Assisted Aged Care Technology Workshop

School of Engineering and Advanced Technology, Nursing
Programme of School of Health and Social Services

Massey University, Wellington

Programme and Abstracts

Programme of Assisted Aged Care Technology Workshop

9:30am to 3:30pm, Executive Suite 5B14, 18th January, 2011

Chairperson: Dr Rose Davies

Annette Huntington /Gurvinder Virk	Opening	9:30 am
Roger Bostelman	NIST's Work in Assistive Technologies for Elderly Care	9:40 am
Subhas Mukhopadhyay	Assistive Technologies for managing home environment	10:00 am
Lindsay Brazendale	Intelligent Laundry sorting system for rest homes	10:20 am
Tea Break		10:40 am
Subhas Mukhopadhyay	Selective Activity Monitoring of elderly people in a smart digital home	10:55 am
Wyatt Page	Technology for learning to hear better as our hearing declines	11:15 am
Iain Emerson	Development of a robotic rehabilitation system for stroke utilising mirror therapy	11:35 am
Austin Boyle	Electric Moped for a Wheelchair User	11:55 am
Lunch		12:15 pm
Group Discussion	Questions/Answers/comments	1:15 pm
Summary Annette/Official		3:00 pm
Close		3:15 pm

NIST's Work in Assistive Technologies for Elderly Care

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This talk will provide statistics of the elderly population, caregivers, and nurses. Organizational information about NIST will be presented along with examples of calibration/traceability and performance measurements of hearing aids and hip surgery, respectively. An extensive discussion will follow describing the NIST Home Lift Position and Rehabilitation (HLPR) Chair showing the method of Survey → Prototype → Test → Recommend. Focus on potential elderly users will be included providing discussion on intelligent HLPR Chair control, stability tests and recommendations to standards overlapping manufacturing and healthcare industries. Information about NIST support for wearable, exoskeleton and prosthetic, robots will conclude the presentation.

Assistive Technologies for managing home environment

A/ Professor Subhas Mukhopadhyay

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A few topics on the application of different assistive technologies will be presented in the seminar:

Zigbee Based Wireless Physiological Monitoring System
A wearable device has been developed to monitor physiological parameters (such as temperature, heart rate, fall) of a human subject. The system consists of an electronic device which is worn on the wrist and finger, by an elderly or at-risk person. The system can be used by normal person as well for the monitoring of physiological parameters. Using several sensors to measure different vital signs, the person is wirelessly monitored within his own home for a smart home. An accelerometer has been used to detect falls. The device can monitor the stressed condition of the person and sends an alarm to a receiver unit that is connected to a computer. This sets off an alarm, allowing help to be provided to the person. Since no vision sensors (camera or infra-red) are used, the system is non-invasive, respects privacy and will find wide acceptance. The system can be used in combination of the home monitoring system to monitor the person continuously.

Sensing System for Detection of Dangerous Marine Biotoxins in Seafood

A novel planar interdigital sensor based sensing system has been developed for detection of dangerous marine biotoxins in seafood. Our main objective is to sense the presence of dangerous contaminated acid in mussels and other seafoods. Initial studies were conducted with three peptide derivatives namely Sarcosin, Proline and Hydroxylproline. These three chemicals are structurally closely related to our target molecule. The proline molecule is arguably the most important amino acid in peptide conformation, contains the basic structural similarity to the domoic acid. Three novel interdigital sensors have been designed and fabricated. The initial results show that sensors respond very well to the chemicals and it is possible to discriminate the different chemicals from the output of the sensor. The outcomes from the experiments provide chances of opportunity for further research in developing a low cost miniature type of sensors for reliable sensing system for commercial use.

Sensors for non-invasive fat estimation in meat
Planar electromagnetic sensors are able to detect the presence of cracks, discontinuities, mechanical fatigue and many other imperfections without material damage. Planar electromagnetic sensors based approach of quality testing of pork belly cuts in a non-invasive and non-destructive way has been proposed. The sensor is of planar interdigital type. The response of the sensor indicates a good possibility of using this type of sensor for estimation of fat content in pork belly in a non-invasive way. The experimental results are reported. A new type of sensor with improved performance has been fabricated and developed.

Zigbee Based Monitoring of Distributed Solar Panel Networks
Design and development work of a wireless performance monitoring of distributed solar panel along with automated data logging has been carried out. The developed system is portable, simple and suitable for home environment. The system can be extended for wide range of solar cells for material research and development activities.

Intelligent Laundry Sorting System for Rest Homes

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Radio-frequency identification (RFID) and mechatronic technology has been applied to a laundry sorting system, which can be potentially used by rest homes in the future to reduce the labour intensity of care givers, to increase the efficiency of laundry sorting, and to reduce the chance of missing garments in rest homes. Several different types of RFID labels/tags have been considered and tested. A suitable RFID laundry tag was selected. The laundry tags have undergone endurance testing under actual washing/drying conditions with commercial laundry chemical products rest homes have used. An electronic/digital analysis system that is specialised to receive and process the signals from the tags under the laundry operation conditions has been investigated and designed. The initial results from this system in operation show that our signal detecting/processing system works precisely with a satisfactory response speed. This system will be demonstrated in our presentation.

A sorting strategy for implementation after laundry garment identification has been investigated. This strategy considers aspects of simplicity, multifunction and compactness of mechanical structure. Production of a prototype according to this strategy will be the next step of this research project.

Selective Activity Monitoring of elderly people in a smart digital home

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Design intricacies and implementation details of a wireless sensors network based safe home monitoring system targeted for the elder people to provide a safe, sound and secured living environment in the society is targeted in this research. The system is designed to support people who wish to live alone but, because of old age, ill health or disability, there is some risk in this, which worries their family or friends. The system works on the principle of using wireless sensor units (SU) to monitor the appliance throughout a house and detect when certain desired electrical as well as non-electrical appliances such as bed, toilet, water-use etc. are turned on or used. Rules are defined for appliances to turn on in certain time intervals. A central controller unit (CCU) queries the sensor units and logs the data into a PC at a pre-defined rate. Communication between the SUs and the controller is using radio-frequency wireless media. The rules inference engine runs on the PC and whenever the situation requires, sends a text message to the care-givers or relatives. Since no vision sensors (camera or infra-red) are used, the system is non-invasive, respects privacy and has found wide acceptance. The system is completely customizable, allowing the user to select which appliances to monitor and define exactly what is classified as unusual behaviour.

Technology for learning to hear better as our hearing declines

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Hearing (the auditory system) is the second sense to develop in the womb and at birth is the most developed of our senses. As our eyesight develops hearing tends to take a back-seat and by the time we are adults, our vision tends to dominate our everyday senses. For many people hearing declines as we age and at some stage hearing loss begins to becomes a significant barrier to social interaction. Neuro-plasticity (the ability of the human brain to change as a result of one's experience) in the adult human is a rather modern discovery but there is not good evidence to show that the adult brain can re-map itself. This talk explores the idea of using assistive technology to re-train the brain to maximise our ability to hear as our hearing declines.

Development of a robotic rehabilitation system for stroke utilising mirror therapy

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Stroke is a worldwide major cause of disability, through damage to the neural pathways in the brain of the sufferer. It results from a sudden disruption to the blood flow in the brain, either due to a blood clot or haemorrhage, the former being the most common. Current rehabilitation for stroke survivors is exercise based requiring physiotherapy, speech therapy and occupational therapy. It has been shown that intensive therapy as early as possible in the recovery of the patient improves the outcome of the rehabilitation process. This would not be feasible without automated interventions, because of a lack of the large amounts of human clinical resources required. This has resulted in alternative stroke therapy being a very active field of research worldwide in many different disciplines. This project focuses on the development of an automated stroke rehabilitation system combining robotic and mirror therapies.

The Mirror-Image Motion Enabler (MIME) and the MIT Manus projects are the most notable works in this area of research. These are of significance to our current work as the current project plans to build on these past projects.

A system is currently under development that combines both robotic rehabilitation and virtual mirror therapy. The system comprises of a small industrial robot (ABB robotics IRB120) utilised to manipulate the arm of the patient. The system also gives visual stimuli to the patient via a virtual mirror feedback system. The intention of the system is to provide a platform to test the effects of combining these different approaches and verify whether a significant improvement in the quality of rehabilitation can be achieved. It is expected that combining these approaches will result in greater improvements in motor recovery and spasticity than each individual approach.

Electric Moped for a Wheelchair User

Austin Boyle

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The product concept is a low cost, three wheel, electric moped for wheelchair users that would provide an independently operated short range transportation option at a price accessible within Ministry of Health funding. The vehicle is driven from within the wheelchair.

New Zealand has one of the highest per capita rate of people confined to wheelchairs. Wheelchair users can regularly require assistance to transport them short distances. Transferring from a wheelchair into a normal car seat or a mobility scooter can also be an uncomfortable task. New vehicles converted to be driven from within a wheelchair are very expensive. A 2006 Statistics NZ study showed that a large number of disabled adults had an unmet need for modifications to a vehicle so they could drive it, mainly due to cost.

In my project the system-level and mechanical design of a prototype was undertaken. The purpose of the project was to evaluate the technical feasibility of the product. The power requirements of a vehicle were analysed, verifying that a 2kW motor would be sufficient for this application which allows the vehicle to fit into the moped licence class.