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Design and Implementation of Android based Wearable Smart Band to Enhance Security and Usability of Device

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***Abstract*— The aim of the research is to implement and test a wireless wearable band interfaced to an android, through which on a button click one could make emergency call or send message to four people about your location notifying that you need an immediate assistance. The band also notifies the heart rate n pulse rate and thus notifies the user when the rates is about cross the threshold levels.**

***Keywords*— Wearable band, android, immediate call/ message, heart rate, pulse rate.**

I. INTRODUCTION

Safety concern is a major issue these days. Incidents of kidnapping, child abuse, lost persons, and misbehaviour with children, adults, and aged people are increasing day by day Road accidents and traffic congestion are the major problems in urban areas. There is no technology for detecting accidents. Also due to the delay in reaching of the ambulance to the accident location and the traffic congestion in between accident location and hospital increases the chances of the death of victim. There is a need of introducing a system which provides immediate assistance and helps to reduce the loss of life due to accidents and the time taken by the ambulance to reach the hospital. [1]

A smart band is an advance technology helping out people to ease the use of various devices. Our designed wireless wearable band assistance the user in case of any danger as it has emergency call button on a click user is able to contact his beloved one or the other option available would be immediate message button which sends a message demanding immediate assistance along with GPS location.

Telemedicine is the use of telecommunication technologies to provide medical services. The key aspect of telemedicine is the use of electronic signal to transfer medical information from one place to another [2]. Various medical sensors are valuable source of information about the patient health. Unfortunately, they are only accessible to patients who stay in specialized hospitals and clinics. Recent advances in electronic, materials and biomedical engineering accelerate development of sophisticated sensors, which can be used for monitoring outside of clinical settings (e.g. in the home or work).

The wearable band is equipped with pulse sensor which constantly reads the values of heart rate and pulse rate and monitors it to the threshold level. Once the values crosses the threshold level the band notifies the user an alert message seeking immediate assistance and also sends text messages demanding immediate assistance.

In this paper we propose a wearable band which assistance the user in case of emergency and also notifies the heart rate and pulse rate thus monitoring one's body condition.

II. MATERIALS AND METHODS

The wearable band is divided into two segments, namely

- Wearable band
- Android app

Wearable band is an embedded system which controls the various functionalities of phone and sensors. The system behaviour was described by the diagram (Fig. 1).

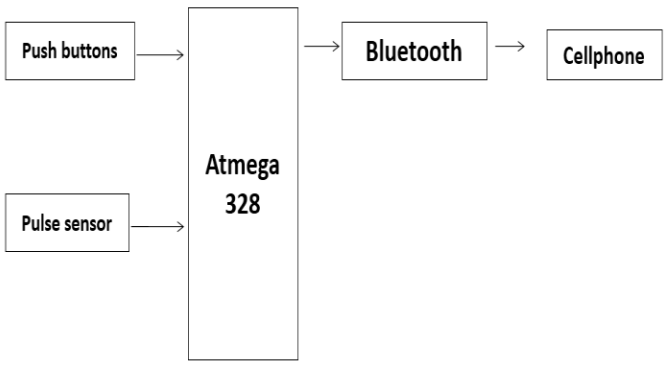

Fig.1 Block diagram of wearable band embedded system.

The system hardware incorporates microprocessor

- Atmega 328 microprocessor.
- HC05 Bluetooth module.
- Push buttons.
- Battery.
- 5V regulator.

The system hardware incorporates the Body Sensor Unit (BSU) and sensor board. The BSU consists of Atmega 8-bit microcontroller, a Bluetooth module and 5V regulator. The sensor comprises of a pulse sensor module as described in the Fig 2.

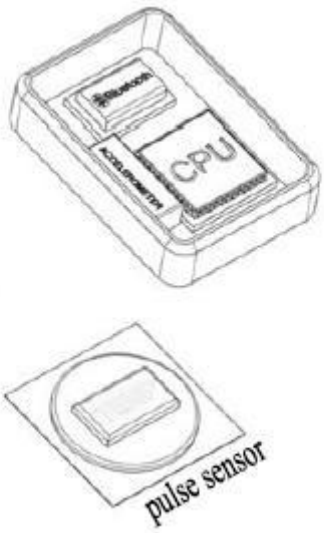

Fig.2 Body sensor unit and sensor unit.

The main segment comprises of processor and Bluetooth modules which are the prime parts of body sensor unit. The pulse sensor values is been constantly monitored by the processors which notifies the user once it is about to cross the threshold level. The communication is established between the phone and band and the values id sent and from a phone an alerting message will be delivered.

The android app comprises of options for connectivity, to store a predefined number to which a user would wish to call in case of emergency and also options to enter four numbers where user can store numbers of beloved ones to whom user would like to notify about immediate assistance in case of emergency. The app is built in such a way that it acts as a Bluetooth client. The embedded system Bluetooth acts as a master which is clearly described in Fig.3.

Fig.3 Bluetooth block diagram of band and Android app.

On a button click a value will be sent to the android app via Bluetooth. The functionality corresponding to that value will be performed by the app for ex: Emergency call button is clicked and value 1# will be sent by band to phone and a call will be made.

An android app is built exclusively for this band which responds to the commands of the band and makes the emergency call, sends text message along with the GPS location and also notifies the user about heart rate.

III. RESULTS AND DISCUSSION

The 'Smart band' app is built on the android platform which acts as a tool to receive and respond to commands given by the band. The means of connectivity between band and app is through Bluetooth. On opening the app we provide the option for saving the contact details like emergency call option, emergency message option, here the number to which the user would like to contact has to be saved and it will be saved in SD card and won't change until user manually changes it.

The band has push button where on clicking emergency call option a value '#1' will be sent through HC06 Bluetooth of band and the number stored in emergency block will be fetched and call will be made.

When emergency message option is clicked '#2' will be sent through HC06 Bluetooth of band and on receiving the data, the phone will fetch GPS values and that will be concatenated to a string and that string will be sent to numbers stored in emergency message block list. Fig 4. Represents the screen shots of the 'Smart band' app.

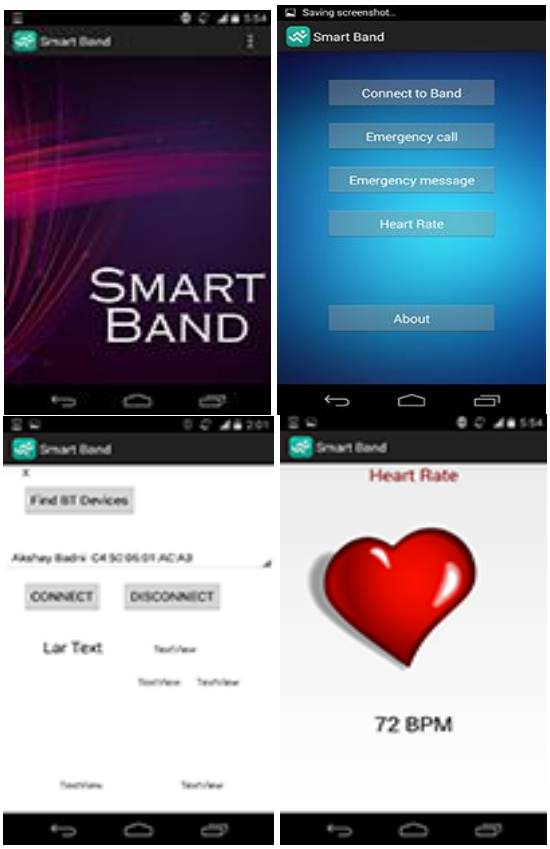

Fig 4. Screenshots of the Smart band android app.

When heart rate button is pressed, the processor fetches the previous 10 values and transmits the data. The data will be in bytes and 10 values will be concatenated, hence they need to be separated which is done by the app. The separated values will be displayed as shown in Fig 4.

A set of heart rate values of different prople were taken with the prototype smart band and the standard device. Fig 5 represents the table of heart beat rating of a person at various stressed condition and normal condition using pulse sensor.

Pulse Reading Output

	Normal state Smart Band output	Normal state Standard Device output	Stressed State Smart Band output	Stressed state Standard device Output
Person 1	68	66	109	104
Person 2	67	66	113	110
Person 3	71	69	121	117
Person 4	74	72	110	106
Person 5	71	71	104	101
Person 6	73	71	109	105
Person 7	68	67	108	102
Person 8	68	69	115	108
Person 9	73	70	118	116
Person 10	72	69	107	101
Mean	70.5	69	111.4	107

Fig 5. Standard mean table of heart rate reading of different people.

A graphical representation of the value obtained from the table represented in Fig 5 is illustrated in Fig 6. which shows a comparative study of the heart rates of the subjects collected from the designed prototype and that of the standard device under the relaxed and stressed conditions.

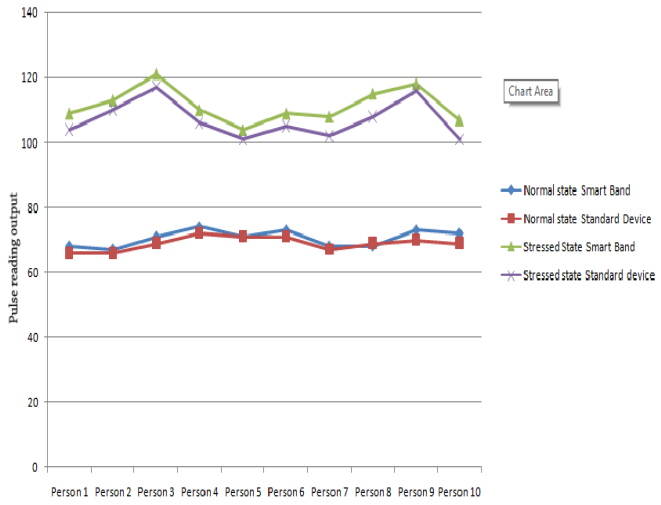

Fig 6. Graphical representation of heart rate at stressed and normal conditions of different person.

Percentage error (E1) between mean heart rates in normal condition obtained from the designed prototype and the standard heart rate monitor respectively is given by,

E1 = [(70.5 -69) x 100]/69 = 2.17 %

Percentage error (E2) between mean heart rates in stressed condition obtained from the designed prototype and the standard heart rate monitor respectively is given by,

E2 = [(111.4 -107) x 100]/111.4 = 4.11%

The processor has a threshold value stored in and it notifies the app when it is about to cross the limit. The processor stores the value of the threshold number of the heart rate which is referred from the table of Fig 5.

The built in prototype has button on a button click it makes an emergency call and on clicking emergency text message button it sends text messages to 4 people. The prototype model is successfully built and the Fig 7 shows the prototype model.

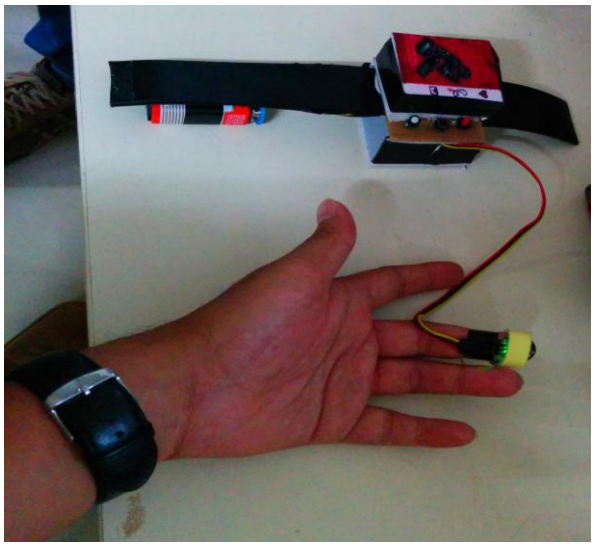

Fig 7. Smart band prototype model.

IV. CONCLUSIONS

The results of the experiments show that the proposed system architecture and the signal acquisition method is suitable for monitoring the heart rate and pulse rate of the user and also the immediate assistance buttons to send messages and make a call is fully functional and proves its utter need in today's society. From the above results, it can be concluded that the designed low-cost heart rate notifier and immediate assistance system can function satisfactorily and can be built at a very low cost (Costs Rs. 5800, approx.).

REFERENCES

[1] Bhandari Prachi, Dalvi Kasturi, Chopade Priyanka, "Intelligent Accident-Detection and Ambulance- Rescue System.", International journal of scientific & technology research volume 3, issue 6, June 2014.

[2] Eliasz Kantoch, "Telemedical human activity monitoring system based on werable sensor network".

[3] S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.