Volume 6, Issue 3, March 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Automatic Slump Detection Using Smart Phones

R. Manjupriya, S. Sathya
PG Students, Valliammai Engineering College, Chennai,
Tamilnadu, India

Abstract— ***Devices are becoming a cohesive part of every person's lives regardless of age. This paper discusses the methodology after developing an application for mobile devices that can determine if a person has slumped. The results of the experiments determine promising hands-free responses to the smart-phone user slumping as compared to other systems like Life-Alert***

Keywords— ***smartphones, Alert, Accelerometer.***

I. OBJECTIVE

This paper discusses the methodology after developing an application for mobile devices that can control if a person has slumped.

II. EXISTING SYSTEM

The related project, "A smart-phone based slump detection system", was completed using smart-phones to detect if the user had slumped [1]. Using the phones accelerometer, they performed several tests to get readings from different scenarios (jumping, sitting, etc)[2]. Once the data was compiled, they created an algorithm that utilized an artificial intelligence to reduce the chance of false positives.

Disadvantages:

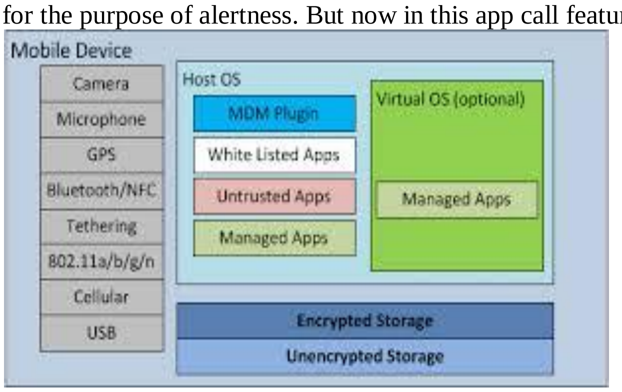
- It can call only to the specific person.
- The specific person is unavailable to pick up the call the situation the particular person in risk.

III. PROPOSED SYSTEM

This project describes solving the same problem using a smart-phone or a similar device, which can provide a reasonable low-cost solution for nonclinical environments conforming to the requirements. Fig [1] Accelerometers in smart-phones can also be used to detect collision during car accidents[2]. The accelerometer can detect a spike in acceleration and call for assistance if the driver is unable to do so.

Advantage:

- It is possible to separately call for assistance without the user having to manually press a button.
- It provide a reasonable low-cost solution for nonclinical environments conforming to the requirements.
- Before this app is used for the purpose of alertness. But now in this app call feature is added.



Fig[1] System Overview

IV. MODULE DESCRIPTION

- Slump detection with Mobile Device.
- Experiments and Data Analysis
- Testing and Data Collection
- Implementing the Algorithm in a Mobile Application

Slump detection with Mobile Device:

In order to detect a slump, the application on the smart phone must be able to distinguish between what is and what is not a slump. Fig [2], For the purpose of this project and as suggested by the three stages of a slump were defined as:

1. The detection of a free-slump phase;
2. The collision of the person with the floor; and
3. The person entering a rest state.

Accelerometers are shared in smart phones and smart devices, such as tablets and smart watches. The accelerometer in these devices read accelerations in the three-dimensions (x, y, and z)[2]. By finding the magnitude of a reading, the situation the device is in can be evaluated. For example, if a phone is dropped while its accelerometer is streaming, the magnitude of the acceleration will spike when it hits the floor, signal that a collision has occurred.

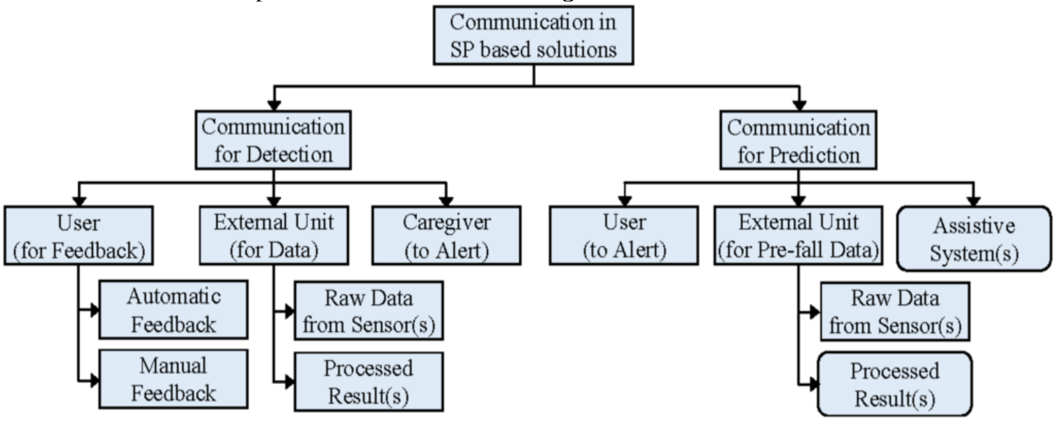
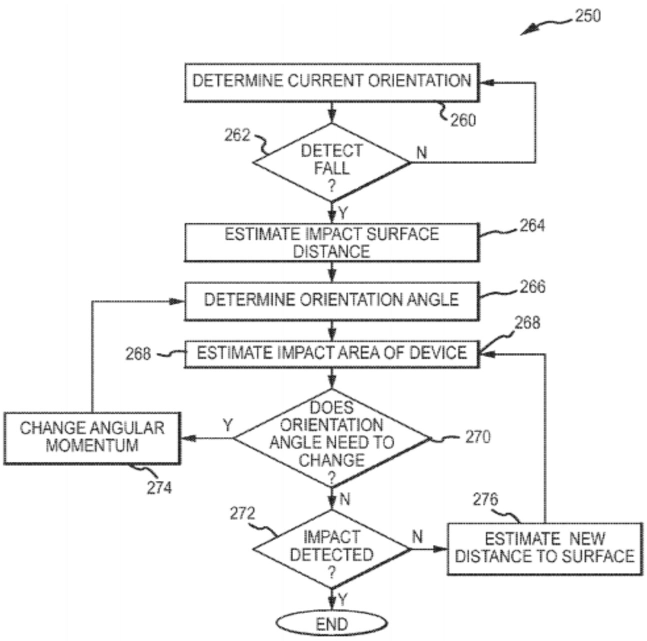


Fig [2] Data communication Diagram

Defining the Algorithm:

With the data collected, an algorithm was devised for determining if a slump occurred. This algorithm utilized the three stages of a slump as the basic conditions. The algorithm takes the magnitude of the x, y, and z acceleration data points at a given time. With this information, the algorithm attempts to detect a value within the free-slump range. In order to do so, the application collects the real-time accelerometer readings on the device and stores a certain length of the most recent records. A median filter is applied to the data in this sliding window. Then, the application evaluates the magnitude of the acceleration vector and compares it to the acceptable values within the free-slump range. Once a value is detected, the algorithm waits a predetermined amount of time before it returns to scanning the acceleration values again. At this point, the algorithm is searching for a value that signifies a collision with the floor. If the value surpasses a threshold, the algorithm will wait for another period of time before seeing if the incoming values signify that the device is at rest. If the device is in a resting state, the algorithm will continue to monitor the readings for a period of time to be sure that the devices remain sat rest. When all the conditions have been met, a slump has occurred. If one or more of the conditions is false, the algorithm will restart from the beginning.

Flow Chart:



V. EXPERIMENTS AND DATA ANALYSIS

Testing and Data Collection*:*

The first stage of this work involved designing a basic application to collect real-time accelerometer data from an Android device. Android platform offers three settings for the delay of data collection from the accelerometer: normal, game, UI, and fastest. For the purpose of the data collection, the "fastest" setting was used in order to obtain more accurate readings. Using this, the basic application collected thousands of data points from the accelerometer into a comma-delimited text document that was saved onto the mobile device.

Once completed, testing began in a safe environment where a test subject fell, jumped, walked, ran, and dropped the phone. Multiple samples were taken from each of the different situations. Each situation was shown to have a unique set of conditions, as illustrated in Figures Though there were similarities in the dynamics of accelerometer readouts between a person slumping and the mobile device, the person slumping with the telephone in their pocket collided with the floor at a higher magnitude compared to when the phone fell to the floor on its own[6][3].

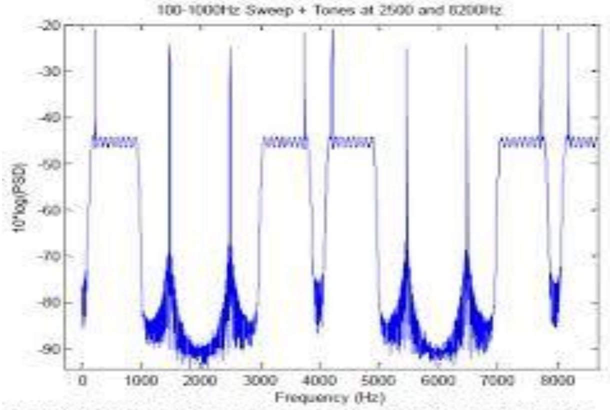


Figure 7 Aliasing details in SP chain with tones at 2500 and 8200 Hz added. C2V switching (sample) rate of 4 kHz.

Implementing the Algorithm in a Mobile Application:

The basic application that collected real-time accelerometer data was further modified in order to utilize the algorithm during runtime. With the algorithm in place, a series of tests were performed to determine the thresholds, ranges, and times for each stage of the slump. The ranges and thresholds are needed to account for minor variations in the hardware of different smart phone models and manufacturers.

By having a predetermine range that is acceptable for each condition, the application can be used universally across each device[4].

VI. FUTURE ENHANCEMENT

- A sensor-based risk assessment scale is preferable as it would ensure objective, repeatable and reproducible measurements.
- Early identification and treatment of slumps risks might prevent a slump from occurring, thus preventing the physical, financial, and emotional costs of slumping**.**

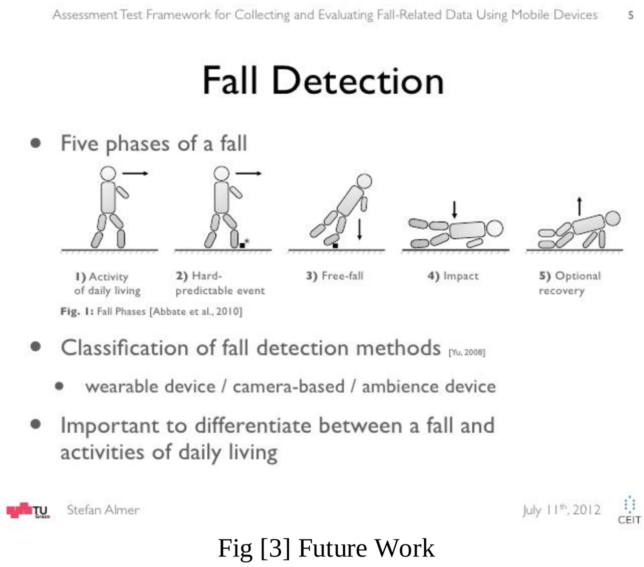


Fig [3] Future Work

- Self-management of slumps risk will become more important as healthcare resources are increasingly stretched.
- A method of assessing slumps risk and educating individuals on slumps risk and interventions must be developed for the general population.

VII. CONCLUSION

The result of this experimentation can be used in many ways and the produced framework for slump detection on mobile devices. Firstly, the research can be expanded into a more complex application for slump detection. The basic applications designed in the process did not include dialling for assistance. The user interface was very basic and was not subjected to any degree of usability testing. This application can also be extended to different smart devices instead of smart-phones. Ideal devices for this research would include the smart-watches. The use of a smart-watch would eliminate the possibility of the telephone slumping by itself and potentially causing a false-positive slump.

REFERENCE

[1] S. Abbate, M. Avvenuti, F. Bonatesta, G. Cola, P. Corsini, and A. Vecchio, “A Smartphone-based fall detection system,” Pervasive and Mobile Computing, vol. 8, no. 6, December 2012, pp. 883-899.

[2] C. V. C. Bouten, K. T. M. Koekkoek, M. Verduin, R. Kodde, and J.D.Janssen, “A triaxial accelerometer and portable data processing unit for the assessment of daily physical activity,” IEEE Trans. Biomed. Engg., vol. 44, pp. 136–147, 1997.

[3] J. Chen, K. Kwong, D. Chang, J. Luk, and R. Bajcsy, “Wearable sensorsfor reliable fall detection,” in Proc. 27nd Annual of the IEEE Engineering in Medicine and Biology Society,September 2005, pp. 3551–3554.

[4] LifeAlert® Protective Services [Online]. Available:http://www.lifealert.com/protectionservices.aspx.

[5] B. Naja_, K. Aminian, F. Loew, Y. Blanc, and P. Robert, “Measurement of stand-sit and sit-stand transitions using a miniature gyroscope and its application in fall risk evaluation in the elderly,” IEEE Trans. Biomed.Eng., vol. 49, pp. 843–851, August 2002.

[6] S. Srinivasan, Jun Han, Lal, D. Gacic, A., "Towards automatic detection of falls using wireless sensors," Engineering in Medicine and Biology.

