ABSTRACT

DEVELOPMENT OF A WIRELESS MOBILE COMPUTING PLATFORM FOR FALL RISK PREDICTION

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Falls are a major health risk with which the elderly and disabled must contend. Scientific research on smartphone-based gait detection systems using the Internet of Things (IoT) has recently become an important component in monitoring injuries due to these falls. Analysis of human gait for detecting falls is the subject of many research projects. Progress in these systems, the capabilities of smartphones, and the IoT are enabling the advancement of sophisticated mobile computing applications that detect falls after they have occurred. This detection has been the focus of most fall-related research; however, ensuring preventive measures that predict a fall is the goal of this health monitoring system. By performing a thorough investigation of existing systems and using predictive analytics, we built a novel mobile application/system that uses smartphone and smart-shoe sensors to predict and alert the user of fall before it happens. The major focus of this dissertation has been to develop and implement this unique system to help predict the risk of falls. We used built-in sensors --accelerometer and gyroscope-- in smartphones and a sensor embedded smart-shoe. The smart-shoe contains four pressure sensors with a Wi-Fi communication module to unobtrusively collect data. The interactions between these sensors and the user resulted in distinct challenges for this research while also creating new performance goals based on the unique characteristics of this system. In addition to providing an exciting new tool for fall prediction, this work will make several contributions to current and future generation mobile computing research.