FallAlarm – Fall Detection and Alarm App

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FallAlam – The Fall Detection App Project Update

To detect a fall, a threshold-based algorithm is proposed in this project. Thus, the first phase of the project is to establish thresholds that will enable us to detect a fall. In this modeling phase of the project, a simple accelerometer data collection app was developed. The app collects the vector magnitude of the three components of the accelerometer readings using the formula:

$$A_m = \sqrt{(A^2_x + A^2_y + A^2_z)}$$

The app collects the data in an array. Upon a click event of a save button, the data (list of numerical values of the acceleration magnitude) is saved in a file.

Sampling is done as follows

1. **Walking** : Run the app, put the phone in my phone and walk around , and save the collected data

2. **Walk-Sit-Stand** : Run the app, put the phone in my pocket and walk, sit, stand, and walk again, and save the data collected
3. **Walk-Fall**: Run the app, put the phone in my pocket, and free fall on a mattress. I fall three times for this scenario and saved the collected data.
4. Data collected from each scenario was exported to excel and a liner graph (x-axis is a sequence of numbers representing relative time), and y-axis representing the acceleration in m/s2 was generated as shown in fig 1 below

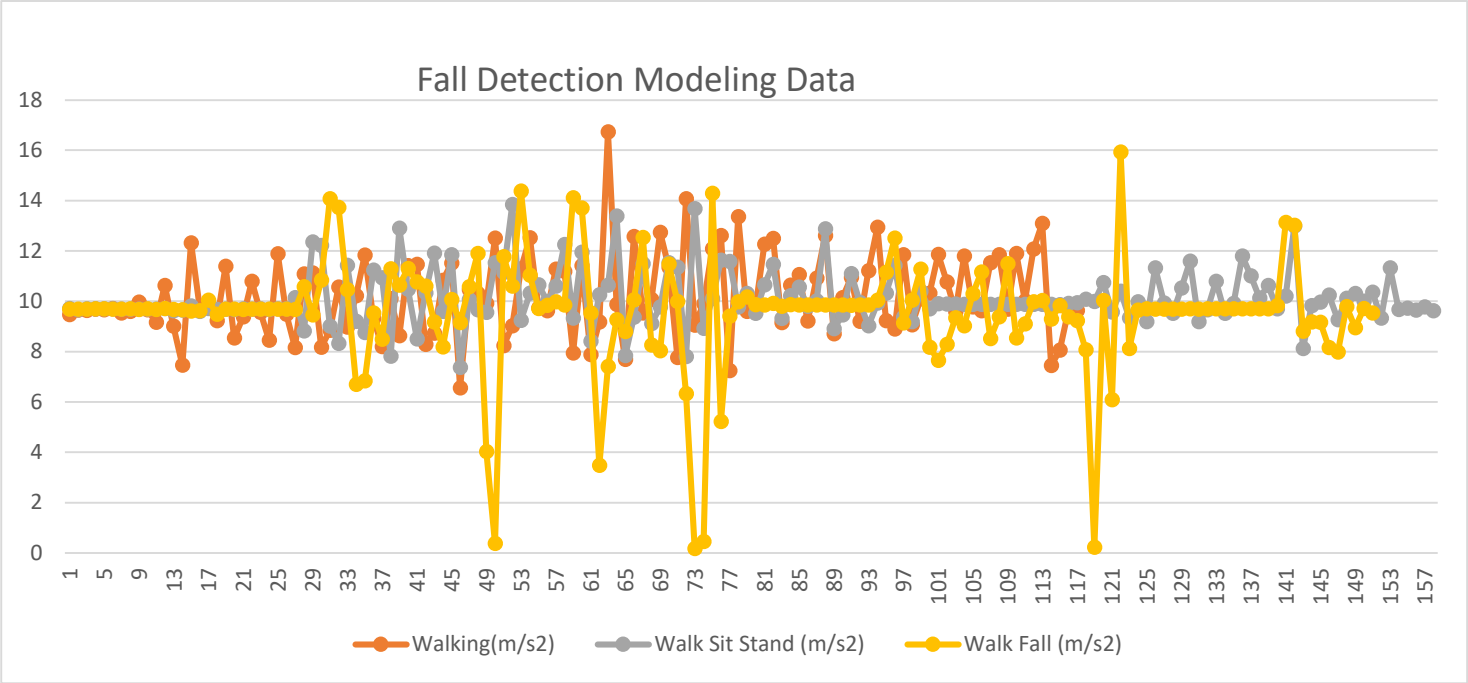

Fig 1. Fall detection modeling

Conclusion

Interestingly, with this modeling and graph, there is not much difference between walking and walk-sit-stand graph ((red and gray lines) patterns. However, for the **walk and fall**, during the fall, the acceleration goes very low close to zero (less than 0.3m/s2, three down bursts of the yellow line) and immediately raises about 11m/s2 upon landing on the ground. Thus , we can assume a fall is detected when the acceleration is falls below 0.3m/s2 and followed by a rise above 11m/s2.

Challenge

One of the biggest challenges in detecting a fall is false positives. For example, jumping from a platform or just simply jumping up and landing back has the same characteristics as a fall. A way to minimize false positive has yet to be found.