



**Universiti
Malaysia
PAHANG**

Engineering • Technology • Creativity

**LAPORAN PEMBENTANGAN KERTAS
KERJA PENYELIDIKAN DI The 3rd
International Conference on Underwater System
Technology:
Theory and Applications 2010 (USYS'10)**

Cyberjaya, Malaysia

1-2 November 2010

Laporan disediakan oleh:

Muhammad Salihin Saealal

**FAKULTI KEJURUTERAAN ELEKTRIK DAN
ELEKTRONIK**

JADUAL PERJALANAN

1 Nov 2010

09:00 am- 13:00 am : Perjalanan dari Pekan ke Oriental Crystal Hotel di Kajang Selangor

2 Nov 2010

08:30 am-09:00 am : Perjalanan dari Oriental Crystal Hotel ke Cyberview Lodge Resort

09:30 am-10:00 am : Proses pendaftaran dan ketibaan peserta

10:30 am – 17:00 pm : Persidangan berlangsung

17:00 pm – 17:30 pm : Perjalanan pulang ke Oriental Crystal Hotel

3 Nov 2010

11:00 am – 15:00 pm : Perjalanan dari Oriental Crystal Hotel di Kajang Selangor ke Pekan

ABSTRAK KERTAS KERJA YANG DIBENTANGKAN

Kertas Kerja

Tajuk : Robust Feed-forward Schemes for Pitch Angle Control of Unmanned Underwater Vehicle

Pembentang : Muhammad Salihin Saealal

Abstrak :

This paper presents investigations into the development of robust feed-forward control schemes for pitch angle control of an unmanned underwater vehicle system. A linear model of unmanned underwater vehicle system is considered and the dynamic of the system is derived using the Newton-Euler formulation. An unshaped bang-bang force input is used to determine the characteristic parameters of the system for design and evaluation of the feed-forward control techniques. Feed-forward control schemes based on input shaping and filtering techniques are to be examined. The proposed techniques are designed based on the properties of the system for pitch angle control. Simulation results of the response of the unmanned underwater vehicle system to the shaped inputs are presented in time and frequency domains. Performances of the control schemes are examined in terms of pitch angle reduction and time response specifications. Moreover, the robustness of the feed-forward control schemes is discussed. Finally, a comparative assessment of the proposed control techniques is presented and discussed.

RINGKASAN LAPORAN PERJALANAN PERSIDANGAN ICCAS 2010

Persidangan International Conference on Underwater System Technology: Theory and Applications 2010 (USYS'10) telah diadakan pada 1 hingga 2 November 2010 bertempat di Cyberjaya, Malaysia. Persidangan ini dianjurkan oleh School of Electrical and Electronic Engineering, Universiti Sains Malaysia (USM) dengan anjuran bersama oleh National Oceanography Directorate. Persidangan ini telah melibatkan Institut Teknologi Bandung, National University of Singapore, Nanyang Technology University sebagai co-organizer.



USYS'10 merangkumi spektrum yang luas wilayah kajian teknologi sistem bawah air. Persidangan ini menyambut asli, pengajian tidak diterbitkan untuk persembahan oral atau poster. Peserta telah diletakkan dalam kumpulan tema Control Systems dan telah membentangkan kertas kerja dalam sesi teknikal CS20.

Seramai enam penceramah utama telah diundang untuk menyampaikan topik masing-masing semasa persidangan ini. Maklumat topik-topik yang disampaikan adalah seperti berikut:

Penceramah 1: Captain Mohd Zahari (ZAC) Hj Jamian

Title: Science and Global Security – The Paradox of Manipulators and Whistleblowers

The issue of climate change has a priority agenda for Malaysia . As recently mentioned by the Malaysia 's Prime Minister over the igem Conference, it is still the case despite global financial crisis. Among others, strategists and scientists around the world are looking into ways of achieving global climate sustainability. While efforts are being made to instill awareness among global communities, building and sharing capacities, and investing huge capitals to turn into long-term benefits, unfortunately the latter turns out scarce and illusory. Some activists and scientists continue to deploy scare tactics - equating for example climate changes as nuclear holocausts. Security and safety of countries are being swayed in a spectrum of vague resolutions and possibilities. As much as sciences have predicted point of no return in the world's destruction, they also suggests the way ahead that if not properly understood, may trigger critical actions by Governments, which will impact national security. The presenter attempts to highlight the paradoxes and invite the audience to share views on the direct and indirect impacts of science to security.

Penceramah 2: **Professor Shigeo Hirose**

Biologically Inspired Robots: Snake-like, Spider-like Robots

Mother Nature is precious source of imagination to develop new type of robotic system. I was inspired by the motion of snake in 1971 and since then I have been studying and developing several types of snake-like robots. I will introduce the history of designing a series of snake-like robots including amphibious model ACM R-5 which made 3D swimming in water, and rescue robot Souryu V which can crawl into the debris of clasped building after the bid earthquake. I also talk about snake-like multi-joint arms including, soft grippers which softly grasp arbitrary shaped objects, and weight balancing multi-joint arm which is already installed in the assembly line of automobile industry. In 1976, I was interested in the spider and since then developing walking robots. I will introduce our on-going research of quadruped walking robot, including wheel-walking hybrid vehicle Roller Walker, Wall climbing quadruped Ninja, and 7 ton world largest walking robot for steep slope construction task.

Penceramah 3: **Dr. Bala P. Amavasa**

Swarm Robot Systems

Traditional robotics depend on building as much functionality as possible into single platforms. In mission critical systems, a failure in one part of the system can lead to an overall system failure. Unlike conventional robotic system, swarm robots have inherent in-built redundancies due to the large number of robots in the population. Swarm robotics is inspired by social insects, where local interactions lead to emergent behaviour. Each

robot in a swarm system is simple and is only able to interact locally. Combining low-level agent expertise, a variety of behaviours may emerge. The purpose of this talk is highlight latest research in the area of swarming, and how they may be used in various areas of robotics.

Penceramah 4: Professor P.A.Wilson

Underwater Vehicle Technology: The European Project (FREESUB)

There are many unresolved scientific questions and equally many major strategic economic and social development needs from an exploration of the seas around Europe. There is a pressing need for the development of advanced technologies to explore and exploit in a consistent and better manner the vastness of the oceans of the world. Intervention Autonomous Underwater vehicles (I-AUV) have shown their potential for the acquisition of marine data at extremely large scales and for the direct intervention in underwater structures without the need for constant human interaction and supervision. Part of the technology required for their development has proven to be feasible. An increased effort has furthered the advances already made in the technology and made the results more accessible to a wider range of commercial and scientific end users. To this end it was necessary to create a critical mass of young researchers capable of bridging the gap between marine technology and science. To achieve this FREESUBNET explored a set of applications with intervention requirements thus allowing the focus of the research to be in the fields of Marine Science, Inspection of Wrecks & Archaeology, assessment of Energy systems and multi-disciplinary applications in Marine Science. In this context,

the network studied novel concepts of IAUV' leading to the identification and the development of the technologies needed to fulfil these tasks. The techniques for navigation, autonomous underwater telemanipulation, vehicle control and mission management technologies. FREESubNET aimed to meet its goals by establishing an international network of technology developers as well as being inter-sectorial and deliver the technology to end-users from different and diverse disciplines.

Penceramah 5: Emeritus Professor John Douglas Penrose

Marine Acoustics – recent developments in the Indian Ocean region

This presentation will review a number of recent marine acoustics programs in the Indian Ocean region, many of which have been carried out at the Centre for Marine Science and Technology (CMST) at Curtin University of Technology, Perth, Western Australia.

Relatively high frequency active acoustic techniques have developed from single beam systems for bathymetric and fisheries biomass applications to multibeam and related systems. A number of multibeam habitat assessment projects have been completed in Australian waters and some progress has been made in using multibeam techniques in fisheries assessment.

Passive acoustic techniques have recently developed strongly in the region. Around the Australian coast the Australian Integrated Marine Observing System (IMOS) includes a number of CMST developed listening stations. A key feature of this work is the

developing understanding of the variety and range of acoustic outputs from marine life. At lower frequencies, and using deep sound channel propagation pathways, it has been possible to track the propagation of the seismic disturbance which resulted in the 2004 tsunami off the Indonesian coast. Antarctic ice cracking events have been recorded, at a deep station off the Western Australian coast, and their sites of origin located. This has led to an understanding of the statistics of ice cracking over a number of years.

Penceramah 6: **Dr Pablo Valdivia y Alvarado**

A Soft Body Under-actuated Approach to Multi Degree of Freedom Biomimetic Robots

Work on robotic devices capable of mimicking different biological locomotion features has been fueled by the potential payoff of superior performance. One of the main challenges when mimicking biological creatures is to replicate their complex body kinematics with simple and practical devices. A methodology to design and prototype soft body under-actuated biomimetic robots by determining appropriate material property distributions will be discussed. When excited, flexible bodies with proper anisotropic material distributions can display modes of vibration that mimic required locomotion kinematics and require minimal actuation. This methodology shows great promise for developing simple, robust, and inexpensive mobile robots that can efficiently accomplish locomotion. Underwater locomotion and other examples will be discussed.

Secara keseluruhannya, perjalanan persidangan adalah lancar dan memuaskan. Banyak maklumat dan input yang telah kami perolehi hasil daripada persidangan ini. Antaranya adalah bagaimana institusi lain yang telah bergerak maju hadapan dalam memastikan kualiti program akademik yang ditawarkan mereka adalah sentiasa menepati kehendak pasaran melalui penekanan kepada enterprenuership dan sebagainya. Selain daripada itu, maklum balas yang kami terima daripada peserta-peserta lain sedikit sebanyak dapat membantu kami untuk meningkatkan lagi mutu kualiti penyelidikan yang dijalankan.