Title: WSN and Assistive Technologies for Home Environment

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A few topics on the application of Wireless Sensors Network (WSN) and different assitive technologies will be presented in the seminar:

Wireless Sensors Network Based Home Monitoring for Elderly care

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 behavior.

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.

Sensing System based Pathogen detection in meat

Sensing system is planned to be developed to detect different dangerous pathogens in meat. The system will provide first hand information report of the existence of pathogen so that rigorous testing can be carried out in laboratory.

New planar electromagnetic sensor for detection of nitrates in natural water sources

A novel sensor based on the combination of meander and interdigital planar electromagnetic sensors has been developed for monitoring the level of contamination in water sources. A series of experiments was conducted to determine the sensors characteristics. Initial results show that the sensor can acceptably detect the presence of nitrate in any samples as shown from the calculation of complex relative permittivity. Furthermore, the sensor response seems to be independent of pH in the pH range of 2 and 9. Water samples taken from various sources and locations have been tested with the sensor and the results was compared with the results obtained using nuclear magnetic resonance (NMR) show a good correlation of the interdigital output with the total amount of organic materials where the ionic strength of the water sample was also estimated. The work and improvement are under consideration.

A short biography of Subhas Mukhopadhyay

Dr. Subhas Chandra Mukhopadhyay graduated from the Department of Electrical Engineering, Jadavpur University, Calcutta, India with a **Gold medal** and received the Master of Electrical Engineering degree from Indian Institute of Science, Bangalore, India. He has PhD (Eng.) degree from Jadavpur University, India and Doctor of Engineering degree from Kanazawa University, Japan.

Currently he is working as an Associate professor with the School of Engineering and Advanced Technology, Massey University, Palmerston North, New Zealand. He has over 20 years of teaching and research experiences.

His fields of interest include Sensors and Sensing Technology, Electromagnetics, control, electrical machines and numerical field calculation etc.

He has authored/co-authored over **240** papers in different international journals, conferences and book chapter. He has edited **nine** conference proceedings. He has also edited **eight** special issues of international journals as lead guest editor and **nine** books out of which **seven** are with Springer-Verlag.

He is a **Fellow** of IEEE (USA) and IEE (UK), an associate editor of IEEE Sensors journal and IEEE Transactions on Instrumentation and Measurements. He is in the editorial board of e-Journal on Non-Destructive Testing, Sensors and Transducers, Transactions on Systems, Signals and Devices (TSSD), Journal on the Patents on Electrical Engineering, Journal of Sensors. He s

the co-Editor-in-chief of the International Journal on Smart Sensing and Intelligent Systems (www.s2is.org). He is in the technical programme committee of IEEE Sensors conference, IEEE IMTC conference and IEEE DELTA conference and numerous other conferences. He was the Technical Programme Chair of ICARA 2004, ICARA 2006 and ICARA 2009. He was the General chair/co-chair of ICST 2005, ICST 2007, IEEE ROSE 2007, IEEE EPSA 2008, ICST 2008, IEEE Sensors 2008, ICST 2010, IEEE Sensors 2010. He has organized the IEEE Sensors conference 2009 at Christchurch, New Zealand during October 25 to 28, 2009 as General Chair.
He is the **Chair** of the IEEE Instrumentation and Measurement Society New Zealand Chapter.
He is a **Distinguished Lecturer** of the IEEE Sensors Council.