SOS & Heart rate monitoring system for Senior Citizen

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***Abstract*—The proposed system is specially designed for for elderly which will allow them to live healthily and safely despite being alone at home. It is a wearable device with many features. It measures heartbeat along with detection of cardiac malfunction (Tachycardia and bradycardia), are measured with the help of single lead ECG module. Additionally, posture of the person is also monitored continuously, which aids in fall detection. It provides live location of the person wearing it. A dedicated SOS button facility is given in the device to immediately notify the relative and call for emergency help. All this data can be viewed on an web portal using IoT technology. Components and their working manner are such selected and designed so to consume minimum power.**

I. Introduction

Due to the increase number world population of elderly citizen, as well as those who live in solitude, there is an immediate need to develop an intelligent monitoring system at home. Many elderly live independently but living alone can be difficult, if not dangerous, for seniors with declining cognitive abilities. So the proposed system is specially designed for elderly which will allow them to live healthily and safely despite being alone at home.

II. Methodology

i. ECG monitoring :

ECG monitoring and Beats per Minutes are measured using R-R interval method. The RR interval is the time between QRS complexes. The instantaneous heart rate can be calculated from the time between any two QRS complexes. For this ECG data is required and is measured using a ECG sensor. An ECG Sensor with disposable electrodes attaches directly to the chest to detect every heart beat. The electrodes of ecg sensor will conversion heart beat to electric signal. ECG Sensors is very light weight, slim and accurately to measures continuous heart beat and give rate data of heart beat. Here there are 3 electrodes are used to pick ECG. To detect R peak, thresholding method is used. The threshold value of applied ECG signal depends on the incoming signal, average high amplitude peak can be labelled as an R peak if its amplitude satisfies both the equations given below:

If amplitude(k)>amplitude(k+1) &&
amplitude(k)>amplitude(k-1)
If (peak amplitude>threshold)

The heart rate is the beat count (number of R-peaks found) per minute. The features extracted above can be used to give heart rate as; From RR interval, the heart rate can be determined as:

$$\text{Average Heart Rate (bpm)} = \frac{60}{\text{Average RR} - \text{interval (insec)}}$$

Based on the values of the features extracted (R-peaks and RR interval and heart rate) from the ECG waveform, classification conditions were formed. On the basis of the heart rate, set of three conditions is formed on the basis of arrhythmias. Detection of different types of arrhythmia is possible according to the heartbeat, signal is thus classified as bradycardia, tachycardia and normal.

Fig.1 BPM measurement

ii. Fall detection :

Activity of person is monitored continuously using accelerometer and gyroscope module. MPU6050 is used for that The MPU6050 consists of a three-axis gyroscope, a three-axis accelerometer. It is located at the waist to monitor the attitude of the body with triaxial accelerometer and gyroscope. A gyroscope is used to determine an orientation and an accelerometer provides the information about the angular parameter as three-axis data. Acceleration magnitude tells us about how quickly velocity changes while acceleration tells us the rate of change in velocity, so we need acceleration magnitude. In a fall situation, there is a large change in acceleration within a split second and then after the fall, the person lies still for some time, showing no change in orientation.

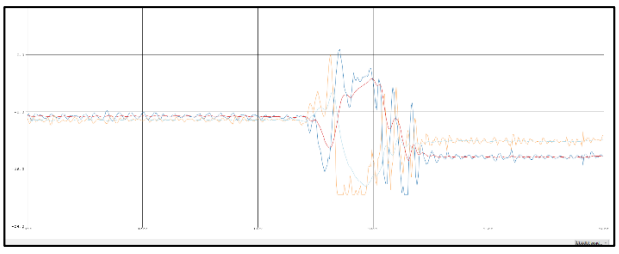

Fig 2.Activity Monitoring

Fig 3. Fall alert SMS

iii. SoS (Emergency panic button):

Many elderly live independently but living alone can be difficult in case of emergency or in case of urgent help. Considering this problem a dedicated SOS button facility is given in the device to immediately notify the relative and call for emergency help. SOS switch button which can be used by the user to send one emergency message to relatives or concern authorities. On pressing that button it will one emergency help message along with location of person.

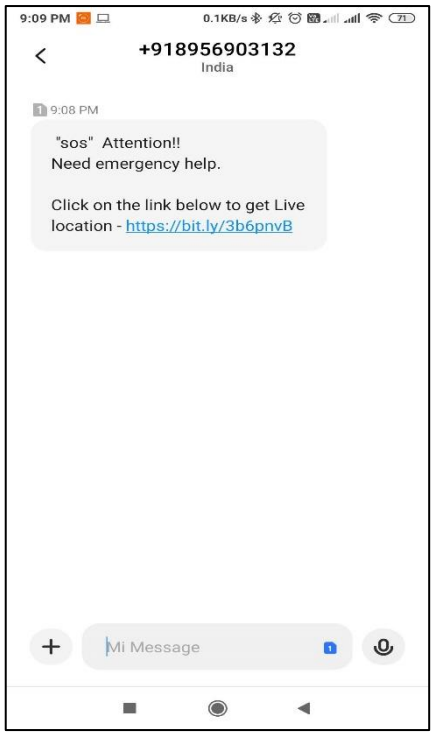

Fig 4. SoS alert SMS

iv. Live location :

Senior citizen usually go for walk or go outside for any other reason and in such case if they want emergency help then it is imprtant to know their location, to provide help at their particular location.So GPS module is used to get the live coordinates (Latitude and longitude) of the person and then those values are given to IoT platform where we can track the location of the person.Whenever person need help he can press SoS button to send help message and that message will also contain the location of person.

Fig 5. Live location output

v. Circuit design:

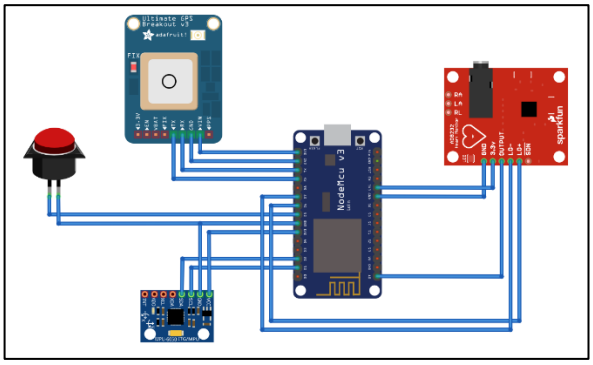

Fig 6. Ciruit diagram

The controller used for this project is NodeMCU. NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC.

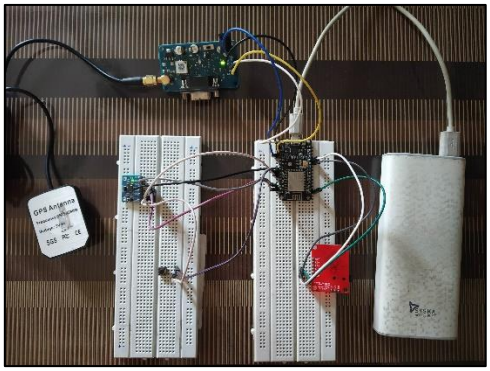

Fig 7. Implemented circuit

vi. Live Dashboard:

Dashboard is designed using Thingsboard platform for the continuous monitoring of the person. We will be able to remotely monitor the ECG of person with the help of IoT platform. When SoS is triggered by the person, we can see the status of SoS on the live dashboard. Dashboard will also provide live location tracking feature using google maps.

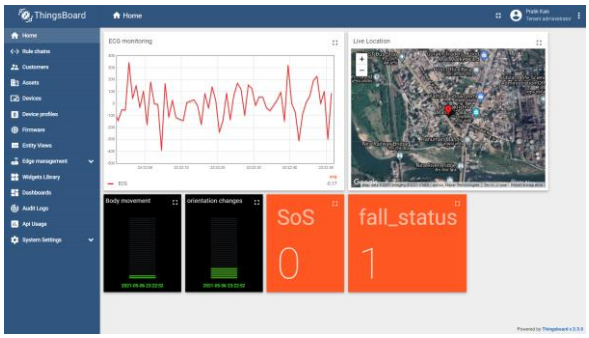

Fig 8. Live dashboard

III. Conclusion

The project entitled " SOS & Heart rate monitoring system for Senior Citizen" is an effective monitoring and safety system which is made by integrating the IoT and embedded technology. It has real-time capability. The future works include optimizing the hardware system and providing more features.

IV. References

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