2012 Fourth Year Student Project Topics

Development of Wireless Video Applications on Android Based Systems in Home Area Networks

Real-time video communication is an essential component of a home area network (HAN). Typical applications include home security, baby monitoring, aged care and so on. Most of existing products in these areas are based on proprietary hardware. As smart mobile devices, such as smart phones and tablets, are increasingly gaining popularity among people across a wide range of age groups, using the smart mobile devices as wireless user terminals of the HAN video communications can be both cost effective and convenient. In this project, students will develop applications (Apps) that run on Android based mobile phones and tablets. The Apps will enable the mobile devices to communicate with a gateway device in a HAN with either a WiFi connection or a 3G connection. The Apps should have well designed graphic user interface (GUI) that enable two way communications between end users and the gateway. The end user should see the videos captured and sent by the gateway device. At the same time, the user can send commands to the gateway in response to warning alerts. Android system is a Linux kernel based system with Java programming language. So students doing this project need to be familiar with Java programming and have working knowledge on software debugging in a hardware platform. Familiarity with Linux and network programming is a definite advantage.  
Required students: 2

Development of DVB-S2 Satellite Receiver on Software Radio Platform

DVB-S2 is the new standard for Satellite Television Broadcasting. It adopts many new technologies developed in the past decade in order to achieve better spectral efficiency, reliability and service variety. Nowadays, satellite transponders are gradually transiting from the old DVB-S standard to DVB-S2. For example, on Optus D1 satellite there are four DVB-S2 transponders. Software radio is a new technology that attempts to implement as much signal processing as possible in software instead of hardware. By doing that, it provides system flexibility, upgradability and versatility. For instance, upgrading from DVB-S to DVB-S2 only needs a software reloading. Another extreme example is that a universal wireless device can be developed based on software radio, which can act as any wireless terminal, say a cellular phone, a television receiver, a satellite phone, a GPS receiver, etc., given an appropriate software downloading. In this project, students will develop a DVB-S2 satellite receiver on a software radio platform, universal software radio peripheral (USRP). The basic functions to be implemented include 8-PSK demodulator (timing, carrier frequency and phase recovery), low density parity check (LDPC) decoder and BCH decoder. The software framework is GnuRadio, in which modules are written in C++ while modules are connected using Python programming language. So students need to be familiar with C++ programming and some script language. In addition understanding of wireless communication principles is a necessary prerequisite. Passion in learning new wireless technology, such as LDPC coding, is a necessity.  
Required students: 2

Implementation of LTE Transceiver (Physical Layer) on Software Radio Platform

Long term evolution (LTE) is one of the 4G wireless communication standards that many operators are starting to roll off all over the world. In Australia, Telstra launched its LTE mobile network late September this year. LTE physical layer includes many new technologies
developed in the past decade, such as MIMO, OFDMA, SC-FDMA, Adaptive Modulation and Coding, etc. In this project, students will implement the key modules of an LTE transceiver on a software radio platform, universal software radio peripheral (USRP). The software framework is GnuRadio, in which modules are written in C++ while modules are connected using Python programming language. So students need to be familiar with C++ programming and some script language. In addition understanding of wireless communication principles is a necessary prerequisite. Passion in learning new wireless technology, such as MIMO, OFDM, is a necessity.

Required students: 2

**Software Radio Based Testbed for Physical Layer Network Coding**

Physical layer network coding is a new technology in wireless communications that can improve the throughput of wireless relay networks. However, most of research work is based on theoretical derivation and simulations. Development of a testbed for physical layer network coding is necessary to verify the performance of the new technology in realistic wireless platforms. In this project, students will develop a testbed on a software radio platform, universal software radio peripheral (USRP). The software framework is GnuRadio, in which modules are written in C++ while modules are connected using Python programming language. So students need to be familiar with C++ programming and some script language. In addition understanding of wireless communication principles is a necessary prerequisite. Passion in learning new wireless technology is a necessity.

Required students: 2