

# MULTI PATIENT MONITORING AND CONTROL USING EMBEDDED SYSTEM

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**ABSTRACT** - Multi – parameter patient monitor is used to determine the patient condition by capturing the physiological vital sign and alert the respective medical staff using alarm. The evolution of machine learning and Internet of Things (IOT) in healthcare. In this model, an IOT based MPM system is designed to monitor the body temperature of the patient, heart rate, respiration rate and oxygen saturation using respective sensors. With the Wi-Fi module the reading from the sensors are transferred to the cloud storage and it is used in front end web application. To ensure the condition of multiple patients, a web application is developed using JavaScript. This provides the live analysis to monitor with a graphical representation of their body temperature and oxidation level. The details of each patient can be referred by the doctor at anytime using this application. The doctor will get a notification through the web application, whenever the patient's health is unusual. Thus this project helps patient as well as doctor because actions are taken immediately for multiple patients without consulting directly. In this project we use Support Vector Machine (SVM) algorithm to improve the performance of MPM system. By this 95% of the accuracy is achieved.

Keywords: Mutli patient; Internet of Things; Zigbee; Support Vector Machine

## 1. INTRODUCTION

Patient monitoring system helps to inform the present health condition of the patient to their guardian or doctor by monitoring the physiological signs. In spite of visiting the hospital and consulting the doctor in-person, this IOT based approach helps to minimize the time consumption. Thus the patient gets regular medical checkups more conveniently. Wireless technology plays a vital role in the growth of different sectors. Targets of this work is to design a home based smart device for aged patients, reading of physical parameters the use of wireless intelligence, according to the statistics received (i.e.) Healthrate,spo2 and many others.

Health is usually a primary subjects in the human race is advancing in phrases of technology. Just like the recent corona virus assault that has ruined the economy of China to a volume is an instance hot fitness care has end up of

predominant importance. In such regions in which the epidemic is unfolded, its far usually a better concept to screen those suffers using far off health monitoring technology.

So the only solution is health monitoring system by IOT.

## 1.1 Work Specification

- Remote Patient Monitoring system enhances the observation of aged person who reside far away from hospital. This in turn reduces the transport expenses of the patient.
- The primary objective of this project is to create and install patient monitoring system, which tracks the health of the patient using sensors and notify to their family members or doctors in case of any emergency. It also helps to reduce the medical expenses like physician office visit, hospitalization, etc.
- Temperature and pulse recognition are used by each one of our bodies to assess our overall health. The sensors are connected to a microcontroller that tracks the status and is therefore interfaced to an LCD panel, as well as a remote connection that can exchange alarms. If the framework detects any unexpected changes in heart rate or body temperature, it notifies the user about the patient's state via IOT and also displays subtle features of the patient's pulse and temperature in real time on the web. In this way, an IOT-based tolerant wellbeing tracking framework effectively utilizes the web to monitor silent wellbeing measurements and save time. Between the proposed system's SMS-based patient development viewing and the IOT-based patient checking framework, there is a substantial capability.
- The reason in the back of that is the records should be checked by using passing by a website or URL. Even as, in GSM based affected person viewing, the flourishing parameters are dispatched utilizing GSM with the aid of strategies for SMS. In most of the rural areas, the scientific facility could no longer be in a hand attain distance for the natives.
- As a result, most people overlook any minor health difficulties that manifest themselves early on in the form of changes in key indicators such as body temperature, cardiac rate, and so on. When a person's health problem has progressed to the point where his or her life is in jeopardy, they seek medical help, which can result in an unwarranted waste of money. This is important to consider, especially when an epidemic spreads in a region where doctors are unable to reach. To prevent the transmission of disease, giving patients a smart sensor that can be monitored from afar would be a workable option that could save many lives.
- Journal of critical reviews, "IOT BASED HEALTH MONITORING SYSTEM" 740 in this project describes the conceptual system, the experimental setup, which includes the circuit, and the implementation algorithm. The experimental outcomes are discussed in section of this project.

## 2. EXISTING SYSTEM

Nowadays patient monitoring system is used if the patients are in the bed. It occupies huge space and can be used in ICU. The system that we develop will help to monitor patient when he is out of bed as well as in the bed. The system mainly monitors main parameters of the body like temperature; heart rate and it compare the value with the set value. If the value crosses certain limit it will send a pop up message to the doctor and family members. In such cases the affected person gets a totally quick medical help and additionally might save time and strength of the spouse and children who wishes to be with them all time.

At present, people love to live a healthy life. Due to increase in pollution and stress level people are affected by heart related diseases which leads to heart attacks. It is important to maintain regular checkups to lead a healthy life.

Patient tracking refers to the nonstop remark of repeating activities of physiologic function to manual remedy or to screen the effectiveness of interventions and is used usually inside the Intensive Care Unit (ICU) and running room. At the least in India there is no system which continuously monitors the patient when patient is on flow and this inspired us to work on this place.

## 2.1 Drawback Of Existing System

- Need to be hospitalized.
- Frequent patient monitoring is not possible once he/she is sent off from the hospital.
- System cannot be used at individual level.

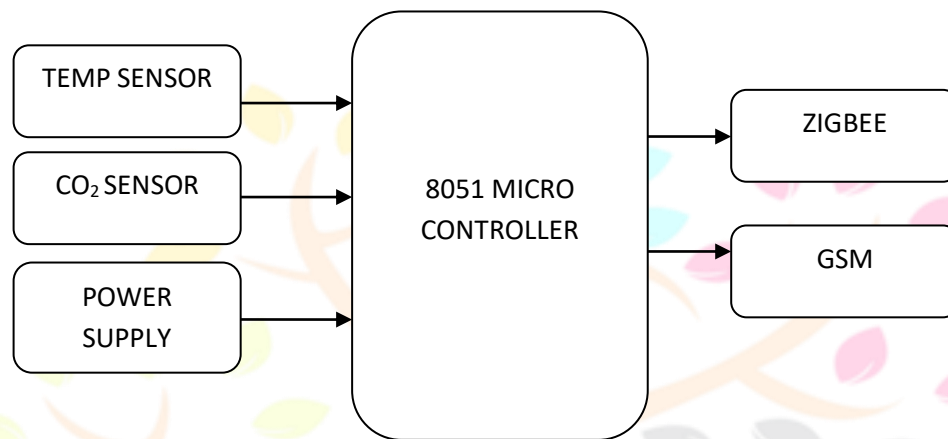


FIGURE 2.1 Block diagram of Existing System

## 3. PROPOSED SYSTEM

The development and construction of a intelligent client health monitoring system are the main priorities of all that kind of project. The described system's observation suggests that sensor is implanted on the person's body to detect client's temperature as well as pulse. Two extra sensors are embedded as residence to detect the temperature and humidity of surgical ward. These monitors are paired to such a monitoring system it sums up the values all four sensor. The above analytics data are sent off to the access point through an IOT cloud storage. These data obtained by physician for any other location from ground station. When a patient arrives a treatment centre, system monitor physiological signals, that are transferred into electrical pulses. Therefore the simple electric power flag gets modified to the enhanced symbol(digitized content) as well as retained in RFID.

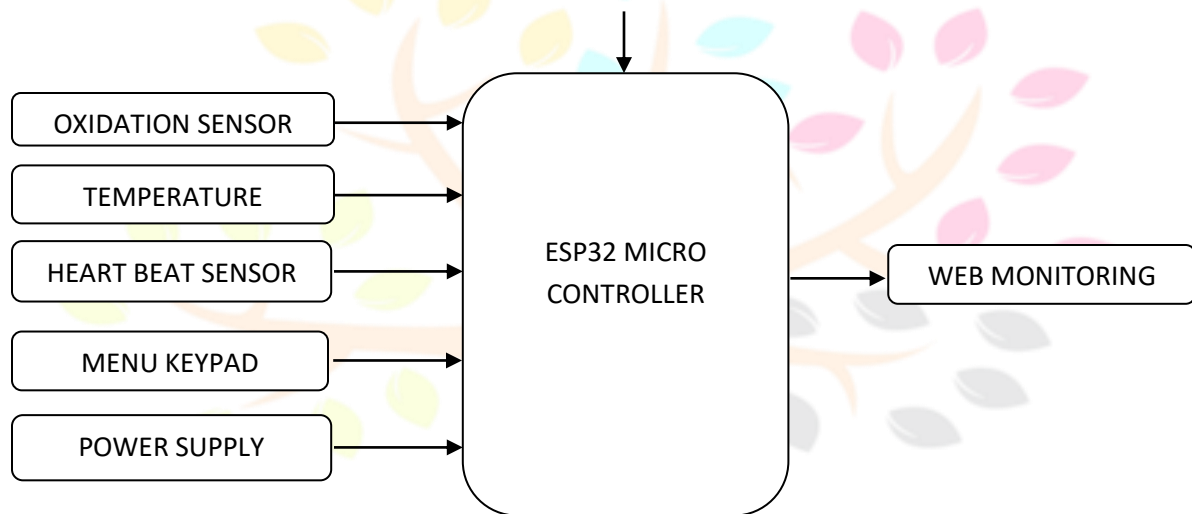
A Zigbee procedure can be used to transfer digitalized data to a particular server. Zigbee is a good choice for this framework. It consists of large number of cell unit. It is compactable for small device. Through WLAN the information is transferred to therapeutic server. At therapeutic server, it analyses the past information and adds the latest information and transfers it to the doctor. If the patient is new then it creates new record for him and stores it in the database. Using IOT the data are transferred to the doctors easily.

With the help of LCD, we can monitor the humidity, heart rate and body temperature. The sensor results are kept in the database. The range of the body temperature and heart rate are defined in the sensor. The disease of the patient are diagnosed based on the various range values. The full body health checkup is help to check whether the patient is healthy, unwell, fever or hypothermia.

### 3.1 RULES FOR DIAGNOSIS:

By observing the membership functions of pulse rate and body temperature, we can define the rules for diagnosis.

- If the rate of body temperature and pulse are (HIGH & HIGH) OR (LOW & LOW) OR (HIGH & LOW) OR (LOW & HIGH), then the person must go for full body checkup.
- If the rate of body temperature and pulse are (HIGH & NORMAL) OR (LOW & NORMAL), then the person is unhealthy.
- If the rate of body temperature and pulse are (NORMAL & HIGH), then the person is having fever.
- If the rate of the body temperature and pulse are (NORMAL & NORMAL), then the person is healthy.
- If the rate of the body temperature and pulse are (NORMAL & LOW), then the person is having hypothermia.



**FIGURE 3.1 Block diagram of Proposed System**

### 3.2 Experimental Workflow

The microcontroller calibrates the sensors of body temperature, heart rate, humidity and room temperature. The main objective of health monitoring system is to display the patient's results visible to themselves through the LCD display. The results are then send to server. The authorized user can access the data with the help of IOT application platform. The patient values are shown in the application.

Based on the results the patient disease is diagnosed by the rules set. By diagnose the disease of the patient, the doctor can suggest the appropriate treatment to cure the disease. When the body temperature, heart rate are taken as 37°C and 72.8 BPM (NORMAL), the output health state is 91.4, which is in healthy membership function. For every input sensors, the output can be determined and diagnosed.

## 4. RESULT & DISCUSSION

The blood pressure of two or more patients was monitored simultaneously. The original pressure sensors are attached to one patient and the remaining patients were checked using potentiometer. The value of the sensors ere transmitted and obtained in real time, in the personal computer using USART application.

#### 4.1 Theoretical Calculation:

The bio medical sensor networks were used to check the critical condition of the patients. Therefore our human lives are solely depend on this network the IEEE 802.15.4 standard performance is noted in terms of transmission delay, packet delivery rate and propagation time.

When the payload data is large, the packet delivery rate increases. Due to this it requires more transmission time. From IEEE 802.15.4, the calculation made are as follows:- MAC Header size = 10 Bytes MAC Footer = 3 Bytes Hence, Data Payload = 117 Bytes, MAC Packet Size =127 Bytes.

The result from the calculated blood pressure is divided into three categories they are normal, mild hypertension and hypertension. By this we can analyze the condition of the patient. The normal blood pressure value is between 80-120. If the value is between 120-140 then, they have mild hypertension. Patient having blood pressure above 140 are having hypertension. The various data rate of bio medical signal in Table 1.

**TABLE 1. Data Rate of Signals**

S. No.	Data Rates of Signals		
	Signal	Data Rate	Units
1	Heart Rate	0.01-10	Kbps
2	Pulse Oximeter	0.01-10	Kbps
3	Temperature	0.01-10	Kbps

The maximum time limit to receive various measured medical parameters is listed in Table 2.

**TABLE 2. Maximum Time Limit**

S.No.	Data Rates of Signals		
	Signal	Time	Units
1	Heart Rate	5	Sec
2	Pulse Rate	5 to 10	Sec
3	Temperature	20	Sec

Therefore the sampling time required for each signal can be calculated as given in “(1)” Transmission time per frame = Data payload/Data Rate (1) Data payload = 117 bytes. The transmission time required for various signals is listed in Table 3.



**TABLE 3. Time Per Frame**

Data Rate Chosen(kbps)	Data Rates of Signals		
	Signal	Transmission Time per frame	Units
10	Heart Rate	0.0912	Sec
3.2	Pulse Rate	0.285	Sec
5	Temperature	0.1824	Sec

From the above calculation a single patient frames are sent in around 0.8 seconds only. For four patients it only requires 3.2 seconds. Hence six patients parameters are transmit to patient monitoring system without loss of data. Hence IEEE 802.15.4 is used to send multiple patient parameters to the single patient monitoring system.

## 5. CONCLUSION & FUTURE SCOPE

Internet of Things is currently seen as a realistic solution for any distant value tracking, particularly in field of healthcare monitoring. It enables the secure storage of individual health parameter data in the cloud, the reduction of the hospital visits for routine checks and most importantly the monitoring and diagnosis of disease through any doctor anywhere at distance.

An IOT-based health monitoring system was created as part of this project. The system used sensors to measure body temperature, pulse rate, room humidity and temperature, which were also shown on an LCD. Such sensor data are subsequently wirelessly transmitted to a medical server. These data is subsequently set to an IOT-platform enabled smart phone belonging to a patient's health status based on the results.

This project had a dual goal that was focused and on and met. First, a low-cost IOT based MPM method was designed. The second step was to model and test a successful SVM algorithm MPM based Internet of Things is more effective than the current approach.

Future studies may concentrate on merging machine learning techniques with cloud computing because than patients can receive case at a remote location and high quality healthcare can be provided.

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