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Fibrillation Detection using Accelerometer and Gyroscope of a Smartphone

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ABSTRACT

Using the smartphone as an answer for the identification of Atrial Fibrillation (AFib), which uses the built-in accelerometer and gyroscope sensors (Inertial Measurement Unit, IMU) of the smartphone for detection? Contingent upon the patient's circumstance, it is conceivable to utilize the created cell phone application either routinely or at times for making an estimation of the subject with no outer sensors is required. From that point forward, the application decides if the patient experiences AFib or not.

Keywords: *Atrial Fibrillation, gyroscope, accelerometer*

I. INTRODUCTION

We consider the accurate detection of a trial fibrillation (AFib) with modern micro electromechanical (MEMS) accelerometers and gyroscopes embedded into modern smartphones. Previously, smartphone based AFib detection has been proposed through the camera of the smartphone while illuminating the user's finger with the camera flash (PPG, photoplethysmography) [1].

Our approach is also based on smartphone, while the acquisition of the heart signal is made in an alternative way. The patient is advised to turn on the application before keeping the smartphone in the pocket of the patient. A measurement with similar duration as in camera based measurement is taken (approximately 2 minutes) with the already available MEMS sensors within the smartphone. The precise stability of the partient can be detected using the application.

II. RELATED WORK

In the field of medical, many research projects has been developed for the health care of elderly person. Here we use accelerometers and different sensors. With the purpose to detect successfully typically falls by applying threshold to accelerations position. It has the following methods.

A. Wearable Detection Methods

Bagale.et al [4], presented an algorithms which is based on accelerometer, of fall detection on fall of real-world.

Cho, Nguyen and Lee [7], used an accelerometer which Is worn on the waist, by applying thresholds to the accretion, they detect accurate fall.

B. Audio, Video Surveillance Detection Methods

Lustrek and Kaluza [4], perform well and it tests and can be found that more comfortable than worn sensors body. However, the sensors which are worn on the body are most widely used method for fall detection.

Diraco and others [5], separated movement area from image by using bayesian segmentation method based on the threshold of distance of the 3 dimensional centroid human from the floor plane and as they move furher found that the fall had

happened when the human centroid is less than the specified height and situation are maintained more than 4s. The human threshold centroid value of 0.4m, accuracy was 97.3% and the recognition rate of 80.0%. Human body data in stooping, standing, laying and sitting down analyzed them they collected and concluded groups three of threshold centroid and the recognition rate & credibility.

C. Ambient Based Methods

Ambient based methods are usually depend on even passive motion infrared sensors, acoustic sensors and pressure sensors which is placed around the caretaker's houses.

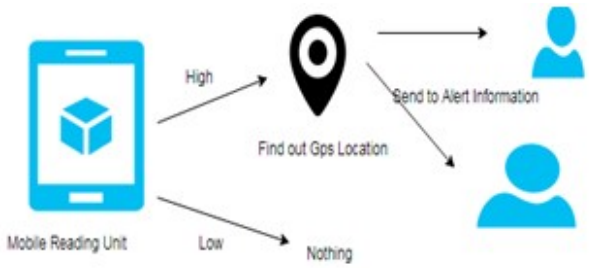
Yan [7] proposed a perceived nature invasive method. They developed such a system in which it is not necessary that the user should waer the sensors, although was able to detect the location of the user which is based on interaction observation with the network of sensor home-installed.

Winkley, Jiang and Jiang [1] proposed a verity of two components, base station and direct monitoring device. They find that the proposed classifier outperforms the conventional classifiers with higher distinguishing capability. In a particular system, they measured real time skin/ambient temperatures.

The video detection methods are better than the ambient based methods and wearable based methods [7].These systems are often suffer from high risk of privacy and also very high cost of implementing cameras. So they used wearable sensor based methods in such types of research. We successfully detect fall with accuracy above 90% by applying threshold to acceleration of accelerometer which is worn on the body of the person. The accelerometer also resulting in 100% accurate fall detection using various accelerometers and sensors.

III. SYSTEM IMPLIMENTATION

The block diagram of proposed Fibrillation Detection system shown in fig.1.It consist of the mobile reading unit, accelearometer, gyroscopesecsor, global positioning system, short message service and a mobile communication network . Accelerometer sensor is used to locate the exact movement of the person in X and Y direction. The gyroscope sensor is used to read the amount of inertia is exerted on the subject. The readings from all these sensors is given to the detection algorithm for an attempt of afib detection.



A. Real –Time Detection

A detection algorithm suitable for real time, by using the micro-controller of the accelerometer, various sensor and various devices. The acceleration component along with the three axes as X, Y and Z respectively [4].

By using information from an body temperature and pulse rate and monitor the health parameters as well as fall detection using sensors such as accelerometer, the impacts of these falls can successfully be distinguished from activities of daily lives reducing the false detection of falls. From the experimentation results of 30 trials, it is found that the proposed fall detection system achieved a high accuracy of above90%, and specificity is 95%.

B. Accelerometers

We use 3-axialaccelerometer.The accelerometer sensor find the movement of the person in X,Y, and Z direction. Two methods of accelerometers are threshold and orientation, both methods gives accurate movement of the person during fall.

C. Gyroscope

To a successful detection, we use the gyroscope (Inertial Measurement Unit, IMU).The gyroscope sensor find the amount of inertia is exerted on the subject for the purpose of avoiding a false alarm.

D. Global positioning system

In case of a detection event the Global positioning system(GPS) is used to detect the location of the subject to direct the emergency services to the subjects location as fast as possible

IV. SOFTWARE REQUIREMENTS

In our Project we use Front End as Java (Eclipse) and Back End as a SQLite.

A. Jdk 1.6

In our project we are using java to design the application process. Java contains technologies such as JEE (Servlet, Jsp) that is used to design the view page easily. Since java is an open source and platform independent this makes the application more flexible.

B. ADT(plugin)

Android Development Tools (ADT) is a plugin for the Eclipse IDE that extends the capabilities of Eclipse to let you quickly set up new Android projects, create an application UI, add packages based on the Android Framework API, debug your applications using the Android SDK tools, and even export signed (or unsigned) .apk files in order to distribute your application.

C. SDK

The Android SDK separates tools, platforms, and other components into packages you
can download using the SDK Manager. For example, when the SDK Tools are updated or a new version of the Android platform is released, you can use the SDK Manager to quickly download them to your environment.

D. Android XML

All user interface elements in an Android app are built using View and ViewGroup objects. A View is an object that draws something on the screen that the user can interact with. A ViewGroup is an object that holds other View (and ViewGroup) objects in order to define the layout of the interface.

Android provides a collection of both View and ViewGroup subclasses that offer you common input controls (such as buttons and text fields) and various layout models (such as a linear or relative layout).

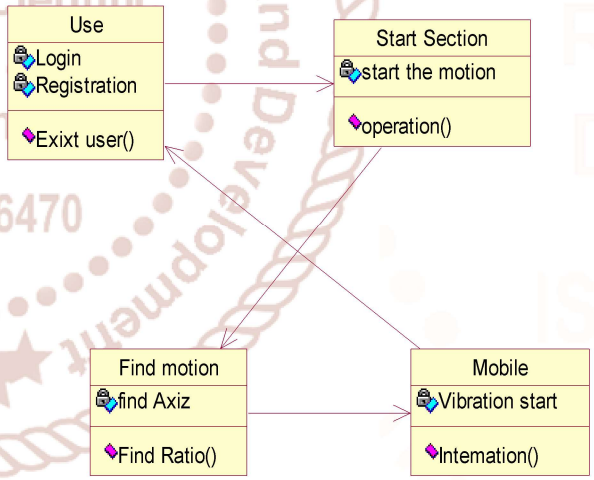
E. SQLite

SQLite is an in-process library that implements a self-contained, zero-configuration, serverless, transactional SQL database engine. The source code for SQLite exists in the public domain and is free for both private and commercial purposes.

V. PROPOSED DETECTION ALGORITHM

The proposed detection algorithm is based on placing an accelerometer sensor and the gyroscope sensor on the user's body. The algorithm is programmed for the detection falls by the X, Y and Z direction of acceleration sensor readings and the amount of inertia inflicted on the subject by the readings of the gyroscope The micro- controller compares the readings and when these readings cross threshold, then the fall is detected in X, Y and Z directions and the amount of inertia exerted
The tracking section determine the exact position of user by using GPS receiver which reads the latitude and longitude co-ordinates to micro-controller in every seconds and micro- controller will read and display the co- ordinates on the LCD. Using GSM modem sending these co- ordinates to base station.

The algorithms following steps and the proposed method [3] for fall detection is based on monitoring the magnitudes of three axial X, Y and Z components of the accelaertion, magnitudes in the three planes, and the total magnitude. The fall detection is based on the observation that a fall is associated In event of a detection the exact location of the subject is sent to the stored ICE(In Case Emergency) number and the response to the emergency situation can be diverted as fast as possible



CONCLUSION

In this paper, a detection system based on sensors which is worn on the body of the person are implemented that successfully detected afib. By making the use of the information from an body sensors, we can monitor the health parameters of the elderly person as well as successfully detect fall by using an accelerometer sensor and a gyroscope sensor. Using GSM the concerned person will receive the sms on his mobile phone, in case any of the parameter goes beyond the normal range or if fall is detected. Also by using GPS the concerned person

know the exact position of the user. From the experimentation of 30 trials, it is found that the proposed detection system achieved a high accuracy of above 90%, and the sensitivity and specificity are 95%.

REFERENCES

1. Liyang Zhau, Zhen Liu, Jian Guo, "Asurveyoff all detection algorithm for elderly health monitoring," in *Proc.2015 fifth International IEEE Eng.* pp, 270-274, 2015.
2. WangYe, Bai Xiangyu, "Research off all detection and alarm applications for the elderly," in *Proc.2013 International IEEE Eng.* pp, 615-619, 2013.
3. Praveen Kumar, Prem C. Pandey, "A wearable inertial sensing device for fall Detection and motion tracking," in *Proc. 2013 annual International IEEEEng.*pp,978-1-4799-2275-8,2013.
4. Lustrek and Kaluza, "Fall detection and activity Recognition with machine learning, "*Informatica*;2009;33:205-12.
5. Diraco G, Leone A, Siciliano P, "An active vision system for fall detection and posture recognition in elderly health care,"[C]//*Proceeding of the Conferenceon Design, Automation and Test*in Europe.[S.1.]:CDATU,2010:1536-1541.
6. C. Rougier, J. Meunier, A. S. Arnaud, and J. Rousseau, "Robust video surveillance for fall detection based on human shaped formation," *IEEE Trans. Circ. Syst. for Video Tech*., vol.21, no.5, pp.611-622, May2011.
7. H.R.Yan, H.W.Huo, Y.Z.Xu, and M.Gidlund, "Wireless sensor network based E-health system: implementation and experimental results," *IEEE Trans. Consumer Electron.*, vol.56, no.4, pp.2288-2295, Nov.2010.
8. Chin-FengLai,Member,IEEE,Sung-YenChang,HanChiehCha,"Detectionofcognitivein juredbodyregion using multiple triaxial accelerometers for elderly falling," *IEEE Sensor Journal*.,vol.11, no.3,pp.763-770,March 2011