



## RESEARCH SEMINAR

### Cognitive Radio and Dynamic Spectrum Management in Wireless Communications

Sunil Maharaj, P.E., Ph.D.

SENTECH Chair in Broadband Wireless Multimedia Communications

Department of Electrical, Electronic and Computer Engineering, University of Pretoria, South Africa

15:00 – 16:30, Thursday, March 12, 2015

Room 150 at Science Building

#### Abstract

Cognitive radio (CR) has been proposed as a technology that is able to make efficient usage of the radio frequency spectrum through opportunistic and dynamic spectrum access. CRs rely on a process, known as spectrum sensing (SS), to gather information about the radio environment in which they wish to operate. This information allows them to make use of appropriate spectrum resources and also helps them to avoid interference with other users of the spectrum. However, the accuracy of this information is of paramount importance since inaccurate data could negatively impact upon the performance of a CR network (CRN). One of the problems associated with SS is the hidden node problem, where due to severe shadowing or multipath fading, it is often not possible for a single sensing node to obtain accurate results. Cooperation between multiple sensing nodes may thus be employed to obtain more accurate SS decisions. Energy efficiency in cognitive radio networks (CRN) is of paramount importance since secondary users (SU) are often likely to be energy constrained. While spectrum sensing (SS) is a critical CRN function, repetitive SS events can significantly reduce the battery life of sensing devices. However, energy efficiency can be improved by employing spectrum opportunity forecasting (SOF) and optimal scheduling for sensor node activation to reduce the required number of SS events. In this presentation, a combination of SOF and optimal scheduling is thus explored. The application of SOF to cooperative SS is one of the unique contributions we have undertaken. Results indicated that this combination could significantly reduce sensor node energy consumption and in so doing increase CRN lifetime. The presentation will also cover the Spectrum Sensing measurement campaign done in South Africa and the opportunities in TVWS for future wireless communications such as for Rural Communications using Dynamic Spectrum Management for Long Range Wi-Fi Rural Broadband.

#### Biography



**Dr. Sunil (BT) Maharaj** is a Full Professor, holder of SENTECH Chair in Broadband Wireless Multimedia Communications (BWMC) in the Department of Electrical, Electronic and Computer and Dean of Engineering in the Faculty of Engineering, Built Environment and Information Technology at the University of Pretoria in South Africa. His research area is in OFDM technology, PAPR mitigation approaches and Cognitive Radio Systems. He has a Masters in Electronic Engineering from the University of Natal, South Africa, a MSc in Operational Telecommunications from Coventry University, UK and PhD in Electronic Engineering from the University of Pretoria. Dr Maharaj is a registered Professional Engineer, MIEEE and Fellow of the South African Academy of Engineering. He has published many IEEE conference papers and ISI journal articles and has spent a sabbatical working on MIMO Channel Modeling at Brigham Young University, Utah, USA. He has won a few best paper

awards and also the 2013 Department of Trade and Industry Award for his broadband wireless communications research in the category of Advanced High-Tech. Dr Maharaj worked in industry as a Microwave and RF Design Engineer for 3 years before joining academia in 1992. He is the IEEE South Africa ComSoc Chapter Chair and was responsible for arranging various conferences and was the Conference Operations Chair for the IEEE ICC Conference in South Africa which was held in 2010.