ABSTRACT

Elderly individuals, aged 60 and above, experience various declines in their physical abilities, one of which is the decreased capacity to maintain an upright posture. They often struggle to maintain their balance, leading to an increased risk of falling. This is primarily attributed to musculoskeletal factors, as the aging process weakens their muscle mass. Additionally, health conditions can also contribute to falls among the elderly. For instance, seniors with hypertension may experience sudden dizziness and loss of consciousness, resulting in falls during walking.

In this final research project, a wearable device is developed to be worn on the chest, equipped with a communication dongle to monitor the falling movements and tendencies of the elderly during outdoor activities. The device consists of two types of tools. The first tool functions as a detector, integrated with Arduino Nano 33 BLE, which includes an IMU sensor used to capture acceleration values, a DC step-down 4r7 module, a push button, and a rechargeable li-ion battery of 100MAH. The second tool is the communication dongle, integrated with ESP32, a push button, a rechargeable li-ion battery of 100MAH, and GPS NEO 7M.

For monitoring purposes, the detection device utilizes BLE communication to transmit the detection data to the communication dongle. Subsequently, this data, along with the location detection data obtained through GPS NEO 7M, is forwarded to an IoT platform via wifi communication. The method used to detect elderly activities is machine learning, with the training process involving the acceleration values from each axis after preprocessing.

The research findings reveal that the most influential feature extractions for this activity are accelero Magnitude Variance, accelero X maximum, accelero Magnitude maximum, accelero Z median, and accelero Z variance. These feature extractions are utilized using the DecisionTree method, resulting in a model accuracy of 99.8% and rill implementation accurary score 60%.

Keywords: Elderly, Falling, Fall Tendencies, Machine Learning, Tracking Location, IoT