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International Journal of Innovative Research in Technology, Science & Engineering (IJIRTSE)
ISSN: 2395-5619, Volume – 2, Issue – 6. June 2016

SVM Based Automated Assessment of Health Alerts Using Smart Home Technologies

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ABSTRACT

Under emergency situations like heavy rain, traffic, rural areas it is not possible to get urgent remedies from physician. By using present telemedicine systems real-time monitoring of such patients is possible. This paper describes the development and implementation of portable, low cost and advanced emergency telemedicine system based on Android Smartphone. Sensors embedded in the environment capture behavior and activity patterns. Changes in patterns are detected as potential signs of changing health. By using sensors and prototyping board, the patient's data can be monitored on Android Application. Further it can be stored on SD Card in the form of screen shot of mobile device. Stored results can be shared with concern physician via new communication techniques like WhatsApp, Facebook, email, and Instagram. The main aim of this system is to provide emergency provisional help to patients before they get hospitalized which can save lives of many before the contact of expert doctors. The system for automated health alerts provides a method for detecting health problems very early so that early treatment is possible.

Index Terms—Health Smart Home, SupportVector Machines, Activity of Daily Living, health alerts

I. INTRODUCTION

Our view of embedded health assessment is the on-going assessment of health changes based on an individual's behaviour and activity patterns and baseline health conditions. Sensor embedded in the environment are used to collect behaviour and activity patterns for the purpose of detecting health changes. Early detection is the key to promoting health, independence, and function as people age. Identifying and assessing problems early, while they are still small, provides a window of opportunity for interventions to alleviate problems before they become catastrophic. Older adults will benefit from early detection and recognition of small changes in health conditions and get help early when treatment is the most effective. Most importantly, function can be restored so they can continue living independently.

II. RELATED WORK

In the related assessment of health changes based on an individual's behavior and activity patterns and baseline health conditions. Sensors embedded in the environment are used to collect behavior and activity patterns for the purpose of detecting health changes. Early detection is the key to promoting health, independence, and function as people age. There is also work on wearable sensor networks and sensing incorporated into clothing. Some wearable systems have been studied extensively or advanced to the stage of commercialization, e.g., accelerometers for fall detection, counting footsteps or assessment in clinics. There is also work on wearable sensor networks and sensing incorporated into clothing. Some wearable systems have been studied extensively or advanced to the stage of

commercialization, e.g., accelerometers for fall detection, counting footsteps, worn on the wrist as actigraphy sensors, or assessment in clinics [1].

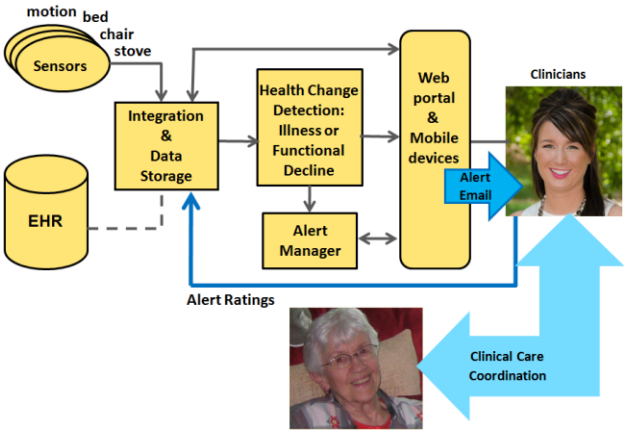

FIG 1. Integrated sensor network with health alerts and ratings onclinical relevance.

The next level of technology is to monitor changes in the person's habits. This has been done with various sensors and systems. With these sensors data, it is then mandatory to develop data fusion algorithms that can detect abnormal situations or evolutions inside the large set of information [2]. In this process to build a system to discretely monitor the activity of older adults in their apartments, while addressing their privacy concerns. We also seek to identify diagnostic measures that are predictors of fall risk, which would then fulfill the long-term goal of our project, which is to generate alerts that notify caregivers of changes in a resident's condition so that they can intervene and prevent or delay adverse health related events [3].

FIG 2. (a) RGB image of the side profile of a person sitting on the chair.(b) Silhouette extracted after extracting the foreground from the image.

III. PROPOSED METHODOLOGY

This system uses Open Source platforms in combination with different biomedical sensors, analog and some digital interfaces. The main task is to capture the real-time data from them and plot the proper graph along with some calculations based on obtained values. But using only Android Phone, it's not feasible, because they are not compatible to directly interface with third party inputs and outputs.

Android itself supports USB peripherals and different third party accessories. There are two possible modes, USB accessory and host. Using USB accessory mode, the external USB hardware can act as the USB host, which gives Android-powered devices the ability to collaborate with USB based techno devices. Here in this proposed methodology an IOIO device is used as USB accessory in coordination with sensors.

Android IOIO is an I/O prototyping board designed for Android device (OS versions 1.5 and greater). The IOIO board contains a single PIC24 microcontroller that acts as a USB host and interprets commands from an Android app. As companion, the IOIO can get across with peripheral devices in the same way as most MCUs. Digital Input and output, I2C, SPI, PWM, Analog Input and UART are peculiar lineaments from the IOIO. Connection with Android device can be established via ADB mode, Bluetooth or USB OTG.

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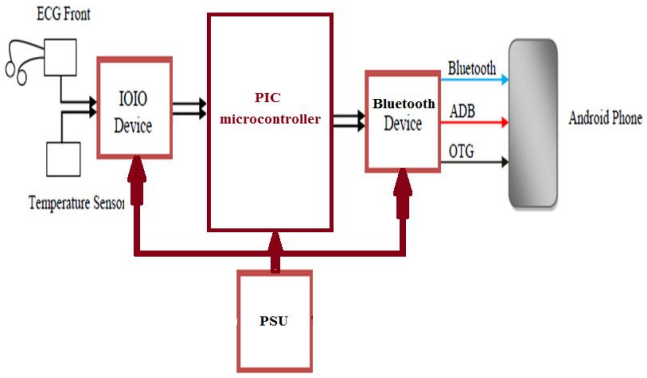

FIG 3. Functionalblock diagram of the system

This Telemedicine system, Person's ECG, Oxygen saturation (SPO2) and body temperature can be received via IOIO and Android. The real time screen showing results can be captured via screen shot by clicking button provided with software. The bio-signal is measured and the Heart Rate can be estimated by the Android mobile system, which is essential to monitor the heart beat rate. Here Fig. 3 shows the obtained ECG pattern on Android application's screen from IOIO and 2 lead ECG systems. Interval can be measured on horizontal axis in seconds. By measuring these consecutive intervals between heart beats and Rate can be easily calculated. The QRS, QT and PR are the intervals, which should be mainly scanned on every ECG.

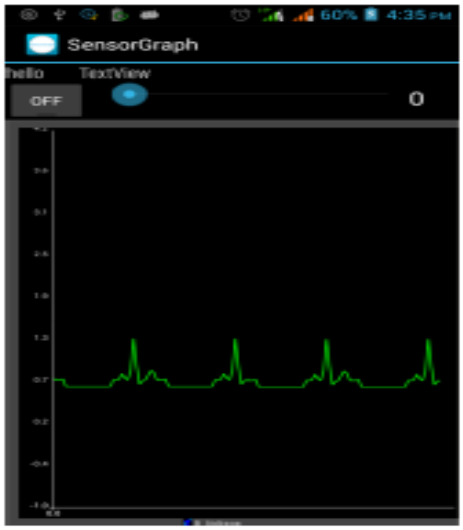

FIG 4.ECG chart using 2 lead ECG system

The inverse of the time difference between the normal heart beats gives the Heart Rate. HR is expressed in beats per minute (bpm) unit.

$$H(bpm) = 60 RR continuation interval\ (sec)$$

IV. EXPERIMENTAL RESULTS

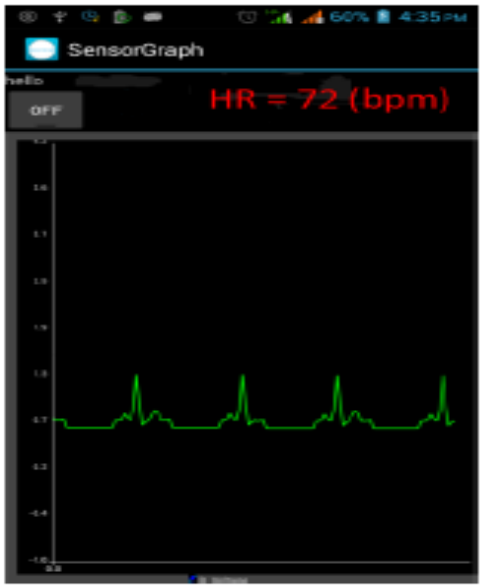

FIG 5. Showing Heart Rate in bpm

Fig.5 shows the calculated HR, based on predicted values. The prototypical relaxing heart rate in adults is 60–80 beats per minute (bpm). To predict HR from an ECG, RR variability must be notified. If any abnormal HR is detected, outside the normal range [10], the mobile device alerts by notifications.

A number of deceases are diagnosed by doing analysis of body temperature. By using body temperature sensor, variations in temperature are measured. Fig. 6 shows the Human body temperature calculated in F0.

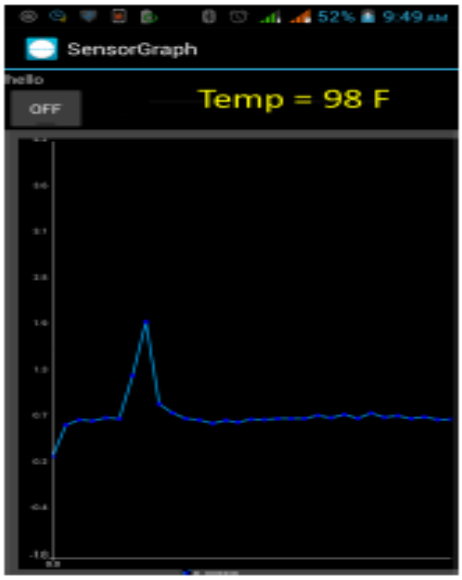

FIG 6. Monitoring variations of human body temperature

V. CONCLUSIONS

Telemedicine system using Android based device, can provide a remedial option at patient's adverse situation. In this system by measuring ECG and plotting its graph, the prior diagnostics can be possible. Another feature of measuring human body temperature can helpful for basic clinical diagnosis of the patient.
This device can be used as a telemedicine to enhance the safety in emergency conditions by recoding the data and sharing results via new mobility techniques with physician. Using this device, the user's health status can be monitored seamlessly and in real time.

VI. ACKNOWLEDGEMENT

We humbly thanking everyone who supported us on preparing this paper and also we express our gratitude to our Professors and friends.

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