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Course: SOFE4610U: Design and Analysis of IoT Software CRN 44430

Project Proposal

**Topic: Fall Detection for the Physically Impaired**

Due Date: Oct 20th, 2021 11:59pm

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Fall monitor is an automatic fall detection system that enables health and safety officers to attend to the elderly, disabled and other citizens, if a fall occurs and no motion is detected. Fall detection systems focused on developing a fall detection device using wearable sensors that can be integrated into watches, shoes, belts, etc. to detect if a fall has occurred. The device uses an accelerometer along with a tilt sensor to track any changes in a person’s acceleration and position. The performance metric of fall detection systems includes precision like true positive, true negative, false positive rate. When it detects too fast of an acceleration or no motion for a long period after a fall, it sends out a signal to the health and safety officers. It uses a cellular modem and the built-in GPS system or in a nursing home an MQTT server coupled with Wifi to track where the client is, and sends a call for the client's medical information. The fall monitor will contain safety measures and emergency protocols that are required in case of a fall. An ideal device must be easy to navigate from the stage of activation by senior citizens and people with disabilities, so a simple interface must be used in the development process.

Functional Requirements:

1. Device is able to detect when a fall occurs, using a motion sensor

* Fall detection accuracy should be 95% or higher
* An accelerometer in conjunction with a tilt sensor
* Call should be placed to emergency services within 15 seconds of fall detection
* The call should be handled by a server

1. Cloud server databases should automatically update the fallen users record, when a fall event occurs. We will likely be using an MQTT server for this and the devices would be treated as clients
2. Devices should be able to read some of the vital signs of the patient i.e. heart rate, blood pressure, blood oxygen saturation, temperature, posture and physical activities. This will be achieved through the sensors that come with the Osoyoo kit

Non-functional Requirements:

1. Devices come in the form of wearable sensors that can be integrated into watches, shoes, belts etc.
2. The system also includes the design and evaluation of user interfaces such as smartphone applications for fall prevention intervention and educating subjects on fall risk factors.
3. Should be easily deployable for widespread implementation in nursing homes and care centers

In terms of timeline, the prototype by mid November will include most functionality implemented but not to accuriances/performance metric standards. If time permits more functionality can be added like monitoring heart rate and body temperature. By the beginning of November, the prototype will include all functionality implemented to all accuracy/performance standards. Testing will start by the first week of December.