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# A Laboratory Application for Measuring Heart Beat and Body Temperature using Wireless Technology

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**Abstract:** *The health care system delivers quality services to all people, when and where they need. This work presents a wireless system and the system is capable of measuring the heart rate and temperature of a person using a single device based on Bluetooth technology. Most monitoring systems are used in hospitals and laboratories, but it is of great need that a system with low cost must be designed so that it can be used in institutions for educational purposes. The body temperature and heart rate varies from person to person. This system picks up the signal from the subject and send it wirelessly to the server using Bluetooth transceiver. This project aims at the design and implementation of a low cost, efficient and flexible heartbeat and body temperature monitoring system using microcontroller. It displays the body temperature and heart rate of a patient in a minute. This data received from module can be saved and viewed for further medical usage. This system can be incorporated and integrated as a part of telemedicine component.*

**Keywords:** *Heart rate, temperature, microcontroller, Bluetooth module, health care.*

## I. INTRODUCTION

Pulse and body temperature are the significant signs that are routinely estimated by doctors after the arrival of a patient. Heart rate alludes to how often a heart contracts and relaxes in a unit of time. Heart rate fluctuates for various age gatherings. Exercises, for example, physical exercise, rest, tension, stress, disease and ingestion of medications can incite changes in pulse of a man. A typical resting heart rate is around 72 thumps for every moment (beats per minute-bpm), for a human grown-up with age at least 18. A lower vital sign of heart still suggests better cardiovascular wellbeing. Infants have a substantially higher rate than grown-ups around 120 bpm and more seasoned youngsters have heart rate around 90 bpm.<sup>[1]</sup> The heart rate increments bit by bit amid exercise and comes back to its normal range after exercise. The rate at which the beat comes back to its typical esteem means that the wellness of a man. On the off chance that the heart rate is lower than the ordinary heart rate, it means that the condition known that a condition known as bradycardia and if the heart rate is higher than the typical heart rate, it means that a condition known as tachycardia.<sup>[2]</sup>

Heart rate is certainly not a steady esteem and it increments or declines with reaction. The ordinary SA(Sino atrial) node terminating rate is influenced via autonomic sensory system action: thoughtful incitement increments and parasympathetic incitement diminishes the terminating rate.

Heart rate is estimated by finding the beat of the heart. This heartbeat rate can be found anytime on the body where the courses throb is transmitted to the surface by forcing it with the list and center fingers (a great territory is on the neck, under the edge of the jaw.) the thumb ought not be utilized for estimating someone else's heart rate as its solid heartbeat may meddle with the right view of the objective heartbeat. The outspread course is the least demanding to use to check the heart rate. This is essential basically in patients with atrial fibrillation, in whom heart thumps are unpredictable and stroke volume is to a great extent not quite the same as one beat to another.<sup>[3]</sup>

Ordinary body temperature additionally differs from individual to individual and changes for the duration of the day. The body temperature is most reduced in the early morning and most staggering in the early night. The ordinary body temperature is around 37° C or 98.6° F. Be that as it may, it can be as low as 36.1° C (97° F) in the early morning and as high as 37.2° C (99° F) and still be viewed as typical. Accordingly, the ordinary range for body temperature is 97 to 100 degrees Fahrenheit or 36.1 to 37.8 degrees Celsius.<sup>[4]</sup> Normal human body temperature otherwise called normothermia or eutheria. Singular body temperature relies on the age, effort, contamination, sex and conceptive status of the subject, the time, the place in the body at which the estimation made and the subjects condition of cognizance. Taking a man's temperature is an underlying piece of a full clinical examination. There are different sorts of restorative thermometers, and in addition locales utilized for estimation, incorporating into the rectum (rectal

temperature), in the mouth (oral temperature), under the arm (axillary temperature), noticeable all around (tympanic temperature), in the nose, in the vagina (vaginal temperature), in the bladder and on the skin of the brow.<sup>[5]</sup>

Numerous outside components influence the deliberate temperature also. Ordinary qualities are for the most part given for a generally healthy, non-fasting grown-up, in a room that is kept at a typical room temperature, 22.7 to 24.4° C amid the morning, however not long after emerging from rest. Besides, for oral temperatures, the patient must not have eaten, smashed or smoked anything in at any rate for the past fifteen to twenty minutes, as the temperature of the nourishment, drink, or smoke can significantly influence the test results. Temperature is expanded subsequent to eating or drinking anything with calories. Caloric limitation, with respect to a weight reduction eating routine declines by and large body Temperature. Drinking liquor diminishes the measure of every day change, marginally bringing down daytime temperature and observably raising evening time temperatures.<sup>[6]</sup>

## II. LITERATURE REVIEW

The crucial thing in maintaining health is to know the conditions of the basic signs which can be routinely seen by health care system providers. Essential signs made up of body temperature, beat rate, breath rate (breathing rate) and pulse. Crucial signs are helpful in distinguishing or checking therapeutic issues. Moreover, crucial signs can be observed at wellbeing suppliers, at the site of a medicinal crisis and even at home.

There are numerous plans of the indispensable signs observing framework in writing. Parekh has planned sensors for wearable indispensable signs estimation framework to screen body temperature, respiratory rate and blood pressure.<sup>[7]</sup> The work utilizes a thermistor as a temperature sensor, a heartbeat oximeter to quantify pulse and electrocardiogram to gauge pulse. The acquired information is continuously and sent to the simple analog to digital converter (ADC) to show the yield. Another work built up a wearable physiological checking framework for space explorers called LifeGuard which is likewise material to clinical and home-wellbeing observing application.<sup>[8]</sup> The gadget is equipped for estimating ECG, temperature, pulse, respiratory rate, oxygen immersion and circulatory strain/force. All the more as of late, Laine et al. created universal human services frameworks utilizing the Zigbee-based sensor to accumulate imperative signs information, for example, ECG and heart rate.<sup>[9]</sup> The created gadget is additionally furnished with cautions, warnings, and examination of therapeutic information.

There are additionally different indispensable sign observing gadgets in the market. Be that as it may, these gadgets are over the top expensive and have an unpredictable framework which is troublesome for locally situated observing purposes.

Nowadays, the overall public especially adults, would not support the routine checkups primarily in light of the way that they feel strong. Notwithstanding, what they don't understand is that, the target of standard restorative checkups is to confirm any therapeutic issues as ahead of schedule as could reasonably be expected, with the goal that they can maintain a strategic distance from genuine medicinal related inconveniences later on. Besides, ordinary visits to doctors can give them about their wellbeing current circumstance, which thus, urge them to keep up a solid way of life. Another motivation behind why the familiarity with standard wellbeing checkups are low is on the grounds that time limitations and transportation trouble to visit wellbeing supplier. These are additionally the reasons why patients with a specific sicknesses who are recovering at home tend to avoid ordinary restorative registration at the clinic.

Subsequently, so as to assist the general population with taking consideration of their wellbeing inside the comfort of their own home, there is the need to give them a compact wellbeing observing framework which is minimal effort and simple to utilize. This work is inspired by this goal, by planning a compact patient observing framework which can screen body temperature and heartbeat rate. By utilizing the proposed framework, therapeutic staff can additionally screen and examine patients conditions at his/her office without the need to meet patients.

## III. METHODOLOGY

The system contains a wearable contraption which is related with an Arduino UNO that techniques the commitment from the sensors, and thereafter yield the results using LCD (Liquid crystal display) show and Bluetooth module. The device contains a thermistor and heartbeat sensor. The customer estimates the body temperature by reaching the thermistor. This thermistor can measure temperatures and shows in LCD. Moreover, it has a sharp response time with low power usage, making it fitting for therapeutic applications. In the proposed checking system, the body temperature regard is appeared on a LCD. Of course, a heartbeat sensor is used to perceive the subject's pulse rate.

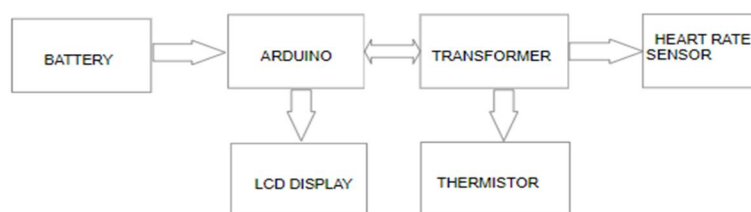


Fig 1. Block diagram

#### IV. WORKING

The purpose of this proposed approach is to diagram a modified remote prosperity monitoring system. The objective is to screen the temperature and heart beat of the patient's body which ought to be displayed to the pros. In specialist's clinics, the checking of the patients prosperity is done by the staff people from the recuperating focus. The temperature and pulse of the patient's body is checked constantly and a record of it is kept.

The required parts used in this structure fuse a power supply, ATmega328 microcontroller, a thermistor, heart beat sensor and a LCD display. The ATmega328 microcontroller is used as a CPU for checking the temperature of the patient. This joins a power supply deter that supply ability to the whole circuit, and a temperature sensor is used to distinguish the temperature and beat of a patient's body.

The circuit diagram of the modified remote prosperity checking system fundamentally fuses transmitter fragment and beneficiary portion. In the TX section, the temperature and heart beat sensor is used to perceive the temperature and beat of the patient's body and the data which are sensed by the sensor is sent to ATmega328. The transmitted information can be encoded into sequential data over and the temperature of the patient's body regards is appeared on the LCD demonstrate using a gathering contraption arranged toward the transmitter and the data from the transmitter is transmitted to the beneficiary end. Five Volt of information is taken from the battery source to the arduino. Arduino has been changed to screen the yield from the senor and thermistor. Transformer is used to increase or decrease and parity out the current from the arduino. From the transformer, heart beat sensor and thermistor brings the data and yield is given to arduino. The yield is traded to the LCD to demonstrate the identified heart beat and temperature.

The beat was assessed with the help of photodiode and splendid LED while the temperature was evaluated by using precision composed thermistor. Both the data were set up in the arduino uno and sent to the remote end remotely by using transmitter and got at the remote end by using beneficiary. The data was taken care of in the arduino uno and the data assessed was appeared with the help of LCD at the remote end.

#### V. RESULT ANALYSIS

The portable wireless system developed is analysed by measuring the heart beat and temperature of some 10 persons with various age. And the result is reported here.

SUBJECT	AGE	HEART BEAT	TEMPERATURE
S1	19	80	36
S2	20	79	35
S3	26	76	37
S4	37	79	36
S5	43	65	35
S6	49	72	36
S7	52	72	36
S8	54	71	36
S9	61	69	36
S10	65	69	35

Fig 2. Result analysis



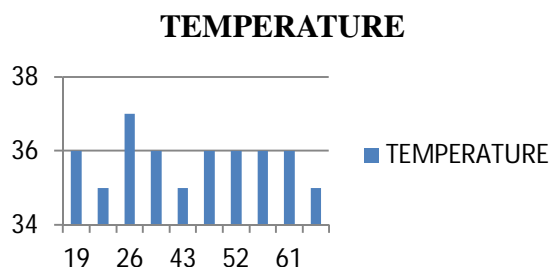


Fig 3. Graphical representation of temperature vs age

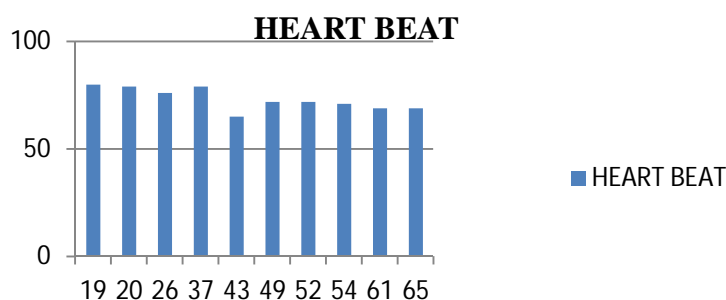


Fig 4. Graphical representation of heart beat vs age

## VI. CONCLUSION

As the aggregate populace is getting the chance to be increasingly prepared, the need to make structures to encourage elderly and debilitated inhabitants is pressing. The assignment discussed in this paper prescribes the enhancement of a pulse and temperature estimation together in a singular device. For that, it was created and working nearby an Arduino Uno board. The proposed system was attempted and the revelations prescribe that the structure works sensibly well, yet a couple of improvements will be taken in regard with the outside diagram of the system. The essential view of this system is it is physically working and it can very well supports the institution/educational field.

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