow, in the form of ions, signals contraction of cardiac muscle fibers leading to the heart's pumping action. The ECG is a valuable, non-invasive diagnostic tool, which has been around since the end of the nineteenth century.

The ECG signals generated by the contraction of the cardiac muscle are obtained from the patients with common heart diseases using electrodes. The electrodes then deliver the signal to the hardware circuitry before able to display the signal on the monitor.

The cardiologists analyze the signal manually and this is an inefficient process. This research is mainly aimed to extract important parameters from the ECG signatures through the scientific research, which can be realized through the DSP technique. By applying the signal analysis techniques, the critical points are predetermined and they are taken as the important parameters for analysis. This parameter will be used by Artificial Intelligent or classifier to classify the heart disease. A system such as this would be useful for an application such as a hospital in need of an automated instrumentation system for its intensive care unit to monitor a patient's ECG and to determine heart disease without knowing how to interpret the ECG waveform. Thus, the development of a computerized interpretation of the ECG is suggested to detect heart diseases.

Nondestructive Inspection Implementing Image Processing Techniques on Infrared Images

Project Head: Assoc. Prof. Dr. Syed Abd. Rahman Syed Abu Bakar

Period: July 2004 – February 2006

IRPA Code: 74271

Grant Amount: RM 88,500.

Summary

This project offers an alternative way of inspecting wear and tear equipments. The main focus for the inspection will be on equipments or plants that will be in contact with heat. Traditionally, the inspection process is done manually. This is to say that the plant needs to be shutdown while the inspector takes out a particular part. The decision of whether the part is defective or not will be based on simply by visual inspection of the physical aspect of the part. Such process could be very time consuming and since the plant or system has to be shut down, this will incur a big loss to the revenue of the company. The other critical issue in such kind of inspection is the possibility of fatal accidents. This is true in the event some careless steps are overlooked such as the plant has not come to a complete halt when the inspection is done or the temperature of the system has not cooled down at the proper temperature when it is inspected. The idea of this project is to make use of the advanced imaging device doing the inspection. The basic principles are to perform the inspection without interrupting on the operation of the plant or system, less human contact unless if the part has been confirmed to be defective, and finally, to be handled by not necessarily aging experience inspectors. With these principles, no loss of revenue from shutting down the plant or system will be incurred, a great deal of high-risk accidents could be avoided, and finally, continuously dependable and reliable inspection mechanism over the years could be guaranteed. The imaging device mentioned is the infrared camera.

Hence, this project's goal will concentrate on how to process these thermal images so that some high levels recognition and interpretation could be inferred. This project then will involve in developing and designing advanced image processing techniques to achieve the desired objective and these will be the main activities in this proposed project. It will be expected that many of these image processing techniques will be based on concepts from advanced digital signal processing. Some of these image processing techniques that will be employed would be segmentation of areas based on the differences of the infrared color distribution, color mapping scheme in isolating the defective areas from the rest, image registration operation in locating the defective areas with respect to ordinary digital image from its thermal counter part, and possibly a recognizer module in order to classify the type and degree of the detected defects

Moving Object Detection

Project Head: Assoc. Prof. Dr. Syed Abd. Rahman Syed Abu Bakar

Period: Nov 2004 – Oct 2006.

Code: 68305 (Contract with SCS Sdn Bhd)

Grant Amount: RM 144,000.

Summary

The main focus of this project is to develop an intelligent surveillance system that would not only able to detect any significant object but also the ability to classify the moving object. In addition the system would also determine the speed and direction of the moving object. This project is a continuation from a phase 1 project where by the previous project has successfully identify and track multiple moving objects, filter any unwanted

moving objects due to swaying leaves and trees and the ability to predict a step forward on the next possible motion of the moving object.

Defect Modeling of Gate Oxide Short (GOS) for Deep Submicron/nano Scale Transistor

Project Head: Assoc. Prof. Dr. Abu Khari A'ain

Period:

Code: 68310 (Contract with Intel Technology Sdn Bhd)

Grant Amount: RM 31,000.

Summary

This project aims to model GOS, which is going to be one of the most problematic issues in failure analysis work. This is due to the smaller size of transistors being introduced in high-speed design. Amongst other circuits being analyzed and its GOS model being developed is SRAM. To date a new novel model has been developed and its application has been tested for possible industry application.

A Study on Signature Analyzer for Design for Test (DFT)

Project Head: Assoc. Prof. Dr. Abu Khari A'ain

Period:

Code: 68309 (Contract with Intel Technology Sdn Bhd)

Grant Amount: RM 189,400.

Summary

This project has two objectives. One is to formulate an algorithm to reduce the test vector required to detect maximum defect in sequential circuits. Another objective is to use a signature analyzer using a linear feedback shift register (LFSR) to locate the defect location. The significance of this project is it could reduce the number of test vectors needed for testing purposes thus reducing test time, which leads to reduced production cost. Another application is in failure analysis where to find the root cause of a defect is always problematic.

Development of a Computer-Based Diagnostic System of Children with Speech Problem

Project Head: Assoc. Prof. Dr. Jasmy Yunus

Period: 21 April 2004 – 20 April 2006

IRPA Code: EAR74250

Grant Amount: RM 87,000.

Summary

So far, children with speech problems are diagnosed manually and subjectively in clinics by speech-language pathologists (SLP). The job of diagnosis is repetitive and laborious. It involves works of evaluation, interview, transcription of sample sounds, analysis and reporting. The experience of the SLP will significantly determine the outcome of the diagnostics. The major problem of this approach is the subjective interpretation of the SLP in determining the diagnosis results. Thus, a computer-based diagnostic system is proposed to help the SLP to assess these children in a standard and objective way so that proper therapy can be carried out to remediate their problems. The system could help the SLP to reduce their workload such as evaluation, analyzing and summarizing of the report.

PUBLICATION

1. SHEIKH HUSSAIN SHAIKH SALLEH, *Mikropemproses 68000 – Prinsip dan Aplikasi*, Penerbit UTM, 2004.
2. A.M. HASHIM, T. HASHIZUME, K. IIZUKA and H. HASEGAWA, “Plasma Wave Interactions in Microwave to THz Range between Carriers in Semiconductor 2DEG and Interdigital Slow Waves”, *Superlattice and Microstructures*, **34**, 2003, pp. 531-537.
3. K. IIZUKA, A. MANAF HASHIM and H. HASEGAWA, “Surface Plasma Wave Interactions between Semiconductor and Electromagnetic Space Harmonics from Microwave to THz Range”, *Thin Solid Films*, **464-465**, 2004, pp. 464-468.
4. HONG KAI SZE and SHEIKH HUSSAIN SHAIKH SALLEH, “Design Of Educational Software For Automatic Speech Recognition (ASR) Techniques”, *Jurnal Teknologi*, **40(D)**, June 2004, pp. 133-144.
5. HUA NING TONG, JASMY YUNUS, SANDRA VANDORT and SHEIKH HUSSAIN SHAIKH SALLEH, “Computer-based Speech Training for Children”, *International Journal of Computer Applications in Technology*, **21(1/2)**, 2004, pp. 52-57.
6. ZUWAIKIE IBRAHIM and SYED ABD. RAHMAN AL-ATTAS, “Wavelet-Based Printed Circuit Board Inspection System”, *International Journal of Signal Processing (IJSP)*, **1**, 2004, pp. 65-71.
7. ABD RAHIM MAT SIDEK and AHMAD ZURI BIN SHA’AMERI, “Development of a Secured Messaging System for Application in the HF Radio Frequency Spectrum”, *National Conference on Cryptography 2004*, Kajang, Selangor, 16 December 2004.
8. ABU KHARI A’AIN, CHEK T LIM, NG. KOOK HONG, SHENG KWANG and LIEW ENG YEW, “A Study on Signature Analyzer for Design For Test (DFT)”, *Proceeding of 2004 IEEE International Conference on Semiconductor Electronics*, Kuala Lumpur, Malaysia, 7-9 December 2004, pp. 138-142.
9. ABU KHARI A’AIN, SIM KIAN SIN and CHEOW KWEE SIONG, “The Effect of Gate Oxide Short in 6-Transistors SRAM Cell”, *Proceeding of 2004 IEEE International Conference On Semiconductor Electronics*, Kuala Lumpur, Malaysia, 7-9 December 2004, pp. 122-126.
10. AHMAD SAZALI SENAWI and AHMAD ZURI SHA’AMERI, “Field Testing of Prototype DPSK Modem on the Skudai-Endau Rompin HF Radio Link”, *M2SIC 2004*, 7-8 October 2004.
11. AHMAD ZURI SHA’AMERI, ABD RAHIM MAT SIDEK and AHMAD SAZALI SENAWI, “Development of a Secured Messaging System for Application in the HF Radio Frequency Spectrum”, *National Conference on Cryptography 2004*, Kajang, Selangor, 16 December 2004.
12. FITRI DEWI JASWAR and AHMAD ZURI SHA’AMERI, “FPGA Implementation of MCPFSK Modulation Technique for HF Data Communication”, *NSF Seminar 2004*, Vistana Hotel, Penang, 20-21 Dec 2004.
13. LEONG MUN HON and ABU KHARI A’AIN, “An Investigation on ADC Testing Using Digital Modeling”, *Proceeding of TENCON 2004*, Chiang Mai, Thailand 21-24 November 2004, pp. 245-249.
14. LEONG MUN HON and ABU KHARI A’AIN, “Digital Modeling for OP-AMP Circuit Test”, *Proceeding of 2004 IEEE International Conference On Semiconductor Electronics*, Kuala Lumpur, Malaysia, 7-9 December 2004, pp. 538-541.
15. M. HASHIM, “Interactions of Semiconductor Plasma Waves and Its Application to High Frequency Device”, *2004 RCIQE International Summer Seminar*, Niseko, Japan, 28-30 July 2004.
16. M. HASHIM, K. IIZUKA, S. KASAI and H. HASEGAWA, “Observation of Interactions between Electromagnetic Waves and AlGaAs/GaAs 2DEG Plasma Waves from Microwave to THz Range”, *39th*

- Hokkaido Regional Meeting of Japanese Applied Physics Society*, Sapporo, Japan, 20-21 January 2004, pp. 85.
17. M. HASHIM, M. TAKEUCHI, S. KASAI, T. HASHIZUME and H. HASEGAWA, "The Interaction Characteristics of Semiconductor Plasma Waves and Its Application to High Frequency Device", *7th Hokkaido University - Seoul National University Joint Symposium*, Sapporo, Japan, 8-9 July 2004, pp. 81-82.
 18. M. HASHIM, M. TAKEUCHI, S. KASAI, T. HASHIZUME and H. HASEGAWA, "Large Conductance Modulation in Interdigital Gate HEMT Device due to Surface Plasma Wave Interactions and Its Device Application", *International Conference on Solid State Device and Material 2004 (SSDM2004)*, Tokyo, Japan, 15-17 September 2004, pp. 664-665.
 19. M. HASHIM, M. TAKEUCHI, S. KASAI, T. HASHIZUME and H. HASEGAWA, "Conductance Modulation in Interdigital Gate HEMT Device and Its Application", *65st Autumn Meeting of Japanese Applied Physics Society*, Sendai, Japan, 1-4 September 2004, pp. 1260.
 20. M. HASHIM, M. TAKEUCHI, S. KASAI, T. HASHIZUME and H. HASEGAWA, "Conductance Modulation in GaAs-based HEMT Device having Interdigital Gates", *40th Hokkaido Regional Meeting of Japanese Applied Physics Society*, Asahikawa, Japan, 16-17 October 2004, pp. 50.
 21. M. HASHIM, T. HASHIZUME and H. HASEGAWA, "Interactions between Electromagnetic Waves and AlGaAs/GaAs 2DEG Plasma Waves", *51st Spring Meeting of Japanese Applied Physics Society*, Tokyo, Japan, 28-31 March 2004, pp. 1569.
 22. M. MOKJI and S.A.R. ABU-BAKAR, "Fingerprint Matching Based on Directional Image Constructed Using Expanded Haar Wavelet Transform", *International Conference on Computer Graphics, Imaging and Visualization (CGIV)*, Penang, Malaysia, 26-29 July 2004. pp. 149-152.
 23. M.N. MALIKI and SYED ABDUL RAHMAN ABU BAKAR AL-ATTAS, "Features Extraction Based on Fuzzy Clustering and Segmentation onto the Motion Region for Medium Field Surveillance Applications", *International Conference on Computer Graphics, Imaging and Visualization (CGIV)*, Penang, Malaysia, 26-29 July 2004. pp. 76-81.
 24. MOHAMED NANSAH MALIKI and SYED ABDUL RAHMAN AL-ATTAS, "Moving Object Features Extraction Using Morphology Approach Based on YUV Format", *International Conference on Artificial Intelligence and Engineering Technology (ICAJET)*, Sabah, Malaysia, 3-5 August 2004, pp. 280-284.
 25. NAZORI AGANI, SYED ABD. RAHMAN AL-ATTAS and SHEIKH HUSSAIN SHAIKH SALLEH, *International Conference on Control, Automation and Systems (ICCAS 2004)*, Bangkok, Thailand, 25-27 August 2004, pp. 2059-2064.
 26. NAZORI AGANI, SYED ABD. RAHMAN AL-ATTAS and SHEIKH HUSSAIN SHEIKH SALLEH, "Texture Defect Detection in Low Quality Images Using Wavelet Extension Transform and Grey Level Co-Occurrence Matrix", *Proceeding of Telematics System, Services, and Applications (TSSA 2004)*, Bandung, Jakarta, May 2004. pp. 69-74.
 27. R. HERIANSHAH and S.A.R. ABU-BAKAR, "Defects Classification on Bare PCB Using Multiple Learning Vector Quantization Neural Network Paradigm", *Proceedings of the International Conference on Computer Graphics, Imaging and Visualization (CGIV)*, Penang, Malaysia, 26-29 July 2004, pp. 50-53.
 28. RAFIQ SHARMAN, ABU KHARI A'AIN, MOHD AZMI and HUANG MIN ZHE, "Design Approach for Tune able CMOS Active Inductor", *Proceeding of 2004 IEEE International Conference On Semiconductor Electronics*, Kuala Lumpur, Malaysia, 7-9 December 2004, pp. 143-147.
 29. S. HUSSAIN, I. KAMARULAFIZAN and J. NAJIB, "Senario Penyelidikan di Malaysia", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, Malaysia, 14-15 Dec. 2004.

30. Y.H. CHAN and S.A.R. ABU-BAKAR, "Face Detection Based on Feature-Based Chrominance Colour Information", *International Conference on Computer Graphics, Imaging and Visualization (CGIV)*, Penang, Malaysia, 26-29 July 2004, pp. 153-158.
31. Y.H. CHAN and S.A.R. ABU-BAKAR, "Fingerprint Center Point Location Using Directional Field", *3rd International Conference on Image and Graphics (ICIG 2004)*, Hong Kong, China, December 2004, pp. 286-289.
32. Z. IBRAHIM, S.A.R. AL-ATTAS, O. ONO and M.M. MOKJI. "A Noise Elimination Procedure for Wavelet-Based Printed Circuit Board Inspection System", *The 5th Asian Control Conference (ASCC 2004)*, Melbourne, Australia, 20-23 July 2004, pp. 874-887.

POWER ENGINEERING

INTRODUCTION

The Power Engineering research is focused on three main areas: power systems, energy, high voltage engineering and power electronics and drives. Over the last three years, the group has managed to secure over RM 3 millions on research grants for various projects in these areas. In 2004, over 40 publications were produced in journals and conference proceedings. Each research area is headed by a reputed professor who has managed to establish the group as the prominent power engineering research centre in the country. In addition, the group is actively involved in testing and consultancy work. The establishment of the High Voltage and High Current Institute (IVAT) is an important breakthrough that extends the role of the group to serve electric power industries. The group maintains close relationships with major players of the power industries and several group members are recognised as key figures in the local and regional power engineering communities. Recently the group has been focusing on the application of renewable energy, with several grants being awarded for the research in photovoltaic and fuel-cell areas, and enhancement in power system technology such as multi-phase transmission system, deregulated power system, optimal power flow and intelligent arching fault detection.

THE GRADUATE FACULTY

Ir. Dr. Abdul Halim Mohamed Yatim

PhD (EE & Power Electronics) Bradford 1990
Professor
Renewable/Alternative Energy, Electric Vehicle, Motor Drives, Utility Application, Power Electronic Converters, Battery Chargers.

Ir. Dr. Abdullah Asuhaimi Mohd Zin

PhD (Power System) UMIST 1988
Professor
Power System Analysis, Planning and Design, Power System Protection, Power Quality, Embedded Generation, HVDC System, FACTS, Arcing Fault Prediction in Underground Cable.

Dr. Ahmad Darus

Ph.D. (High Voltage Eng.) Strathclyde 1991
Professor
High Voltage Engineering - Performance of GIS System, Vacuum Insulation, Surges, Field Studies.

Dr. Hussein Ahmad

PhD (High Voltage) UMIST 1986
Professor
Lightning Protection, Grounding, Surge Suppression, Power System Insulation Contamination, EMC, EMI.

Hjh. Faridah Mohd. Taha

M.Sc (Elect. Power Eng.) Strathclyde
Associate Professor
Renewable Energy Systems, Energy Efficiency, Energy Modelling and Forecasting.

Hj. Md. Shah Majid

M.Sc (Electrical Power) UMIST 1985.
Associate Professor
Energy Efficiency, Demand and Supply Side Management and its Environment Impact, Control Schemes to Power System.

Dr. Mohd. Wazir Mustafa

Ph.D (Power System) Strathclyde 1997
Associate Professor
Power System Analysis, HVDC System, FACTS, Microwave Power Transmission, Microwave Cordless Charging.

Dr. Nik Rumzi Nik Idris

PhD (Power Electronics) UTM 2001
Associate Professor
AC Motor Drives, Power Electronic Converters and Simulation

Tarmidi Tamsir

MSc. (Electrical Power Eng.) Strathclyde 1985.
Associate Professor
High Voltage (HV) Tech., HV Cable Solid and Liquid Dielectrics.

Dr. Zainal Salam

PhD (Power Electronics) Birmingham 1997
Associate Professor
AC Motor Control, Utility Application, High Voltage Equipment, Power Electronic Converters, Power Electronic Simulations.

Dr. Zulkurnain Abd. Malek

PhD (High Voltage) Cardiff 1999
Associate Professor
HV Systems, Overvoltage Protection System and Insulation Coordination, Measurement Techniques, HV Surge Arrestors, Magnetic Engineering.

Dr. Ahmad Safawi Mokhtar

Lecturer
PhD (Power Eng.) Manchester 2005
Power Quality, Power System Analysis.

Dr. Awang Jusoh

Lecturer

PhD (Power Electronics) Birmingham 2004

DC-DC Converter, Electric Vehicle, DC Drive.

Dr. Azhar Khairuddin

Lecturer

PhD (Electrical Eng.) UTM 2003

Deregulated Power System, Large Scale Power System Simulation.

Dr. Mohamed Afendi Mohamed Piah

Lecturer

PhD (Electrical Eng.) UTM 2004

High voltage insulation diagnostic and co-ordination, partial discharges and surface tracking phenomena, polymer insulating materials and insulator condition monitoring.

Dr. Mohd Muhridza Yaacob

Lecturer

PhD (Electrical Eng.) UTM 2004

High Voltage & High Current, Lightning Effect on Low Voltage System.

Dr. Naziha Ahmad Ali

Lecturer

PhD (Electrical Eng.) UTM 2002

Power converters static applications, AI control of power converters, power quality, active power filters and PV/fuel cell power conditioning systems

Dr. Mohamad Yusri Hassan

Lecturer

PhD (Electrical Eng.) Strathclyde 2004

Power Systems Economics (Transmission Pricing), Electricity Industry, Deregulation Issue, Energy Management.

Dr. Zolkafle Buntat

Lecturer

PhD (Power Eng.) Loughborough 2005

Ozone generation using electrical discharges: Atmospheric pressure glow discharge, Pulsed streamer discharge, Silent discharge; Fruit, vegetable and meat preservation using ozone; Ozone therapy and ozone for medical application.

RESEARCH TOPICS OF INTEREST

* Note: This list is not an exhaustive list.

- Gas-insulated switchgear (GIS) power system.
- Corona and electrical discharges.
- Performance of power system apparatus under lightning and switching surges.
- Effects of transients on telecommunication equipment and other protective devices.
- New insulating materials such as polypropylene fiber, composite and gas mixtures.
- High voltage testing and insulation co-ordination and diagnostics.
- Fast transient response of zinc oxide surge arresters.
- Application of neural network and fuzzy logic in power system
- Integrated protection engineering and management using AI
- Design and analysis of demand side management
- High performance uninterruptible power supply (UPS).
- Development of solar/electric/hybrid powered vehicles.
- Power conditioner for fuel cell power system application.
- Application of solar photovoltaic systems.
- Rapid and intelligent battery chargers for electric vehicle and rechargeable batteries
- DSP and FPGA based controllers for power electronics application
- Microcomputer implementation of a controller on a micro-alternator set
- Loss minimization in power system
- Power system harmonics - measurement, penetration and prediction
- Short-term load forecasting
- FACTS transmission system'
- Restructuring electricity market
- Power quality

RESEARCH GRANTS

Development of An Intelligent System for Power Quality Planning and Management

Project Head: Prof. Dr. Abdullah Asuhaimi Mohd Zin

Period: July 2002 – Dec 2005

IRPA Code: 74063

Grant Amount: RM 177,500.

Summary

Power quality has always been an important issue in the electricity supply industry. The main objectives of this project are to develop an intelligent system for power quality planning and management, to develop the interfacing of power quality instrument and Intelligent Power Quality System (IPQS) and to enhance the existing data extracting methods.

Development of a Digital Protection Scheme for a Six-Phase Line Embedded in a Three-Phase Power System

Project Head: Prof. Dr. Abdullah Asuhaimi b Mohd Zin

Period: April 2003 – Sept 2005

IRPA Code: 74167

Grant Amount: RM 139,760.

Summary

Six-phase conversion of one or more strategic lines in a three-phase system is an attractive option for enhanced power transmission avoiding new line construction or voltage upgrading. This research will focus on the following aspects related to protection of a TNB transmission line that may have potentials for conversion into a six phase one.

- i) To develop an appropriate computer model for analysis of the currents and voltages under a plethora of fault combinations and locations arising due to six phase conversion.
- ii) To develop a laboratory replica of the converted line and a fully digital protection unit.
- iii) To identify the most suitable scheme for the protection of the converted line and the most accurate algorithm for determining current and voltage fundamental components for all the fault combinations by turn.
- iv) To verify the findings of step (iii) above by feeding into the developed digital protection unit the actual signals from various faults staged at low voltage on the laboratory replica of the six-phase line.

Development of On-Line and Intelligent Energy Saving Scheme for a Commercial Building

Project Head: Assoc. Prof. Md Shah Majid

Period: January 2003 – December 2004

IRPA Code: 74120

Grant Amount: RM 199,076.

Summary

Intelligent control schemes for both air-conditioner and lighting systems, taking into account the conflicting ambient and environmental conditions, appears to have received little attention. The research focuses on the development of on-line and intelligent energy saving scheme using Artificial Intelligence techniques, which would contribute to the optimum use of electrical energy especially in non-residential bulk energy consumption sectors such as offices/shopping complexes, academic institutions and high-tech industries.

Static and Dynamic Impacts of Three to Six Phase Conversion of Selected Transmission Lines in an Electric Energy System

Project Head: Assoc. Prof. Dr. Mohd Wazir Mustafa

Period: April 2003 – March 2005

IRPA Code: 74164

Grant Amount: RM 143,760.

Summary

Three to six phase conversions of one or more transmission lines in a power system has the potentials for enhanced power transfer avoiding new line construction or voltage upgrading. This research will focus on the following aspects.

- i) To conduct a load flow analysis of the TNB power system considering conversion of one or more of its existing three phase double circuit lines into six phase ones. This will determine the impacts of conversion on voltage stability and thermal load ability (ampacity) under varied loading conditions.
- ii) To carry out a fault analysis of the same system as in (i) to determine the adequacy of existing switchgears' short circuit capacity for permitting three to six phase conversion.
- iii) To make a transient stability analysis of the same system as in (i) to determine the impacts of conversion on the security of the system following outage of a converted line.
- iv) To verify the computer simulation results (i to iii) by developing a laboratory-scale replica of the TNB system's equivalent and then conducting tests on this replica.

Development of Arcing Fault Prediction in Underground Distribution Cables

Project Head: Zaniah Muda

Period: January 2002 – December 2005

IRPA Code: 74002

Grant Amount: RM 115,000.

Summary

Arcing faults are experienced in power systems because of insulation failure. These faults can cause substantial damage if they are not detected and isolated promptly. The techniques presently used in power systems are based on detecting faults by examining the voltages and currents. The changes usually do not occur immediately after the establishment of an arcing fault. The consequence is that the damage at the fault is usually substantial. The damage can be reduced if arcing faults of low level are detected before they develop into major faults. Detection of arcing faults has always been a difficult issue. Those faults tend to be of high fault resistance and hence the fault current is well below maximum load limit and its detection is not possible through the use of overload relays. In the case of overhead line, the gas generated through arcing is dispersed rapidly. But in the case of underground cable, the generated gas could travel along cable duct and could result in explosion at manhole location. This is dangerous to personnel. In the past many investigations have been performed and methodologies have been suggested in its detection. Arcing produces travelling waves that could be used to detect its presence and location. The methodologies used included Fourier Transform, Artificial Neural Network, spectrum decomposition etc.

Evaluation of Insulation Strength For High Phase Order Conversion Of A HV Transmission Line

Project Head: Prof. Dr. Hussein Ahmad

Period: November 2002 – October 2005

IRPA Code: 74103

Grant Amount: RM 192,280.

Summary

Malaysia is undergoing rapid industrialization and urbanization. Also the country has boosted up its all sorts of development and economic activities keeping ahead "Vision 2020". This increases the demand for electrical energy, which is the most convenient form among all the types of energy. To satisfy the ever-increasing demand, bulk transmission of electricity from distant generation sites to the load centers is required to be increased. An alternative to new line construction or voltage upgrading is three to six phase conversion (termed high phase order conversion) of an existing double circuit line that would permit about 73% more energy transmission without any change of the existing line tower, conductors and Rights-of-Way area. However, this

conversion will have impact among others on the insulation of the tower, line and substation equipment (transformer, switchgear) at both ends of the line. The insulation impact can be studied independently of the other impacts. This research will focus on conducting analytical and experimental (laboratory) studies on a selected three-phase double circuit line of the TNB transmission network to determine the adequacy of existing insulation strength under steady state AC and Lightning transient conditions for six phase conversion of the line.

Development of an Efficient Variable Speed Compressor System

Project Head: Prof. Ir. Dr. Abdul Halim Mohd Yatim

Period: August 2002 – July 2005

IRPA Code: 74535

Grant Amount: RM 400,000.

Summary

Battery or fuel cell operated system put great emphasis on efficiency of operation because of limited energy fuel or resources. Conventional vehicle air-conditioning systems are based on fixed speed and almost constant power compressor operation in which the temperature control is based on on-off control mechanism, which is not efficient. The project proposes an efficient electrical motor compressor system that is able to maximize the motor efficiency at various load conditions. Motors are normally operated at a constant air-gap flux and the efficiency is very low when operated at light loads where most of the power consumed will be absorbed by the motor (magnetizing iron losses) and the effect is heating of the motor and this will decrease the life span. The proposed system will optimise the motor operation by varying the flux based on the load conditions i.e. low flux at low load and high flux at high load. This is done with care, as we do not want to over saturate the flux and damage the motor. Therefore a sophisticated controller has to be used for such operation. The project proposes to use a powerful Digital Signal Processor for this task.

Static VAR Compensator and Active Power Generator Using Photovoltaic Inverter For Industrial Application

Project Head: Assoc. Prof. Dr. Zainal b Salam

Period: November 2002 – October 2004

IRPA Code: 74102

Grant Amount: RM 277,000.

Summary

As the application of solar power is steadily increasing, (due to the constant trend of price reduction of solar cells, and concern over environment), it is natural to capitalise this resources for various applications. One area that generates considerable interest recently is the use of photovoltaic (PV) power compensate for the distortion in the supply current. This work involves designing and building a prototype for a small static VAR/Active filter compensator for a small size industrial plant. The main contribution will be the development of the algorithm for the current reference using the extended p-q theorem. The aim is to compensate for the distorted line current and to achieve near unity power factor. The main target users are the small or medium scale industrial plants which normally have poor power factor and as a results are paying heavy penalties on their electrical tariff.

Design And Development Of High Performance Resonant Type Inverter For Rooftop, Grid-Connected Photovoltaic Application

Project Head: Assoc. Prof. Dr. Zainal Salam

Period: November 2002 – October 2005

IRPA Code: 74104

Grant Amount: RM 200,000.

Summary

The aim of this research is to produce a high performance, low cost PV inverters for rooftop applications. To achieve this end, several possible inverter topologies will be investigated. Particularly, the high-frequency bi-directional resonant converter will be of greatest interest. Emphasis will be stressed on producing a workable

prototype, which can be incorporated with a 500-1000 W of PV panel. Other aspects of the system, such as integration and protection will also be studied extensively to suit with local conditions and climate.

Study on the Early Streamer Emission Mechanisms Aided by Laser Radiation Ionization Process

Project Head: Prof. Dr. Hussein Bin Ahmad

Period: November 2004 – October 2007

IRPA Code: 74276

Grant Amount: RM 93,000.

Summary

An early streamer emitter (ESE) is an air terminal (lightning rod) that is equipped with a device or formed in such a way that it supposedly creates an upward propagating streamer faster than a standard air terminal. This streamer connects with a downward propagating leader of a lightning stroke. The claimed function of an ESE device is the triggering of an upward streamer or leader at a time, ΔT , earlier than the triggering time of a simple lightning rod. The time difference is also defined as the time advantage. It is proposed that this time advantage be multiplied by a constant velocity of the upward progressing discharge. The velocity multiplied by ΔT determines the length, ΔL , of the triggered discharge. The ESE rod with the length of L is also claimed to give the same protection as a simple lightning rod length plus the mentioned ΔL . Thus the protected zone equals $L + \Delta L$. The protection is designed using the Rolling Sphere Method. These theories in NFPA draft Standard 781 on ESE devices have been greatly disputed by the scientific community all over the world until to the extent of being opposed by many distinguished scientists in the lightning field. The claimed advantages of the operation of ESE device have never been proven correct under natural lightning condition. The underlying concept of ESE devices is that they generate upward streamers earlier than done by the traditional Franklin Rods proposed have not been understood by the inventor themselves. However in this research a new type of ESE lightning protection shall be designed, developed, and tested that use the laser radiation ionization process to further enhance the creation of upward streamer from the lightning rod to the coming downward streamer.

PUBLICATION

1. ABDULLAH ASUHAIMI MOHD ZIN, *Manual Penyelesaian: Kejuruteraan Sistem Kuasa*, Faculty of Electrical Engineering, UTM, Malaysia, Dec. 2004.
2. A. KHAIRUDDIN, S. SHAHNAWAZ, M.W. MUSTAFA, A.A. MOHD.ZIN and H. AHMAD, "A Novel Method for ATC Computations in a Large-Scale Power System", *IEEE Transaction on Power System Journal*, **19**(2), May 2004, pp. 1150-1158.
3. E. RADWAN, N. MARIUN, S. MAHMOD, I. ARIS and A.H. YATIM, "Rotor Time Constant Estimation for IRFO Induction Motor", *Journal of Electrical Engineering*, Politechnica Publishing, **4**(2), 2004, pp 86-93.
4. HUSSEIN AHMAD, A.A. AL-ARAINY, SITI NORASMAH MOHTAR, NORHAMIMI HAMDAN, and WAN FAZIATUL LATIFAH, " On the Evaluation of Carbon, Bentonite, and Mixture of Carbon, Clay, Peat, Salt and Cement as Additive Filler in Grounding System Application", *Elektrika*, 2004, **6**(1), pp. 100-107.
5. J.A. AZIZ and Z. SALAM, "A New Pulse-width modulation (PWM) Scheme for Modular Structured Multilevel Voltage Source Inverter", *International Journal of Electronics*, Taylor & Francis, **91**(4), April 2004, pp. 211 – 226.
6. M.A.M. PIAH and A. DARUS. "Modeling Leakage Current and Electric Field Behavior of Wet Contaminated Insulators", *Power Engineering Letters: Journal of IEEE Transaction on Power Delivery*, **19**(1), 2004, pp. 432-433.
7. M. AFENDI M. PIAH, AHMAD DARUS and AZMAN HASSAN, "Effect of ATH Filler on The Electrical Tracking and Erosion Properties of Natural Rubber-LLDPE Blends Under Wet Contaminated Conditions", *Journal of Industrial Technology*, SIRIM, **13**(1), pp. 27-40.
8. MD. MORTUZA ALI, MD. ZAHURUL ISLAM SARKAR, MD. YEAKUB HUSSAIN and HUSSEIN AHMAD, "Calculation of Lightning Induced Electric Field Over Lossy Ground with Modified Technique", *Elektrika*, **6**(1), Dec. 2004, pp. 23-27.
9. MOHD HAFIZ HABIBUDDIN, MOHD WAZIR MUSTAFA and AZHAR KHAIRUDDIN, Determining Available Transfer Capability Using Feedforward Neural Network, *Elektrika*, **6**(1), Dec 2004, pp, 76-81.
10. MOHD WAZIR MUSTAFA and HUSSAIN SHAREEF, "Transmission Usage And Loss Allocation Of Electricity In A Liberalized Energy Market, *Elektrika*, **6**(1), Dec 2004, pp. 82-87.
11. N.A. AZLI, and A.H.M YATIM, "Modular Structured Multilevel Inverter (MSMI) For Fuel Cell Power Conditioning Systems (PCS)", *International Journal of Power and Energy Systems*, Acta Press, **24**(2), 2004, pp. 89-97.
12. N.N.R. IDRIS and A.H.M. YATIM, "Direct Torque Control of Induction Machines with Constant Switching Frequency and Reduced Torque Ripple", *IEEE Transaction on Industrial Electronics*, **51**(4), August 2004, pp. 758-767.
13. N.A. IDRIS, A. RAMLI, N. MOHAMAD NOR and H. AHMAD, "Comparative Study on Earth Impedance Values Obtained Using Computer Modeling and Impulse Conditions", *Elektrika*, **6**(1), 2004, pp. 39-42.
14. P.L. LEOW and N.A. AZLI, "SVM Based Hysteresis Current Controller For A Three Phase Active Power Filter", *Elektrika*, **6**(1), 2004, pp. 88-94.
15. S. SHAHNAWAZ AHMED, M. HASSAN, M.E. HAQ KHONDKER, A.K.M. MONIRUZZAMAN and AZHAR KHAIRUDDIN, "Prospects of Using Time Series to Find the Maximum Power Point of a Photovoltaic Array from its Load Currents and Voltages", *Journal of Energy and Environment*, **3**, May 2004, pp. 81 –90.

16. ZAINAL SALAM and ZULKIFLI RAMLI, "A Bi-directional UPS Inverter Utilising High-Frequency Center-tapped Transformer", *Journal Teknologi*, **40(D)**, June 2004, pp. 59-76.
17. A.A. MOHD ZIN, H. MOHD HAFIZ and M.S. AZIZ, "A Review of Under Frequency Load Shedding Scheme on TNB System", *PECon 2004*, Shah Alam, Malaysia 29-30 November 2004.
18. A.A. MOHD ZIN, H. MOHD HAFIZ and W.K. WONG, "Static and Dynamic Under-frequency Load Shedding: A Comparison", *Powercon2004 Conference*, Singapore, 21-24 Nov 2004.
19. AWANG JUSOH, "The Instability Effect of Constant Power Loads", *National Power and Energy Conference (PECon 2004)*, Shah Alam, Malaysia, 29-30 November 2004.
20. B.C. KOK, A.A. MOHD. ZIN and M.W. MUSTAFA, "Power System Dynamic Equivalents Using Line Flow Minimization Approach", *AUPEC'2004*, Brisbane, Australia, 26-29 September 2004.
21. CHAN WEI KIAN, ABDULLAH ASUHAIMI MOHD. ZIN, MD. SHAH MAJID, HUSSEIN AHMAD, ZANIAH MUDA and LO KWOK LUN, "Artificial Neural Network Based Arcing Fault Detection Algorithm For Underground Distribution Cable", *4th NSF Seminar*, Penang, Malaysia, 20-21 Dec. 2004.
22. CHEE LIM NGE and ZAINAL SALAM, "Unipolar SPWM HF LINK Soft Switching DC/AC Converter", *IEEE National Power and Energy Conference (PECon 04)*, Shah Alam, Malaysia, 29-30 Nov 2004, pp. 116-121.
23. H. AHMAD, L.M. ONG, and S. SHAHNAWAZ, "Laboratory Studies on a Modified Lightning Protection System Based on Laser Aided Ionization of Air", *ICECE 04*, Dhaka, Bangladesh, 28-31 Dec 2004.
24. KOK BOON CHING, ABDULLAH ASUHAIMI MOHAMMAD ZIN, MOHAMMAD WAZIR MUSTAFA and LO KWOK LUN, "Development of Power System Dynamic Equivalents Toolbox For Digital Type Power System Simulator", *4th NSF Seminar*, Penang, Malaysia, 20-21 Dec. 2004.
25. LEONG SOON TOH, ZAINAL SALAM and MOHD ZULKIFLI RAMLI, "Analysis and Design of a Closed Loop Controller for Bidirectional High Frequency Link Inverter", *IEEE National Power and Energy Conference (PECon 04)*, Kuala Lumpur, Malaysia, 29-30 Nov 2004, pp. 67-72.
26. MD AFENDI MD PIAH and AHMAD DARUS, "Mathematical Analysis of Leakage Current Level in Correlation with Environmental Stresses for Solid Insulating Material under Tracking Test", *2nd National Power and Energy Conference (PECon 2004)*, Shah Alam, Malaysia, 29-30 November 2004.
27. MD AFENDI MD PIAH, HUSSEIN AHMAD and AHMAD DARUS, "From Laboratory to Center of Excellence in High Voltage Engineering: IVAT's Experience", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, Malaysia, 14-15 Dec 2004.
28. MOHD FUAAD RAHMAT and A.H.M. YATIM, "Kajian Persepsi Majikan Terhadap Graduan Program Separuh Masa Kursus Sarjana Muda Kejuruteraan Elektrik UTM", *Conference on Engineering Education (CEE2004)*, 14-15 Dec. 2004.
29. MOHD SHAH MAJID and HASIMAH ABD RAHMAN, "Energy Efficiency and Conservation Study in a Medium Scale Industry in Malaysia", *IEEE National Power and Energy Conference (PECon 2004)*, Shah Alam, Selangor, Malaysia, 29-30 Nov. 2004.
30. MUHAMMAD ABU BAKAR, HUSSEIN AHMAD and S. SHAHNAWAZ, "Development of an Indigenous Fog Chamber for Insulator Test", *3rd International Conference on Electrical and Computer Engineering (ICECE 04)*, Dhaka, Bangladesh, 28-31 Dec 2004.
31. N.A. AZLI, "Design and Implementation of Problem Based Learning Cases in Electrical Engineering Courses", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, Malaysia, 14-15 Dec. 2004.
32. NIK DIN MOHAMED, JAAFAR SHAFIE and A.H.M. YATIM, "PSPICE Based Design of DC-DC Converter Systems", *IEEE National Power and Energy Conference*, Kuala Lumpur, Malaysia, 29-30 Nov. 2004.

33. P.C. TAN and ZAINAL SALAM, "A New Single Phase Two-wire Hybrid Active Power Filter Using Extension p-q theorem for Photovoltaic Application", *IEEE National Power and Energy Conference (PECon 04)*, Shah Alam, Malaysia, 29-30 Nov 2004, pp. 126-131.
34. S. AYOB and Z. SALAM, "A New PWM Scheme for Cascaded Inverter Using Multiple Trapezoidal Modulation Signals", *Proc. of IEE Power Electronics, Machines and Drives (PEMD' 04)*, Edinburgh, UK, 31 March-2 April 2004, pp. 242-246.
35. S.M.A. RAZAK, M.M. ALI, M.Z.I. SARKAR, and H. AHMAD, "Lightning Induced Over Voltages on Overhead Distribution Lines Including Lossy Ground Effects", *ICECE 04*, Dhaka, Bangladesh, 28-31 Dec 2004.
36. SAIFULNIZAM ABD KHALID, MOHD HAFIZ HABIBUDDIN, DALILA MAT SAID and MOHD WAZIR MUSTAFA, "Problem-Based Learning in Power Engineering Laboratory", *Conference on Engineering Education (CEE2004)*, Kuala Lumpur, Malaysia, 14-15 Dec. 2004.
37. WAHYU UTOMO and A.H.M. YATIM, "On-line Optimal Control of Variable Speed Compressor Motor Drive System Using Neural Control Model", *IEEE National Power and Energy Conference (PECon 2004)*, Shah Alam, Malaysia, 29-30 Nov. 2004.
38. Z. SALAM and Z. RAMLI, "A DC-DC Type Bidirectional High Frequency Link Inverter Using Center-Tapped Active Rectifier", *Proc. of the 30th IEEE Industrial Electronics Conf. (IECON 04)*, Busan, Korea, 2-6 Nov 2004.
39. Z. SALAM, "An on-line Harmonics Elimination PWM Scheme for Three-Phase Voltage Source Inverter Using Quadratic Curve Fitting", *Proc. of the 30th IEEE Industrial Electronics Conf. (IECON 04)*, Busan, Korea, 2-6 Nov 2004.
40. Z. SALAM, M.Z. RAMLI, L.S. TOH and C.L. NGE, "A Bi-directional High-frequency Link Inverter Using Center-tapped Transformer", *Proc. of IEEE Power Electronics Specialist Conf. (PESC 04)*, Aachen, Germany, 20-25 June 2004, pp. 3883-3888.
41. Z. SALAM, M.Z. RAMLI, L.S. TOH and C.L. NGE, "Isolated Bi-directional Inverter Using High Frequency Center-tapped Transformer", *Proc. of IEE Power Electronics, Machines and Drives (PEMD' 04)*, Edinburgh, UK, 31 March- 2 April 2004, pp. 644-649.
42. ZAINOREN SHUKRI and ABDULLAH ASUHAIMI MOHD ZIN, "Impact of ICT on the Feasibility of an Integrated Protection Engineering and Management Solution for Transmission System", *OAORC-CIGRE Regional Technical Meeting*, Putrajaya, Malaysia, 23-25 March 2004.
43. ZAINOREN SHUKRI, ABDULLAH ASUHAIMI MOHD.ZIN and K.L. LO, "Integrating Protection Engineering and Management Tools for Utility Practices", *CIGRE, Paris*, 2004.

RESEARCH STUDENTS

Communications

PhD

Abu Sahmah Mohd Supaat	Design and Implementation of a Thermo-Optic Polymer Switch
Leow Cheah Wei	Design and Fabrication of a MEMS Optical Switch
Liza Abdul Latiff	Development of a 3D GPS-Free Indoor Location Aided and Power Aware Routing For Mobile Ad-Hoc Network
Khalid Zayid Al-Muharrami	Simulation and Evaluation of Free Space Optic for Oman Weather
Maznah Kamat	Mobility Management for TCP-IP-Based Wireless Sensor Networks (WSNs)
Mohd Haniff Ibrahim	A Development of an Active Optical Device Based on Benzocyclobutene (BCB) Polymer
Mokhtar Harun	Speech Intelligibility Prediction Models in Room With Reflective Dome
Muladi	Development of High-Rate MIMO-OFDM System With Multiple Antennas and Multilevel Coding
Norashidah Md Din	Fuzzy Logic-based Traffic Control Scheme for DiffServ-aware MPLS Internet
Nor Hisham Hj. Khamis	Derivation of Path Reduction Factor From the Malaysian Meteorological Radar Data
Reza Firsandaya Malik	Energy Efficient Communication Protocol for Bluetooth (IEEE 802.15.3) in Ad-hoc and Sensor Networks
Sharifah Kamilah Syed Yusof	Intercarrier interference (ICI) and Peak-to-Average Power Ratio (PAPR) Reduction Technique in MIMO-OFDM Systems
Wan Haslina Hassan	Mobility Management via Collaborative Cogents
Yusnita Rahayu	Design and Development of Multiband Fractal Antenna for Wireless Communication

MEng

Adel Ali Ahmed	Location Tracking in Integrated Mobile Ad hoc Network with Mobile IPv6
Azhari bin Asrokin	Design and Development of Active Integrated Antenna For Wireless LAN System
Chua Tien Han	WLAN Indoor Geolocation System
Ikhwan Peranggi	Development of S-Based Front-End Microwave Antenna For a Small Scale Wireless Power Transmission (WPT) Reception
Imran Mohd Ibrahim	Pembangunan Antenna Lubang Alur Untuk Aplikasi Rangkaian Kawasan Setempat Wayarles Komunikasi Titik ke Titik Pada Frekuensi 5725-5875 MHz
Mohammad Syafwan Arshad	Fade Dynamics Characteristics for Satellite Communication Link in

	Malaysia
Mohd Asrul Awang	Pengaruh Taburan Saiz Titik Hujan Pada Frekuensi Gelombang Mikro Di Malaysia
Munirul Ula	The Study of Normal Incidence Sound Absorption Coefficient of Perforated Panel with Geometric Patterns Using Numerical Techniques
Muralitharan Pillai	Mesh Optical Fibre Network Over Existing SDH Ring
Ooi Chia Ching	Implementation of Geocast-Enhanced AODVbis Routing Protocol in Mobile Ad-hoc Network (MANET) Test bed
Noor Azwan Shairi	RF Transceiver Design and Development For WLAN Bridge System Operating at 5.725-5.825 GHz
Rajan Ratti Satya Nand	Modelling and Simulation of WLAN Physical Layers Based On Orthogonal Frequency Division Multiplexing (OFDM)
Sahrul Hilmi Ibrahim	The Implementation and Evaluation of a Broadband Optical Access System
Shee Yu Gang	Polymer Based Optical Waveguides
Siti Fatimah Abdul Rahman	Traffic Pre-emption in Multiprotocol Label Switching (MPLS) DiffServ Aware Network
Su Shaw Bank	Interaction Data Communication Between Media Equipment and PDA Through IEEE WLAN 802.11B
Tang Min Keen	Channel Modeling and Bit Error Rate Performance Simulation For Fixed Broadband Wireless Access System
Thomas Peter S. Thomas	Integrated Active Low Noise Amplifier (LNAA) Design for WLAN Applications at 5GHz

Control and Mechatronics Engineering

PhD

Abd. Rahim Ahmad	Handwriting Recognition Using Support Vector Machine and Hidden Markov Model
Abdul Fadlil	Online Handwriting Recognition Using Neuro-Fuzzy Methods
Andi Adriansyah	Development of a Autonomous Mobile Robot With Fuzzy Behavior Based Tuned by Genetic Algorithm
Azura Che Soh	Intelligent Urban Traffic Lights Control Using Dynamic Hybrid Artificial Intelligent Techniques
Dirman Hanafi Burhannuddin	System Identification of a Quarter Car Passive Suspension System
Hafizah Husain	Modeling and Control of Complex Plant using Intelligent Control Schemes

Hazlina Selamat	Adaptive Controller Design for the Primary Suspension of a High-Speed Mechatronic Train
Mohamad Shukri Zainal Abidin	Development of Fault Diagnostic and Fault Isolation for a Plant Using Artificial Intelligent Techniques
Ribhan Zafira Abdul Rahman	An Intelligent Fault Detection and Diagnosis Software for Distillation Column
Shahrin Azuan Nazeer	A New Algorithm for Face Recognition Using Artificial Intelligence Techniques
Siti Norul Huda Sheikh Abdullah	License Plate Recognition
Tan Eng Teck	A New Control Technique for Micro Ceritation System Using the Piezoelectric Actuator
Yusri Md. Yunos	Measurement of Gas Volumetric Flow Rate in Gas/Liquid Mixtures Using Optical Tomography
Yahaya Md. Sam	Modelling and Control of Active Suspension System Using Proportional Integral Sliding Mode Control

MEng

Chiam Kok Thiam	Optical Tomography System Using DSP
Eileen Lew Yi Lee	Design of an Intelligent Wood Recognition System for Classification of Tropical Wood Species
Eileen Su Lee Ming	Design of a Vision System For Mobile Robot Navigation In a Structured Environment
Leong Lai Chen	Implementation of Multiple Fan Beam Projection Technique Using Optical Fibre Sensors in Process Tomography
Goh Chiew Loon	Application of Ethernet Technology on Data Acquisition of Optical Tomography System
Hakilo Ahmed Sabit	Flow Regime Identification of Particles Conveying in Pneumatic Pipeline using Electrical Charge Tomography and Neural Network
Hazrul Izwan Hussein	Neuro Fuzzy Control of an Inverted Pendulum
Ma Tien Choon	Biomimetic Design and Development of a Hexapedal Running Robot with Automatic Gaiting Selection Based on Terrain
Mohd Amri Md Yunus	Real Time Imaging of Solid Flow in a Gravity Flow Rig Using Infra Red Tomography
Mohd Faisal bin Ibrahim	Fuzzy Modeling and Control of Nonlinear System: Distillation Column
Mohd Hafiz Fazalul Rahman	Non-Invasive Imaging of Liquid/Gas Flow using Ultrasonic Transmission Mode Tomography
Nenny Ruthfalydia Rosli	Design of a Sub-Pixel Analysis Module for Image Processing With Industrial Applications

Ng Wei Nyap	Composition Determination of Water and Oil Flow Using Ultrasonic Tomography
Noor Azurati Ahmad	Development of Microcontroller Based Embedded Web Server for Real-Time Interaction With Mobile Robot
Norhayati A. Majid	An Approach and Implementation of Sensor Fusion in Environment Mapping for Autonomous Mobile Robot Navigation
See Siew Min	On the Design of a Chattering-Free Sliding-Mode Control for Uncertain Systems with Mismatch Disturbances and Uncertainties
Tay Cheng San	Using Micro-Genetic Algorithm for Solving Scheduling Problems
Tee Zhen Cong	Electrical Capacitance Tomography Using Universal Serial Bus (USB) Technology
Wai Tai Kuan	Development of Visual Based Obstacle Avoidance for Mobile Robot Using Optical Flow
Wong Hwee Ling	Face Detection on Mobile Robot for Human-Robot Interaction
Yap Wooi Hen	Design of a DSP-Based Fully Automated Face Verification System
Yaw Wee Lee	Real-Time Mass Flow Rate Measurement of Particle Conveying in Pneumatic Pipeline Using Electrodynamical Sensor
Yeong Che Fai	Development and Evaluation of Various Modes of Human Robot Interface for Mobile Robot
Zalhan Mohd Zin	Design of Face Tracking System

Electronics and Computer Engineering

PhD

Izzeldin Ibrahim Mohamed	Performance Evaluation and Modeling of Self-Similar Behavior of MPEG4 Video Traffic in IP Networks
Nasir Shaikh Husin	VLSI Interconnect Optimization with Buffer Insertion and Wire Sizing
Nazori Agani	Texture Analysis and Classification of Echocardiography Images Using Wavelet Transform for Detection Heart Defect
Omar Abdullah Ali Attiah	Non-linear Knowledge Discovery with Self-organizing Maps: Developing a National Information and Communication Technology Strategy Framework Using Case of Saudi Arabia
Rubita Sudirman	Recognition of Speaker-Independent Speech Recognition Based on Neural Network
Rudi Herdiansyah	Infrared Thermography for Predictive Maintenance in Petrochemical Plant
Salwani Mohd Daud	An Intelligent ECG-Based Brain Computer Interface (BCI)
Siti Zarina Md Naziri	An Investigation of the Efficient Implementation of Advanced Encryption

Standard (AES) Algorithm

Ting Hua Nong Developing Methodology for Computer-based Malay Articulation-Phonology Assessment

MEng

Abd Rahim Mat Sidek Design and Analyses of Stream Cipher Algorithms for Secured HF Messaging System

Ahmad Kamarul Ariff Ibrahim Malay Continuous Speech Recognition System

Ahmad Sazali Senawi Implementation of DQPSK for HF Communication System Using DSP Processor TMS320VC5416

Arief Ruhullah A Harris Development of Intelligent Fitness Test and Athletic Training System

Arul Paniandi Design Of a RSA Co-Processor Microchip for Smart Card

Avinash Rajah ASIC Design of a Neuron Array Processor Core Implementing the Kohonen's Ann Algorithm

Chan Ying Hui Integrated Multilevel Security Access System

Chen Weng Cheow An Admission Control Method For IEEE 802.11e Contention Access Mechanism

Cheow Kwee Siong Analysis and Model Development of Gate Oxide Short (GOS) for Deep Submicron CMOS Transistor

Fitri Dewi Jaswar FPGA Implementation of MCPFSK Modulation Technique For HF Data Communication

Gan Hock Lai Performance Study and Security Enhancement For Password-Based Authentication In Wireless LAN

Hau Yuan Wen Public Key Infrastructure On-Chip for Next Generation Smart Card

Huang Min Zhe Integrated Class F Power Amplifier for Radio Frequency Application

Kamarulafizam Ismail A Comparative Study of Pattern Classifier for Heart Sound and Murmurs Signal

Lau Ker Chea Development and Performance Study of A Proactive Network-based Intrusion Detection System (NIDS) based on Kohonen's Self-Organizing Map (KSOM)

Leong Mun Hon An Investigation on Digital Modelling Test Technique for Mixed Mode Circuits

Liew Eng Yew A Study on Signature Analyser Design for Test

Lew Man Wai Modeling and Fabrication Process of Nanoelectronic Devices

Michael Tan Loong Peng The Role of Velocity Saturation in Deep Submicron Mosfet Device Performance

Mohamad Nansah Maliki	Recognition of Hand Activity For Intelligence Surveillance System
Mohd Azmi Ismail	RF CMOS Class E Power Amplifier
Mohd Izuan Ismail	Design of an Advanced Encryption Standard (AES 128) Crypto-Processor in FPGA
Mohd Najeb Jamaludin	Development of 12-Lead ECG Data Acquisition System and Optimization of Wave Detection on Embedded System
Nurul Fadzilah Hasan	HF Messaging System With Automatic Link Establishment (ALE) Capability
Prakash Sowndappan	Real Time Implementation of Speaker Recognition
Rafiq Sharman Khamis	Design of CMOS Common Gate Low Noise Amplifier With On-Chip Active Inductor
Shanjeev Kumar Magithalam	Adjustable Electronic Fuel Injection System to Provide a Better Fuel Usage In Ration to the Power Produced Using DSP Approach
Teoh Chin Hong	A Study of Semiconductor Devices in Nanoscale Dimension
Tiong Hung Huei	Design and Verification of an HF Channel Characterisation System
Vannebula Eka Indraguna	Electronic Engine Combustion Controller (EECC) Design and Development for Natural Gas Vehicle (NGV) Motorcycle
Zamri Mohd Zin	Selection of Features For Heart Sound and Murmurs

Power Engineering

PhD

Alireza Tavakolighainani	Development of Digital Protection Scheme for a Six-Phase Line Embedded in a Three-Phase System
Bakri bin Sawir	An Intelligence Fault Diagnostic With Respect to Power Quality Effect Due to TNB Transmission Network Disturbance
Goh Hui Hwang	Development of an Intelligent System for Power Quality Planning and Management
Hussain Shareef	Transmission Usage Allocation in Pool Based Power System
Kok Boon Ching	Dynamic Equivalents of Power System for Digital Type Power System Simulator
Lim Yew Soon	Techo-Economic Studies Focusing on Losses
Mohamed Afendi Mohamed Piah	Leakage Current and Surface Tracking Characterization of New Natural Rubber-Based Material for High Voltage Insulation
Mohd Azlan Abdul Shukor	Use of Artificial Neural Network in Arcing Fault Pattern Recognition and the

Identification of Defects in Underground Distribution Cable

Mohd Muhridza Yaacob	The Behaviour and Performance of Metal Oxide Varistor Under the Application of Multiple Lighting Impulses
Muhamad Abu Bakar Sidik	Study on the Early Streamer Emission Mechanism Aided by Laser Radiation Ionisation Process
Muhammad 'Irfan Jambak	Evaluation of Insulation Strength for Three to Six Phase Conversion of HV Transmission Line
Wahyu Mulyo Utomo	Improvement of the Efficiency Variable Speed Compressor Motor System
Zainoren Shukri	Overall (Knowledge) Management Scheme for Protection System for a Power System Utility
Zuraimy Adzis	Electromagnetic Effects of Lightning Striking Directly on a Nearby 60 meter Metallic Structure on a Test Telecommunication Line

MEng

Ahmad Zafuan Mohamed Kassim	Development of Competitive Wholesale Market for Energy Transaction in Electricity Supply Industry
Azriyenni Azhari	Investigating Alarm Processing Characteristics in Power System Fault Using Intelligent Techniques
Herlanda Windiarti	Development of an On-Line and Intelligent Energy Saving Scheme for a Commercial Building
Mohd Redzuan Ahmad	Static and Dynamic Impacts of Three to Six Phase Conversion of Selected Transmission Lines in an Electric Energy System
Nge Chee Lim	Improved Cycloconverter Type HF Link Inverter with Soft-Switching Control
Nurul Aishah Idris	Performance of Soil Under High/Current Impulse
Ong Lai Mun	Studies on Performance of Different Configuration of Franklin Air Terminals
Singit Anang Sulisyanto	Penentuan Kehilangan Kuasa Menggunakan Sistem Bil dan Sistem Maklumat Pelanggan Untuk Meningkatkan Kualiti Kuasa
Tan Perng Cheng	A New Single-Phase Two-Wire Hybrid Active Power Filter Using Extension p-q Theorem for Photovoltaic Application
Toh Chuen Ling	Implementing Direct Torque Control (DTC) of Induction Machines Utilizing Digital Signal Processor (DSP) and Field Programmable Gate Arrays (FPGA)
Toh Leong Soon	A Digital Controller For Bidirectional High-Frequency Link Photovoltaic Inverter
Zalizah Poniran	Life Assessment of Power Transformer Via Paper Ageing Analysis

AWARDS

Faculty of Electrical Engineering, UTM

UTM Vice Chancellor Publication Award, awarded by UTM for excellence in publication, Universiti Teknologi Malaysia, 1 September 2004.

Prof. Dr. Abu Bakar Mohamad

UTM Research Award, awarded by UTM for excellence in research, Universiti Teknologi Malaysia, 1 September 2004.

Prof. Dr. Abu Bakar Mohamad & Assoc. Prof. Dr. Abu Sahmah Mohd. Supaat

Gold Medal, International Exhibition of Invention, New Techniques and Products for the project “Thermooptic Photonic Switch”, Geneva, Switzerland, 30 March–4 April 2004.

Assoc. Prof. Dr. Abu Khari A’ain

Intel Cash Grant (RM 158,400.00), awarded by Intel Malaysia for excellence in research ‘Intel-UTM Design’.

Prof. Dr. Marzuki Khalid

Silver Medal, International Exhibition of Invention, New Techniques and Products, Geneva, Switzerland, 30 March-4 April 2004.

Prof. Dr. Mohamed Khalil Hj. Mohd Hani

Silver Medal, International Exhibition-Ideas-Invention-New Products (IENA) 2004 for the project “Public Key Infrastructure (PKI) System–On-A-Chip: A Crypto-Processor Microchip Prototype For Next Generation Smartcards and IT Security”, Nuremberg, Germany, 28-31 October 2004.

Prof. Dr. Mohamed Khalil Hj. Mohd Hani

Gold Medal, INATEX 2004 for the project “Public Key Infrastructure (PKI) System–On-A-Chip: A Crypto-Processor Microchip Prototype For Next Generation Smartcards and IT Security”, UTM, 2004.

Prof. Dr. Shamsudin Hj. Mohd Amin & UTM Robocon Team

National Champion, Best Technology Award and ABU prize at National Robotics Contest 2004 (Robocon 2004 – Reunion of Separated Lovers), Kuala Lumpur, May 2004.

Prof. Dr. Shamsudin Hj. Mohd Amin & UTM Robofest Team

Champion and Runners-Up, Pole Climbing Robot Competition, Robofest 2004, MegaMall MidValley.

Champion, Partner Robot Competition, Robofest 2004, MegaMall MidValley.

Champion, Robot Grab Competition, Robofest 2004, MegaMall MidValley.

Runners-Up, Survival Robot Competition, Robofest 2004, MegaMall MidValley.

Prof. Dr. Tharek Abd. Rahman

Silver Medal, Expo Science, Technology and Innovation 2004 for the project “Small Aperture Radial Waveguide Slot Array Antenna for Indoor Wireless Local Area Network”, Kuala Lumpur, 27-29 August 2004.

Prof. Dr. Tharek Abd. Rahman

Silver Medal, Seoul International Invention Fair 2004 (SIIF 2004) for the project “Radial Waveguide Slot Antenna for Indoor Wireless Local Area Network”, Seoul, South Korea, 10-14 December 2004.

Prof. Dr. Tharek Abd. Rahman

Gold Medal, INPEX2004, USA for the project “Flat antenna for point to point microwave link”, USA, 2004.

Assoc. Prof. Dr. Zainal Salam & Junaidi Abdul Aziz

Third Prize in National Journal Category awarded by Universiti Teknologi Malaysia for the paper “Harmonic Analysis of a Five Level Cascaded Inverter Under a New Modulation Scheme” published in *Jurnal Teknologi* (No. 38D, June 2003, pp. 79-102), 1 September 2004.

Zuwairie Ibrahim

Session Best Presentation Award, Joint 2nd International Conference on Soft Computing and Intelligent Systems and 5th International Symposium on Advanced Intelligent Systems (SCIS & ISIS2004), Keio University, Yokohama, Japan, 21-24 September 2004.

Zuwairie Ibrahim

IEEE Neural Network Society Walter J. Karplus Summer Research Grant 2004, for a Research Visit at DNA Computing Lab, Hokkaido University, Sapporo, Japan.

Zuwairie Ibrahim

Student Paper Award, for the paper “Solving Unconstraint Assignment Problem by a Molecular-Based Computing Algorithm” presented at 2004 IEEE International Symposium on Industrial Electronics (ISIE2004).