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# Remote Patient Monitoring using Healthband

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**Abstract:** *The quantity of old residents is on the ascent around the world. Thus, the quantity of those living alone is likewise liable to increment. At the point when an old individual living alone has a coronary failure or falls at home, no one is around to alarm relatives or the specialist. It can take hours or days for the episode to be found, and the individual might be dead by that point. With this stressing situation furthermore, the developing maturing populace as a primary concern, we have thought of a framework that permits ready signs to be sent either consequently or at the press of a catch. This wearable wristband health checking framework involves a smart wristband gadget that can screen the soundness of an older individual and can discover regardless of whether the individual wearing it is in a health-related crisis and can consequently alert the relatives and specialists if fundamental. The gadget can speak with an advanced mobile phone and is furnished with selective and imaginative highlights.*

**Keywords:** *Arduino, Remote, Sensor, Health, Monitoring, Parameters, Health band, Database, Server*

## I. INTRODUCTION

In India the measure of the elderly population, i.e. people over the age of 60s is fast growing. In spite of the fact that it constituted as it were 7.4% of total populace at the turn of the new millennium. Rising health care costs and an expanding elderly populace are putting a strain on current medical care administrations [1].

Elderly patients, especially those with chronic conditions, require persistent long-term checking to distinguish changes in their conditions as early as conceivable. Major researchers and developers working in health care field have been centered on accomplishing common stage for therapeutic records, checking health status of the patients in a real-time way, making strides the concept of online monitoring, upgrading security and feedback from the patients. This requires creation or upgrading telemedicine services, which can provide required medical and healthcare services to those in need using advanced telecommunication services [2], mobile phone and is furnished with selective and imaginative highlights.

## II. RELATED WORK

Telemedicine and health monitoring are developing discipline every day. Research and improvement in this discipline is developing at a magnificent fee with technological advancement. With developing interest of researchers this area has many improvements associated to remote and persistent health monitoring and vital parameters monitoring. In this section of paper, we will discuss about some of many related works in remote health monitoring.

Young-Dong Lee a, Wan-Young Chung b [3] proposed a smart shirt with wireless sensor network compatibility. It is designed and fabricated for continuous monitoring of physiological ECG signal and physical activity signal from an accelerometer simultaneously. The adaptive filtering method is used to cancel noise and tested to get clear ECG signal even though during running or physical exercise of a person. But this Can lead to discomfort and also Noise due to change in weather conditions like rain and snow and also due to sweating is not considered. It has Limited battery life due to sensors and wireless nodes consume more power. Cost is more due to fabrication process.

Jacey-Lynn Minoi and Alvin W Yeo [4] proposed a Tele-Health monitoring system in a rural community through primary health center using internet of medical things. It allows the measurements to be automatically transmitted via wireless 3G network or Wi-Fi. Real time basis monitoring through the sharing of data with improved connectivity and monitoring from anywhere and anytime. It may face security issues. And It requires internet services to work.

## III. PROBLEM STATEMENT

Nature of human services benefits in country and urban regions aren't to an extent, as a result of an inadequate number of doctors in rustic zones medical services administrations are exceptionally poor. India contains about 68% of India's populace with half of it living underneath the neediness line, battling for better and simple access to social insurance administrations. Individuals living in country territories can't profit by preventive health administrations because of absence of framework. What's more, with the fast maturing of the total populace, the requirements of the continuous health support are expanding. Notwithstanding incessant heart

malady, there is a high likelihood that the patient will lose his life because of unreasonable exhaustion of the heart during rest around evening time, particularly in Chronic Obstructive Pulmonary Disease (COPD). Gadgets that give persistent checking of these patients are over the top expensive and touchy and require prepared faculty to use them [5]. It is feasible for such patients to be lined up persistently with wearable health gadgets while keeping up their day by day lives in the social condition. The dismissing of rural medicinal service framework is generally because of absence of pros specialists in rustic part.

#### IV. METHODOLOGY

##### A. System Design

The obstacles in present methodology are studied. The proposed methodology over-comes by means of continuous monitoring of patients with assistance of the health band, beneficial for patients, database record upkeep and indication to involved clinical officials. In this approach we used the mechanism of methods reachable for the ICU patient’s health.

A temperature sensor is used to measure temperature with an electrical output proportional to the temperature (in C). The body temperature of the patient can be measured by using The LM35 Linear Temperature Sensor module. This sensor gives a useful temperature values between -40 degree Celsius to 150 degree Celsius and used to measure ambient temperature [7]. A coronary heart beat rates display is a private monitoring system that approves one to measure one's heart rate in actual time or report the heart rate for later study. The ordinary resting grownup human heart rate tiers from 60-100 bpm. ADXL335 is a triple axis accelerometer [11]. Tipple axis in the experience that it can measure acceleration alongside three axes viz x, y and z. GSM SIM 900A module is used alert close person immediately in case of an emergency. Information given by means of accelerometer is used to realize the motion of the body. HC 05/06 Bluetooth module works on serial communication [9]. Serial statistics are dispatched to the Arduino. This data from Arduino is sent to a mobile application which is associated with patient and also simultaneously sent over the server for maintaining the file, keeping the record and continuous vital parameters monitoring for doctor or any medical professionals.

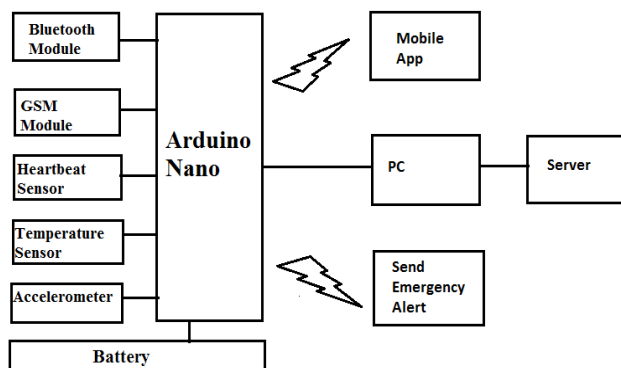


Figure 1 : General Block Diagram

##### A. Arduino Nano

The Arduino Nano could be a little, compatible, and breadboard-friendly board supported the ATmega328P (Arduino Nano 3.x). It's additional or less identical practicality of the Arduino UNO, however in an exceedingly completely different package. It works with a Mini-B USB cable rather than a customary one. Every one of the fourteen digital pins on the Nano may be used as associate input or output. Arduino Nano Pin out contains fourteen digital pins, eight analog Pins, two Reset Pins & 6 Power Pins [6]. The Arduino package includes a serial monitor that permits data in text format to be sent to and from the Arduino board. It comes with an associate in operation voltage of 5 V, however, the input voltage will vary from 7 to 12 V.

##### B. LM 35 Temperature Sensor

LM35 is employed to measure precise centigrade temperature. The output of this device shows linear variation with the input. The output voltage range of LM35 vary from -55 to +150 C. It additionally has low self-heating power. Its operational voltage is 4 to 30 volts. Within the most circuit, this device is employed with associate operational amplifier equipment. By victimization LM35 with operational amplifier equipment we are able to get amplification of output voltages of LM35. Its most and minimum input voltages are measure from 35 V and -2 V respectively. It usually operates at five V. It will measure temperature from -55 C to 150 C [7]. Its Output voltage is directly proportional (Linear) to temperature (i.e.) there'll be an increase of 10 mV (0.01V) for each 1 C rise in temperature.

**C. Heartbeat Sensor**

The basic heartbeat device consists of a light-weight emitting diode and a detector sort of a light sleuthing electrical device or a photodiode. Due to the heart beat pulses the flow of blood changes in different regions of the body. Once a tissue is well-lighted with the light supply, i.e. light emitted by the semiconductor diode, it either reflects or transmits the light (earlobe). A number of the light rays absorbed by the blood and also the transmitted or the mirrored light is received by the light detector. The quantity of light absorbed depends on the blood volume therein tissue. The detector output is in type of electrical signal and is proportional to the heart beat rate. Here a light Dependent Resistor device (LDR) is employed as a light detector [8]. It works on the principle that once light falls on the resistor, its resistance changes. As the light intensity will increase, the resistance decreases. Therefore, the voltage drops across the resistor decreases.

**D. Bluetooth Module**

HC05 module is a simple to utilize Bluetooth SPP (Serial Port Protocol) module, designed for straightforward wireless sequential connection setup. The HC-05 Bluetooth Module can be utilized in a Master or Slave design, making it an extraordinary answer for remote communication. It utilizes CMOS innovation and with AFH (Adaptive Frequency Hopping Feature). It is equipped with an integrated antenna and an edge detector with 3 Mbps EDR (Enhanced Data Rate) [9]. It has 2.4GHz radio transceiver and base band.

**E. GSM SIM 900A Module**

SIM900A GSM/GPRS modem is fitting and reliable modem with RS232 serial communication bolstered. Henceforth, Advantage of utilizing this modem will be that its RS232 port can be utilized to convey and create embedded applications. Applications like, information exchange, SMS Control, remote control and logging can be created. SIM900 modem underpins highlights like voice call, SMS, Data/Fax, GPRS and so on. SIM900A modem utilizes AT orders to work with bolstered highlights [10]. To be associated with a cell organize, the modem requires a SIM card given by a system supplier. This is an ultra-small and solid wireless module. The SIM900A is a finished Dual-band GSM/GPRS arrangement in an SMT module which can be installed in the client applications.

**F. ADXL345 Accelerometer**

The ADXL345 is a little, flimsy, three-axis MEMS accelerometer with high resolution (13-bit) estimation up to 16 g and has low power consumption. Advanced yield information is designed as 16-bit twos complement and is available through either an SPI (3-or 4-wire) or I2C computerized interface. The ADXL345 is especially can be utilized for cell phone applications [11]. It quantifies the static increasing speed of gravity in tilt-detecting applications, just as unique quickening coming about because of movement or shock.it can likewise recognize free fall, dynamic or inert state.

**V. FLOWCHART OF SYSTEM**

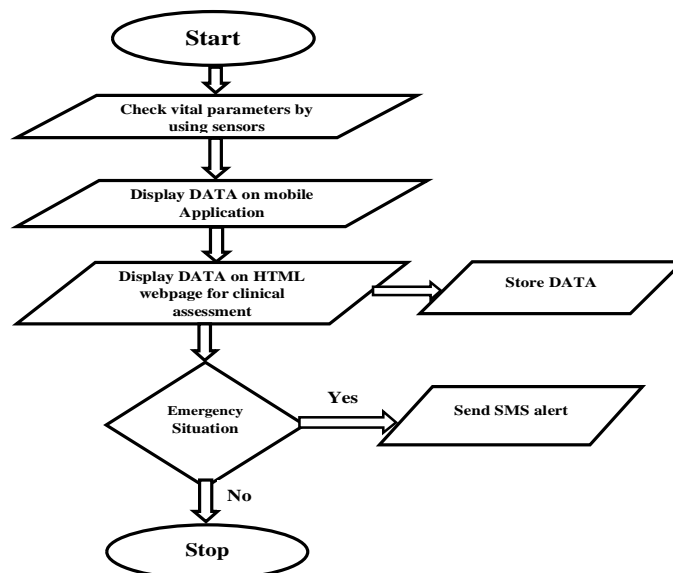


Figure 2 : Flowchart of System

## VI. WORKING AND RESULTS

The proposed framework suggests continuous monitoring of patients, useful for multiple patients, database report maintenance and indication to concerned medical officials. The LM35 Linear Temperature Sensor module can be used to monitor patient's body temperature. A pulse rate sensor monitor allows to measure heart rate in real time or record the heart rate for later study. And can be compared with the normal resting adult human heart rate which is from 60-100 bpm.

A Remote Patient Health Monitoring System (RPHMS) which has heartbeat detection system, steps count, temperature detection system. In addition to this, use of multiple microcontroller based intelligent system we use the idea of network technology with wireless applicability, providing each patient a unique ID by which the specialist can without much of a stretch recognize the patient and his/her status of vital parameters remotely. Utilizing the proposed framework, information can be sent remotely to the Patient Monitoring System, permitting ceaseless checking of the patient. Contributing exactness in estimations and giving security in appropriate ready component give this framework a more significant level of consumer loyalty and minimal effort execution in clinics. Data is prepared or put away by utilizing database server for following the historical backdrop of the client. Such a network with outer gadgets and administrations will take into consideration taking preventive measure (e.g., after predicting an up and coming heart stroke) or give prompt consideration (e.g., when a client falls and needs assistance).

The health band has all the sensors interfaced with microcontroller and the whole system is powered by power supply. Each sensor sends respective vital parameters such as temperature, pulse rate, movement to the microcontroller then that data is sent to the mobile application connected with database server via Bluetooth module. An emergency button is provided which is directly connected to GSM module via microcontroller. This additional feature allows patient to contact relatives or medical professionals through an alert message. This data of patient stored on a server is accessible by concerned doctor for remote monitoring and advising regularly.

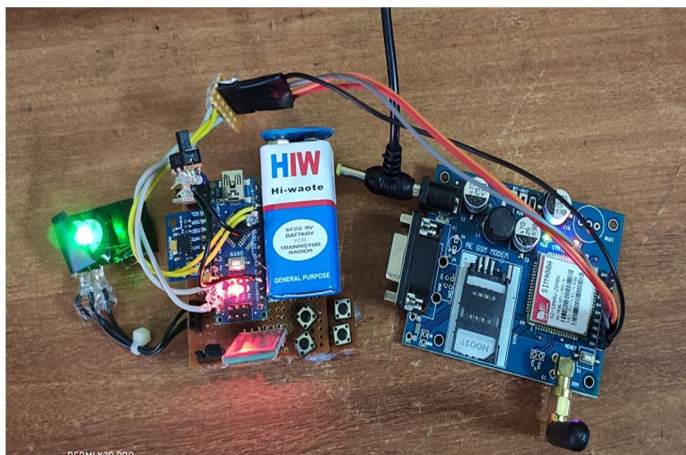


Figure 3 : Health Band with GSM Module



Figure 4 : Mobile Application for Health Monitoring

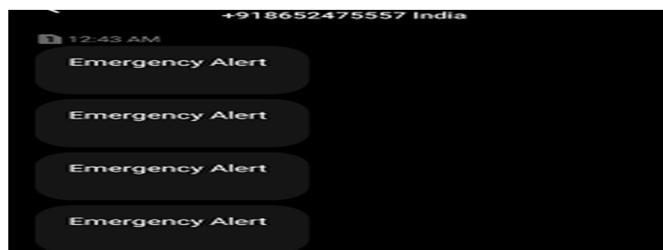


Figure 5 : Emergency Alert via SMS to relatives

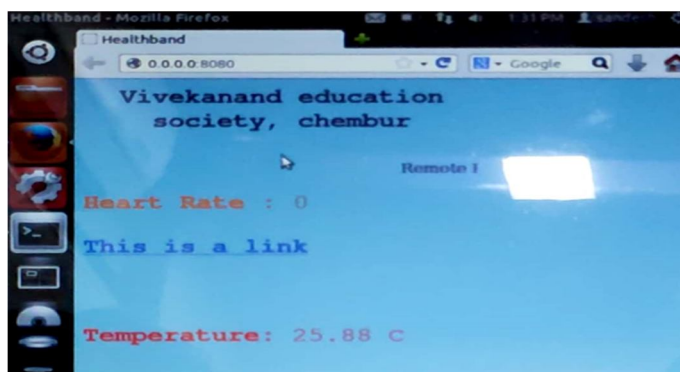


Figure 6: Monitoring via HTML Page for Doctor

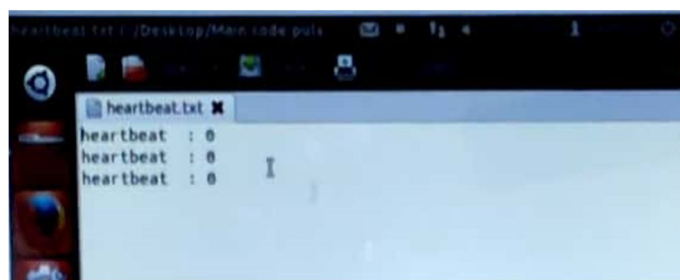


Figure 7: Data stored on server

## VII. FUTURE PLAN

The future work of the project is extremely essential so as to create the planning system additional advanced. In the designed system the enhancement would be connecting more sensors which measures various other health parameters and would be beneficial for patient monitoring. In the future, a portable health monitoring system can be designed using Arduino. The new inventions in technology will lead to a reduction in the size and cost of band making it more compact and lightweight.

## VIII. CONCLUSION

Today, many services can be reached with internet technology and the number of applications that use this technology is constantly increasing. One of them is the keen health field and this part offers staggering open doors for us with new applications. The monitoring of the patients, who should be kept under constant surveillance, in the hospital environment is very difficult with the existing infrastructure and methods. Patients under surveillance in hospitals are dependent on bedding and this makes the patients uncomfortable. Many health problems that require early diagnosis may cause vital problems for the patient because they cannot be monitored on time. Early diagnosis is unbelievably important for patients with heart disease. New items and innovations are being developed. ARDUINO nano was seen as increasingly smaller, easy to understand and less mind boggling, which could promptly be utilized to play out a few monotonous and tedious assignments. Reproduction of scenario performed by utilizing Proteus simulation programming by putting proper sensors like temperature and heart beat rate for detecting the wellbeing condition and the outcomes are dissected under typical conditions and variation from the norm conditions. This arrangement of patient health monitoring can be exceptionally utilized in crisis circumstances as it very well may be every day observed, recorded and stored in a database SQL server.



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