Wearable Gait Analysis Sensor for Fall Detection

***ECE 4220 – Project Proposal***

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Introduction

Falling is a common and potentially life threatening problem that faces many elderly people. Consequences of falling can include a broken hip, head or spine trauma, and even death. Many elderly people do not remember if they have fallen or are simply unwilling to admit they have due to fear of losing their independence. This project implements a way of detecting poor walking habits in elderly and works toward preventing future falls from occurring. By placing multiple sensors around the waist, gait, balance, and velocity can be measured and analyzed in order to determine whether or not the user is at risk of falling. This device records waking habits and provides a history for doctors and health professionals in order to prevent unknown falls from occurring.

For this project I plan to develop software for a real-time system to detect the fall of the user. The software will have the combination of the hardware that get the data from the accelerometer and filter by the low pass filter. The module will compose of ts7250 board, a breadboard a, a buzzer , several resisters and low pass filter.

This project will contain several real-time knowledge we discussed in class, including muti-thread programming, real-time scheduling of critical tasks, and data/resource control using mutexs and semaphores. By using real time operating system, we can ensure the priority level and ensure that we the people falls , the buzzer will be automatically sound. And the whole device and whole task will be done under certain amount of time limit.

Functional Block Diagram

In order to determine the different assemblies needed for this device a functional block diagram, shown in Figure 1, was created. Each assembly represents a physical component of the device. The Process Control manages each of the detectors and vibrational devices. It is important to note that the two important functions of this Unit is to gather information on the user’s gait and alert the user in the case of a dangerous fall.

The Gait Detection assembly provides information on the user’s walking patterns to the process control which will then send a vibrational notification back to the user if their walking patterns are below a certain level of safeness. If the subject begins to fall, the Fall Detection assembly is triggered which notifies the Process control to send out an alarm using the Audio Emergency Alert assembly. The communications link sends all of the data collected by the Gait Detection assembly to the Database unit.

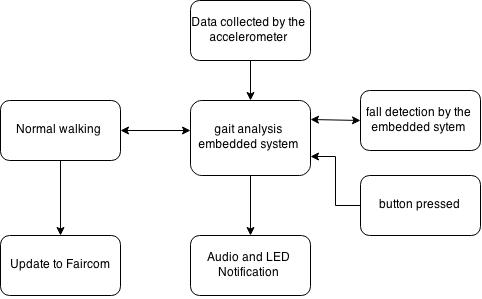
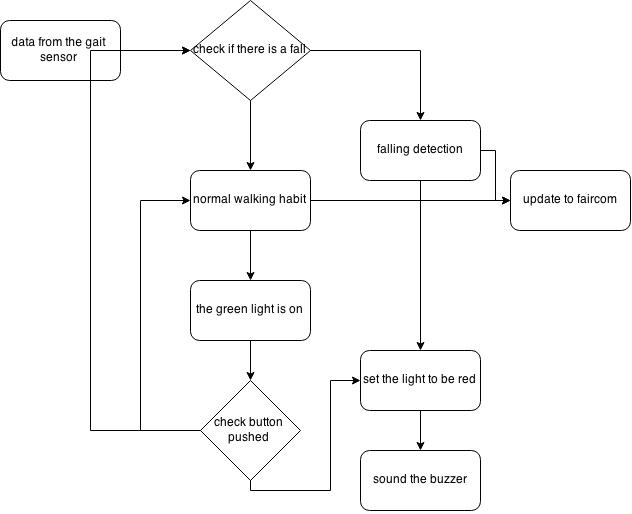


Figure : Functional Block Diagram

# Hardware

The hardware is composed of a battery, a buzzer, the 7250 board the filter, several resisters and the LED light. When the fall is detected by the processor, the light will turn to red and the buzzer will sound.

# Software

**In this software, I plan to use faircom to update the data. The gait accelerometer will get the filtered data from the hardware part. I will set a real time periodic real time task to check if there is a fall and whether the user is pressing the button if they feel any uncomfort. If the fall is detected, due to I set the falling task to be the highest priority, the program will execute the falling task first and it will automatically sound the buzzer and turn on the red light. After all the data processing the data will automatically restore and update in the faircom.