

# Remote Healthcare Monitoring System

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**Abstract-** This paper deals with design and developed for remote healthcare monitoring system. The primary function of this system is to constantly monitor patient's physiological parameters such as pulse rate, Temperature and ECG. In hospitals, where patient's physiological parameters are needed to be constantly monitored, is usually done by a doctor or other paramedical staff for maintaining a record of it. It is a tedious method. In this proposed system transmitting module continuously reads patient's pulse rate or heart beat rate, temperature and ECG through a pulse sensor, temperature sensor and ECG electrode.

**Keywords:** Microcontroller, Ardiuno, IOT, ESP8266, ECG, Cloud, Thingspeak.

## I. INTRODUCTION

The rate of diseases in India has increased especially among young men, and about 35 percent of deaths in India are due to cardiovascular diseases. Majority of them die due to heart attack because they cannot reach hospital within an hour. This is mainly due to the improper food habits, lack of physical activity, stress, smoking and alcohol consumption. Increasing population, increasing pollution has affected day-to-day life. Also large number of vehicles and undisciplined traffic has invited the number of accidents every day. Also the stress on the mind is too much and brain popularly known as Blues are demanding the need for the well-equipped hospitals and diagnostic centers.

The today's hospitals are huge and with large areas in a building. They may occupy no. of floors in one building. Different wards are situated at different places such as men's wards, women's wards, maternity

wards, general wards, special rooms, and more importantly ICU's, so there is need to keep monitoring all the Patients in these wards continuously, and this requires more manpower. It is not feasible for the doctors to go to each ward and monitor each

patient frequently after each half an hour. Also people who live in rural areas and physically challenged people don't get proper treatment. Doctors in hospitals are having high workload and it is difficult to give treatment to all the patients simultaneously. It is also difficult to manage, analysis and maintain the data of patients. To get rid of these problems we

have developed wireless remote healthcare monitoring system which can be used efficiently to monitor the patient's physiological parameters such as body temperature, pulse rate, ECG monitoring. These parameters will be analyzed by biomedical officer in the cloud and it will be transmitted to the doctor as per the need. In case of critical condition ambulance service will be provided to the patient. In this way it is beneficial for the hospitals to use this system. By employing this system they can reduce their manpower. Due to this overhead of the doctors can be reduced up to large extent and their precious time can be utilized for the some good cause. In this system the patient's physiological parameters are continuously monitored and the acquired data is transmitted to a ARDUINO UNO.

A ESP8266 wifi module is connected to every patient monitor system that consumes very low power and is extremely small in size. The data is accessible to doctors through mobile device for convenience. Data of all patients is stored in a Thingspeak. This data is analyzed by the medical officer and action is taken accordingly.

## II. REVIEW OF LITERATURE

[1] K.C. Kavitha, A. Bazila Banu: Wireless Health Care Monitoring, 2014 International Journal of Innovative Research in Science, Engineering and Technology Volume 3, Special Issue 3, March 2014.

- This paper deals with design and Develop for remote patient Monitoring in health care monitoring.
- The various sensor used here are accelerometer sensor, pulse rate sensor, Respiration sensor, Blood pressure sensor. These parameters are used to measure pulse rate, blood pressure, pulse rate, movement of patient.
- In this project data are displayed by using WAMP for windows Apache (an HTTP Server), MySQL for stored information in database and PHP language for server side communication.
- The pulse wave form can be viewed using the pulse sensor amped visualizer.
- Our proposed project will measure the parameters which are not Our proposed project will measure the parameters which are not mentioned in this system that are temperature and ECG which are the most important parameters.
- Our proposed system will send the sensor data to the cloud database so that it can remain safe and historic data can be viewed whenever needed.

[2] Harshvardhan Patil, Prof. V.M. Umale: Arduino Based Wireless Biomedical Parameter

Monitoring System Using Zigbee, International Journal of Engineering Trends and Technology (IJETT) – Volume 28 Number 7 - October 2015.

- This paper has included the ECG module and it measures the ECG of the patient and send the data through wireless transmission module using Zigbee.
- The Single lead heart monitor sensor is used to measure the ECG and the pins are connected to the heart rate monitor which if further connected to the Arduino and data is sent through Zigbee.
- Out proposed project will use this sensor to

measure the ECG of the patient and further analysis will be done on the measured ECG to avoid any critical condition.

## III. PROPOSED METHODOLOGY

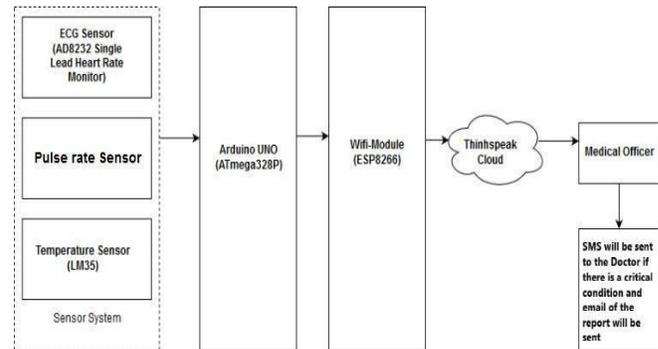


Figure 1: System Block Diagram [3]

The sensors are used to sense the information and Microcontroller is used to receive the data from the sensor. Using a ESP8266 wifi module the sensor data is send to thingspeak cloud database and finally displays record to doctors via web browser. The data sent to cloud is analyzed by the medical officer and in case of critical condition; respective message will be forwarded to the doctor.

The process begins when medical staffs does registration of user in cloud database. This data is stored in the central cloud database. When user wants to get information about his/her physiological parameters he will send his/her credentials to cloud for authentication process. If authentication is successful patient can carry out activities such as measuring his/her physiological parameters with the help of sensors.

This physiological information will be passed to the Arduino microcontroller. This information is further send to the ESP8266 module. This ESP8266 module will send the data to cloud database. The medical officer will perform analysis on data according to the threshold value of respective patient. If the critical condition occurs ambulance service will be called or medical services will be provided as per the need arises.

#### IV. HARDWARE USED

##### Arduino Uno (Atmega328P) Microcontroller:

This one is the most important module of our project. It is used to get input from various Sensor and send the data to cloud using Wireless Sensor Networks

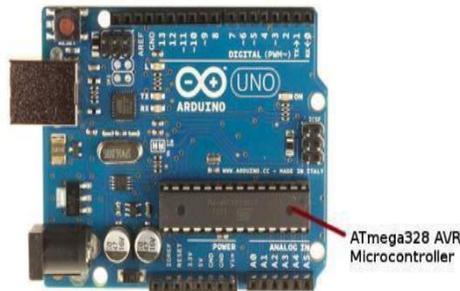


Figure 2: Arduino Uno328P [4]

##### AD8232 Single Lead Heart-rate Monitor:

Electrical activity of the heart is analyzed with the AD8232 Single Lead Heart Rate Monitor. The electrical activity of the heart is analog in nature and charted as an ECG or Electrocardiogram. The signals of ECG are extremely noisy, AD8232 acts as an op amp for getting clear signals from the PR and QT intervals.



Figure 3: AD8232 Single Heart Rate Monitor [5]

##### LM35 (Temperature Sensor):

LM35 is a precision IC temperature sensor. LM35 is an integrated circuit sensor used to measure temperature with an electrical output proportional to temperature in  $^{\circ}\text{C}$ . The temperature measurement is more accurately than thermistor or any other temperature sensor device. The sensor circuitry is sealed and not subject to oxidation.

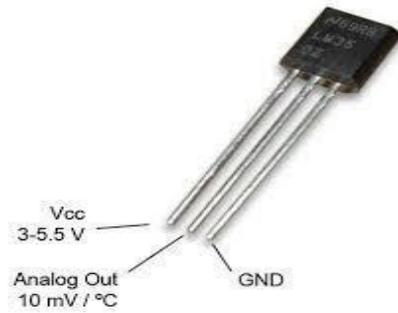


Figure 4: LM35 Temperature sensor [6]

##### ESP8266 WiFi Module:

The ESP8266 wifi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your wifi network. The ESP8266 is capable of either hosting an application or offloading all wi-fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much wifi-ability as a wifi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

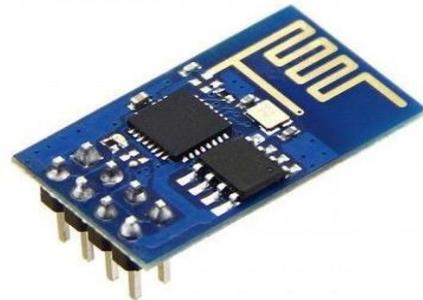


Figure 5: ESP8266 module [7]

##### Pulse Rate sensor:

The pulse sensor amped is a plug and play heart rate sensor for Arduino. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse reading. Simply clip the pulse sensor to your earlobe or fingertip and plug it into your three or five volt Arduino and you're ready to read heart rate.

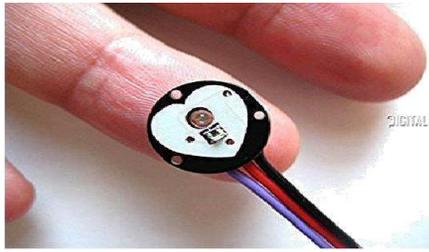


Figure 6: Pulse Rate Sensor [8]

## V. SOFTWARE USED

In the softwares the website is developed using PHP, HTML, CSS and JavaScript. It has admin login which has functions to add the doctor, get doctor's information, add patient information this information collected through forms is stored in MySQL database. The patient's has an Thingspeak channel ID which is used to get the details of the physiological parameters of the patients through the sensors. The data is plotted onto a graph which shows current and past values with time and date.

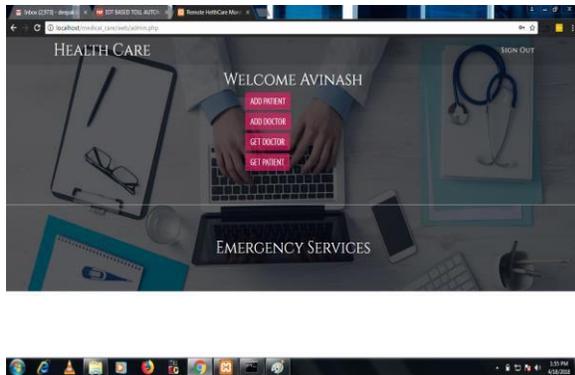


Figure 7: Admin Dashboard

## VI. RESULTS

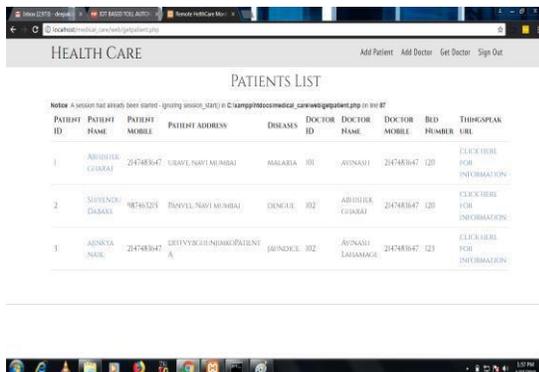


Figure 8: Patients List at Admin Dashboard

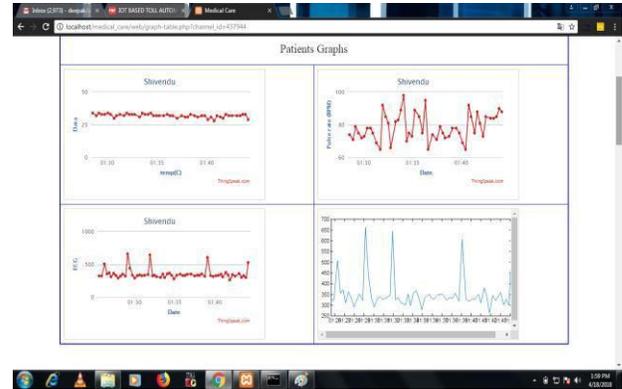


Figure 9: Parameter Data Graph on Website

Created_at	Entry_id	Field1	Field2	Field3
2018-03-26 19:58:33 UTC	119	34	74	332
2018-03-26 19:58:54 UTC	120	32	71	323
2018-03-26 19:59:10 UTC	121	34	79	368
2018-03-26 19:59:28 UTC	122	33	75	443
2018-03-26 19:59:47 UTC	123	33	72	332
2018-03-26 20:00:04 UTC	124	34	75	390
2018-03-26 20:00:22 UTC	125	32	78	327
2018-03-26 20:00:41 UTC	126	30	78	199
2018-03-26 20:00:57 UTC	127	32	75	326
2018-03-26 20:01:18 UTC	128	33	69	333
2018-03-26 20:01:42 UTC	129	32	85	345
2018-03-26 20:01:57 UTC	130	34	92	645
2018-03-26 20:02:15 UTC	131	33	85	325
2018-03-26 20:02:31 UTC	132	33	81	333

Figure 9: Parameter Data in Table Format

## VII. CONCLUSION

The proposed Remote patient monitoring system is integration of embedded and web application, provides a platform in cost efficient manner, solution for patient and doctor located at a remote location. The doctor can come up to a conclusion by examining and monitoring the health parameters of the patients at remote locations.

The abnormal change in values of patients health parameters can alert the doctor and help in taking the necessary actions that are possible. This system provides real-time reading of patients physiological parameters with its demographics, which will help in patient health diagnosis.

## VIII. REFERENCES

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- [2] Harshvardhan Patil, Prof. V.M. Umale, Arduino Based Wireless Biomedical Parameter Monitoring System Using Zigbee, International Journal of Engineering Trends and Technology (IJETT) – Volume 28 Number 7 - October 2015.
- [3] <https://www.arduino.cc/>
- [4] <http://www.dx.com>
- [5] <http://www.roboelements.com>
- [6] <https://circuit.rocks>
- [7] <http://www.amazon.com>

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