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Autonomous Wearable Device for Health Monitoring

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ABSTRACT: The growing demand for wearable devices is imposed by the ability to monitor in real-time critical situations in the different areas of daily life. In many cases, communication is the limiting factor for such devices. One aspect with the fitness bands is that it introduces limitation in range of communication that too a mobile has to be connected continuously via Bluetooth. In this paper, a proposed wearable device with an energy harvesting module has been designed for the measurement of vital signs. The energy-harvesting module is implemented to directly power the electronic circuit board by a chargeable battery power bank. This paper describes the proposed instrumented autonomous T-shirt powered by the battery applied directly on the T-shirt. The instrumented T-shirt is capable of measuring heartbeat, temperature of the body. If the heartbeat or temperature of the person rises above normal limit, an SMS is sent to his near ones indicating the alarming situation. Along with the sms the person's location is also sent using GPS module so that immediate and appropriate help can be provided to save the person's life

KEYWORDS: Wearable Device, Flexible solar panel, GPS & GSM;

I.INTRODUCTION

In the literature review, wearable systems which are equipped energy harvesting module, sensors and suitable electronics devices are used to condition and store the vital signals have been reported.

Monitoring devices helps to check the physical status of elderly person in his/her daily routine life, indoor as well as outdoors. The main advantages are decrease in the health costs and waiting time and overcrowding in different medical structures. This increases the independence of the people improving the quality of life [1]. The MAIN Shirt [2] is a wearable that consists of sensors based on electromagnetic coupling. The sensor is a coil that is sewn into the shirt. The MAIN Shirt is also tested for pattern recognition. They also developed a device that comprises magnetic induction and reflectance photoplethysmography for cardio-respiratory monitoring [3]. Wearable system for continuous measurement for vital signs for health monitoring has been described in [4]. The authors have design a wearable sensor which can monitor important signs of health and fall detection. The current composition of the device is 150mA. The wearable device transmits the data via Bluetooth [5]. This project presents the design of energy harvesting module. It harvests the energy from the sun and body heat from the environment. But no vital signs are measured.

This paper describes a battery less wearable system which detects heartbeat and temperature of the patient's body. The energy is harvested with the help of flexible solar panel. This power generated is then used for powering up the electronic circuit. Whenever the heartbeat or temperature of the patient goes high a sms and location to doctor and near ones so that action can be taken to save the person's life.

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II.OVERALL SYSTEM

The wearable system with details about the autonomous instrumented T-shirt is schematically shown in Fig.1. It can be divided into several blocks:

- A T-shirt that is made of single jersey cotton with Lycra for enhanced comfort and good body adherence.
- The electronic circuit board including conditioning sensor circuits, heart beat sensor and temperature sensor.
- The flexible solar panel used as energy-harvesting system to supply power to circuit board.

A GSM and GPS Module which send the data and location to the mobile no. feeded to indicate the alarming situation.

Fig -1: Wearable System Architecture.

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III.METHODOLOGY OF PROPOSED PROJECT

Methodology of body surface temperature and heartbeat detection is shown in Figure 2 below. After initialization of hardware components and sensors, the system continuously monitors the temperature and heartbeat of the body. If the body temperature goes above 400C or the heartbeat of the person goes above 90beats/min then the GPS and GSM modules come into action. A sms is send indicating body status and coordinates of the location so that immediate help can be provided.

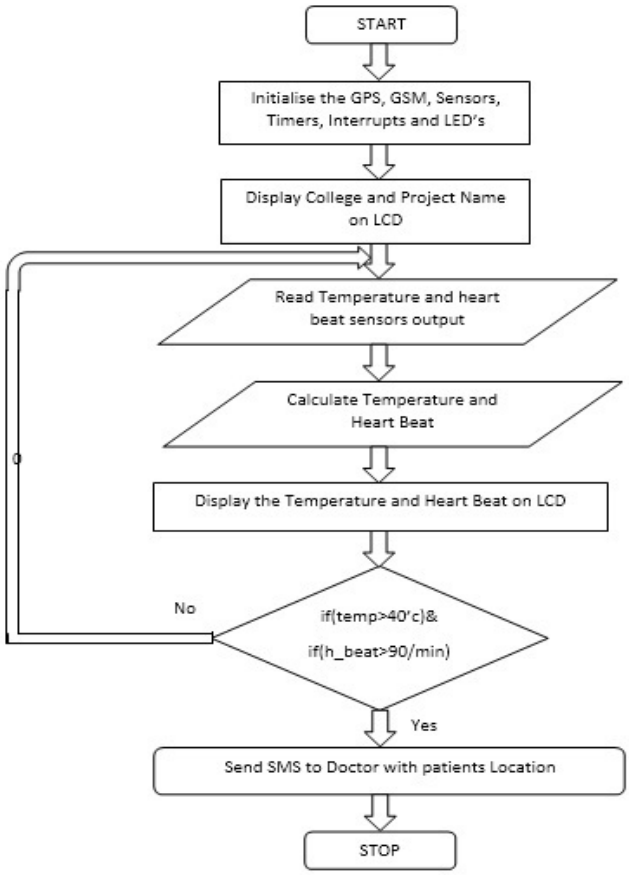

Fig -2: Flow Chart.

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IV. SYSTEM IMPLEMENTATION

The whole system is fitted inside the t-shirt. Whenever the body temperature goes beyond 40^0C or the heartbeat raises beyond 90beats/min or below 60beats/min then a sms will be send to doctor or to other person indicating the alarming situation. Thesms also contains his/her location so that immediate help can be provided and the person can be saved.A power bank is connected to the system of capacity 1500mAh battery so that person can go outdoors freely for a long time without worrying about the charging. In case of any emergency the person can press an emergency push button so that smswill be send indicating that help is required.

Fig. 3: Hardware implementation.

V. RESULT AND DISCUSSION

When a sms is received, one can simply copy the longitudinal and latitudinal coordinates as shown below and paste it in google map to track the person. This can also be done using various apps available on google play store.

Fig -4: Screenshot of the sms received when the body temp. goes high.

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We can locate the position of the person in google map or by using apps available on android play store. From google map we can search the position by typing in following format-
From the sms - ¤GPGGA,1957.4204,N,07349.5434,E,060146.000,A,D*59

Type in search box – 19 57.4204,073 49.5434

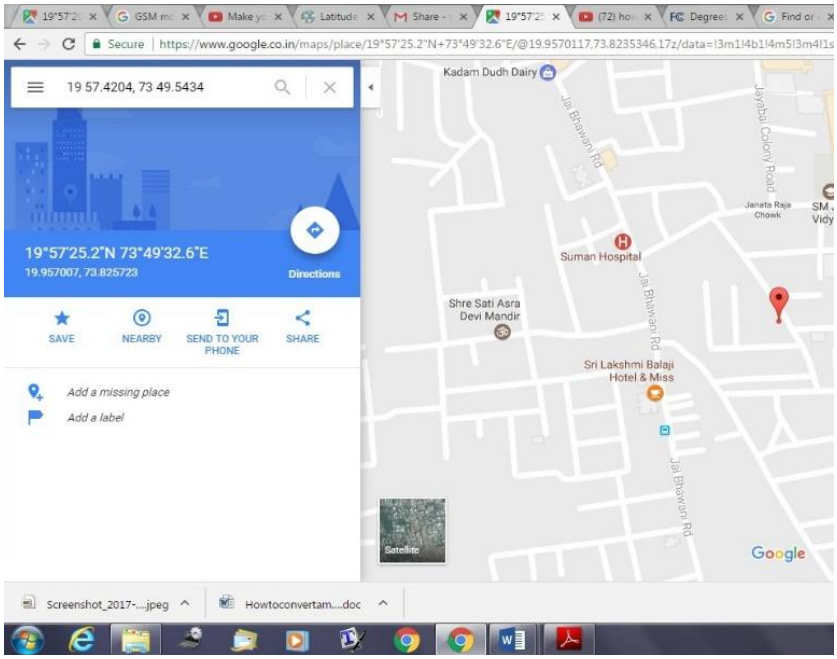

Fig -5: Tracking of location in google map

VI.CONCLUSION

In this paper autonomous instrumented T-shirt embedded with health monitoring sensors is presented. Low-power circuits have been implemented in the circuit board measuring heart rate and temperature. Power bank is used to supply the requested power. The overall system described in this report is capable of producing reliable data compared with the data obtained with these instruments. A further research will investigate a clinical characterization of the vital sign measurements with different subjects. The wearable system with the energy-harvesting module allows improving the non-invasiveness opening up new prospects to develop self-sustained electronic devices for outdoor long-monitoring or with specific indoor monitoring. The wearable device sends a sms when the temperature rage or heartbeat of a person goes beyond normal range. Location of the person is also send with the sms to track the person to provide appropriate help. Emergency push button helps the person to acquire help in any alarming situation whenever needed. In this regard, the power management could be adapted so as to accumulate a large amount of energy when possible by using flexible solar panel to charge the battery to increase cost effectiveness for operation of the system.

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BIOGRAPHY

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