

# Wearable System for Vital Signs Measurement

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**Abstract** - Wearable devices, refer to embedded system which includes electronic component or computers that can be worn on the human body. The health issues are increasing day by day in all age groups due to change in lifestyle. In case of urban areas, both husband and wife or more and more members go to work outside for job. It is not possible to look after elderly parents and take care of them always. Hence there is a need of autonomous system which can monitor the health of elderly people or a patient continuously without anybody's support and can inform the concern person about the alarming situation if the health of the person is affected. This paper describes about such autonomous system which will be present to monitor the person's health. This wearable device monitors the basic vital health parameters that is temperature and heartbeat of the person. Whenever a person undergoes any change in his\hers health it measures the surface body temperature and heartbeat of the person and sends sms when these parameter goes above or below normal range. Not only it informs about the health but also send the person's location in the sms.

**Key Words:** Wearable Device, Vital health parameter, GPS & GSM modules;

## 1. INTRODUCTION

A wearable devices is a range of new technology devices that are worn on your body. There are many different categories of wearables which are used for different purposes.

In today's concept, wearable devices are used to monitor physical parameters of the body. Athletes often use to monitor their body performance in their respective games. Other people use it to monitor their footsteps and to monitor how much their body has burnt calories. Diabetic patient use wearable device to check their sugar level and so on. Wearable devices has various applications according to the needs. It allows one to be less dependent on others for monitoring his\her own health. Earlier, one would need to go to hospital to check his vital health parameter. Even in hospital there are different machines for checking of different health parameters. Nowadays one can check his health condition sitting at home itself. With the help of single wearable device persons can check multiple health parameter independently.

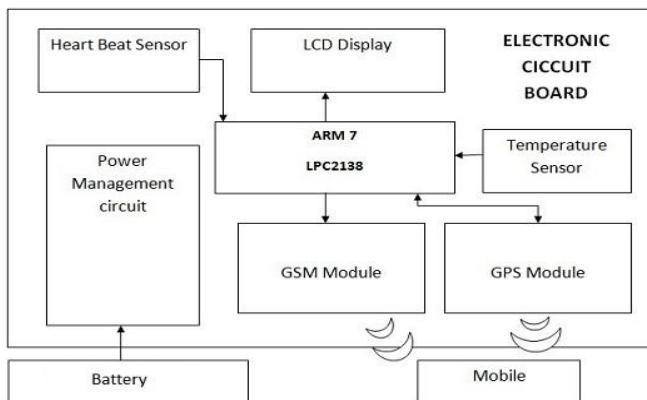
The main advantages of wearable device are decrease in health cost and reducing time consumption for the check-up

process. It contains the design of a wearable energy harvesting jacket, which harvests energy from solar and body heat in the outdoor environment. The prototype illustrates the proposed solar energy harvesting system with partition of cells into different zones is simple, yet effective [1]. The study of thermoelectric energy harvesting on people presented in this paper, it shows that although power generation is affected by many factors such as ambient temperature, wind speed, clothing thermal insulation, and a person's activity, it does not directly depend on metabolic rate as shown in the experiment [2]. The proposed telemedicine platform represents a valid support to early detect the alterations in vital signs that precede the acute syndromes, allowing early home interventions thus reducing the number of subsequent hospitalizations [3]. In this paper, the prototype development of a wrist-worn integrated health monitoring device (WIHMD) with telereporting function [4]. Using Thermoelectric Energy Harvesting to Power a Self-Sustaining Temperature Sensor in Body Area Networks: In this paper, a thermoelectric energy harvester with an active area of 0.5x0.2mm fabricated in a 130nm process is presented [5]. The main aim of the paper is to make this technique easily available to everyone at low cost while maintaining the reliability and efficiency. The technique which is focused on measuring the different gait parameters by using gyro sensor [6].

This paper describes about the wearable device which can detect temperature and heartbeat of a person. The autonomous system can me fitted on a t-shirt so that the person can use it indoors as well as outdoors. Whenever the temperature or hearbeat of a person is affected a sms is send to doctor and other concern people with his\hers location co-ordinates so that appropriate action can be taken.

## 2. WEARABLE SYSTEM ARCHITECTURE

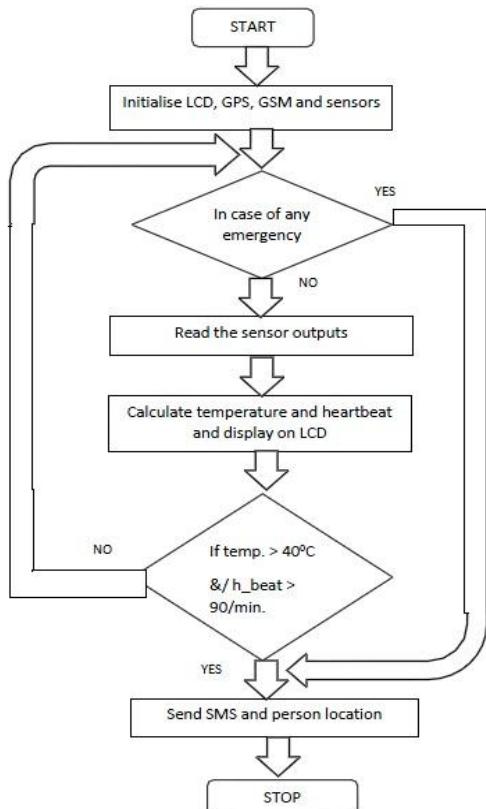
Basically it is divided into two main parts. First is sensor module that consists of temperature sensor and heartbeat sensor and second is communication module which includes GPS and GSM module. Communication between cell phone and the presented hardware is done with the help of GSM module and GPS module provides the exact location of the person via sms. Figure 1 shows the block diagram of the proposed system. In which LPC2138 ARM processor is used. The temperature sensor and heartbeat sensor continuously monitor the person's health.



**Fig -1:** Wearable System Architecture.

### 3. METHODOLOGY OF PROPOSED PROJECT

Methodology of vital body parameter detection is shown in Figure 2 below. Initialization of hardware components such as LCD display temperature and heartbeat sensor, GSM and GPS module, etc. is done. The system continuously monitors the body surface temperature and heartbeat. If the temperature of the body goes above  $40^{\circ}\text{C}$  or below  $35^{\circ}\text{C}$  and/or the heartbeat goes above 90beats/min or below 60beats/min then a sms is send to the concern person indicating he alarming situation with his\hers location co-ordinates with the help of GSM and GPS module. In case of any kind of emergency an emergency switch button is pressed then a sms is directly send indicating help required along with the co-ordinates.



**Fig -2:** Flow Chart.

### 4. SYSTEM IMPLEMENTATION

The wearable device is fitted inside the pocket of the t-shirt. In case the health of the person is affected it is detected by the temperature sensor and heartbeat sensor attached to the body. The system is powered by a power bank of 1500mAh capacity. If the body temperature goes above  $40^{\circ}\text{C}$  or below  $35^{\circ}\text{C}$  and also if the heartbeat goes above 90 beats\min or below 60 beats\min then a sms is send to the doctor or concern person. With the help of GPS module the location co-ordinates of the person is also send so that help can be provided.



**Fig. 3:** Hardware implementation.

## 5. RESULT AND DISCUSSION

The sms consist of the co-ordinates and the health parameter. Copy the longitude and latitude co-ordinates from the sms and paste it in the google map and search it. We can trace the exact location of the person. Mobile apps are also available to the tracing job from the co-ordinates received in the sms.



Fig -4: Screenshot of the sms received .

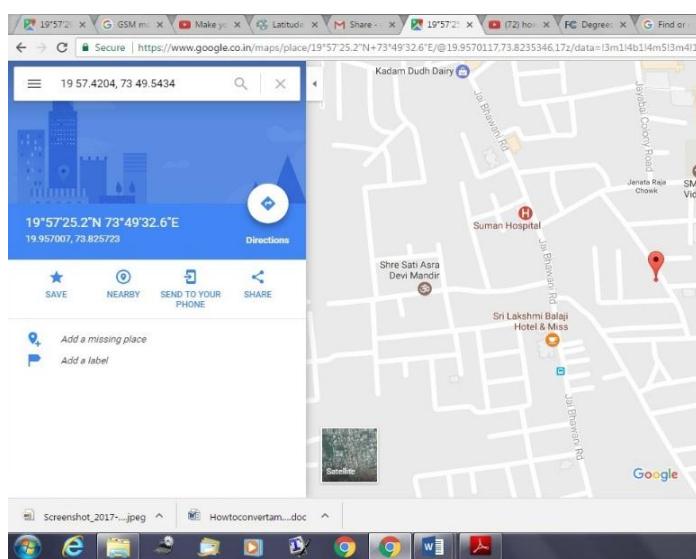


Fig -5: Tracking of location in google map

## 6. CONCLUSIONS

This paper describes a wearable device embedded on the body. It helps in monitoring surface body temperature and heartbeat. Low-power electronic component have been implemented in the system so as to ensure the system efficiently works on the battery. This helps in making the device portable so that the person can use it indoors as well as outdoors. The overall system presented is cable of producing reliable results. A further research can be done on increasing the no. of vital health parameters to be monitored. Also the system can be powered by flexible solar panel to eliminate the use of battery which decreases the weight. The device sends a sms when these health parameter goes above or below normal range. Location co-ordinates of the person is send with the sms to track the person to provide appropriate help. It also consist Emergency push button. In case of any emergency one can press that button and immediately a sms is send indicating the help required. This device helps in monitoring the health of the patient and elderly people. This helps in taking care of our elder ones in our absence and provide help whenever required which can also save life in emergency situations.

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## BIOGRAPHIES



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