Senior Design Project Proposal
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1. Project Title: uBALANCE: Balance monitoring and alerting system for elderly

2. Project Description:

Falls are the most common cause for elderly people being forced to transition from independent living to assisted care. Hence, rapid medical intervention or prediction of falls in order to reduce fall rates is very important.

The project will involve the design of a three accelerometer-based sensors body wireless network for balance monitoring to be used indoors or outdoors. Two of the sensors will be attached to the two legs while the third sensor will be attached to the upper body. The sensors will communicate with a gateway connected to a server (laptop or PC for indoors or a cell-phone for outdoors) which will run specialized algorithms to identify the vertical or horizontal position of the subject. In situations when unexpected horizontal orientations are detected an alert signal will be transmitted under the form of a phone call or e-mail over the internet to a command center. If time will be permitting, we will enhance the system for even more complex processing for gait analysis and fall risk evaluation.

3. Project Design Objectives:

The following are the main steps.

1. The design of a three node low-power wireless network. In this step we will design a test circuit board equipped basically with an accelerometer-based sensor. The board will also host a transceiver for communication with the main base (gateway node) and possibly other sensor nodes. The gateway node may be also designed and implemented or a commercial one will be used. It will be connected to the main computer via the USB.

2. The development and implementation of intelligent algorithms for subject orientation identification. The main computer that is attached to the network's gateway will be responsible with collecting and storing data as well as with running these algorithms.

3. Once both the hardware and software start working together, we will test the system on a real subject.

4. Maintain a project website.

4. Project Prerequisites:

Some experience with programming in C/C++. Basics of signal processing and communication. Knowledge of Matlab would be a plus.

Most importantly, students should be self-motivated to learn new interdisciplinary approaches that bridge knowledge and skills from electronics, wireless communication, signal processing, and programming.