Title: Development of hand-held devices based on Zigbee or WiFi signals to see through walls

In this project, we aim to develop a low cost X-ray vision wireless hand-held device. The developed hand-held device can be used to see through walls to track moving human bodies. The technique would be based on a concept similar to radar and sonar imaging, instead of using high power signal, this one would use low power Wi-Fi or ZigBee signals to track the movement of people behind walls and closed doors. When a Wi-Fi or ZigBee signal is transmitted towards a wall, due to the absorbing property of the walls, only a small part of the signal can be penetrated through the wall and can be reflected back when the signal reaches any objects that happen to be moving around in the other room. Based on the reflected signal, we can detect the moving objects.

Supervisor: Zihuai Lin and Branka Vucetic. Email: zihuai.lin@sydney.edu.au

Requirements: up to 3 students are required for this project. The students participating in this project should have good knowledge on wireless local area networks and wireless sensor networks. Matlab and C++ programming skills are essential.

Title: Precise Indoor Positioning based on moving Robots or Unmanned Aviation Vehicles (UAV) and UWB/Zigbee/WiFi techniques

Recently, indoor positioning is attracting considerable attention from both research and industry. Logistics, health-care applications, search and rescue, military services, tracking of objects and people, gaming and entertainment are a few examples of applications which can benefit from having precise localization information. However, in indoor environments, traditional services provided by e.g. GPS usually are not available, unreliable or inaccurate. For this reason, alternative solutions need to be developed. In this project, we aim to using Ultra-Wideband (UWB)/Zigbee/WiFi techniques and/or moving robots to realize precise indoor positioning.

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Requirements: up to 2 students are required for this project. The students participating in this project should have good knowledge on wireless sensor networks, communication theory and signal processing. Matlab and C++ programming skills are essential.

Title: 3-D Video Coding

With its dazzling 3-D effects, Avatar created a worldwide phenomenon in 2009 that ushered in a new era of 3-D video technology. The even more ambitious goal of delivering rich 3-D experience to mobile users anytime and anywhere has become increasingly attractive and technologically feasible. In this project, we aim to address this emerging topic of 3-D video delivery to mobile users using an unequal error protection (UEP) rateless codes-based application-layer forward error correction paradigm. The new UEP-rateless codes have the advantage of providing stronger
protection to more important parts of 3-D video, achieve improved bandwidth efficiency irrespective of the channel erasure rate, and feature low-complexity implementation.

**Supervisor:** Zihuai Lin and Branka Vucetic. Email: zihuai.lin@sydney.edu.au

**Requirements:** up to 2 students are required for this project. The students participating in this project should have good knowledge on communication theory and signal processing. Matlab and C++ programming skills are essential. The students with average marks above 75 are preferred.

**Title: Joint Network Source Channel Coding for Future Cellular Networks**

With explosive growth of wireless networks and the Internet, network resource utilization becomes one of the critical design issues. Network coding has emerged as a promising tool for the design of next generation communication networks. There is a need to develop systematic design of network coding techniques for real wireless energy efficient networks. In this project, we plan to systematically design joint network source channel coding mechanisms for cellular networks and related signal processing algorithms, as well as demonstrate the feasibility and benefits of integrating the developed network coding schemes into practical systems. The research outcomes are likely to result in significant improvements in network performance

**Supervisor:** Zihuai Lin and Branka Vucetic. Email: zihuai.lin@sydney.edu.au

**Requirements:** up to 2 students are required for this project. The students participating in this project should have good knowledge on wireless cellular networks, communication theory and signal processing. Matlab and C++ programming skills are essential. The students with average marks above 75 are preferred.

**Title: Smart home application**

In this project, you are asked to design a smart home system. The basic function is that one can remotely control smart appliance at home from your office or vice versa. The project contains six sub-projects: (1) Mobile phone APP development based on Android system. Here you need to develop an APP for Android system, the basic function is that you can use the APP control the smart devices, such as, the air-conditioning, light, etc. (2) Mobile phone APP development based on iOS system. Similar to the first project, now the platform is changed to iOS, the APP is particular for iphone, ipad, etc. (3) Computer based user interface. One can send a command through computer interface to control the devices at home. The above three subprojects are highly related. (4) Smart gateway development. Here you will be required to develop a gateway, which can integrate Zigbee signal and the WiFi signal together, so that the command via the mobile phone app or the computer interface can control both camera and the smart devices, such as light, etc. (5) Constructing a Zigbee network at home. In this project, you need to construct a Zigbee network at home, you need to construct a mesh network, also you need to develop an equipment which can control the light through Zigbee signalling. (6) Zigbee IP stack
investigation. In this project, you need to do some further investigation of the advanced Zigbee stack.

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**Requirements:** up to 4 students are required for this project. The students participating in this project should have good knowledge on wireless sensor networks, communication theory and signal processing. Matlab and C++ programming skills are essential.