Base paper.

2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS)

IoT based Patient Monitoring System using TCP/IP Protocol

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Abstract – **In this IoT based observation and intimation of a paralyzed patient healthcare system, is designed to help the patient to convey their health issues/status and various messages to the doctor, nurses, or to the caretaker over the internet or by sending a message. Our proposed system works by reading the data of the patient, in case of any non-typical value of blood pressure, oxygen level, or any other desired sensor for the patient. Any worst-case scenario it will be intimated by a message or over the internet to the doctor or to the caretaker. This system takes cares when the patient is most of the time not taken care and any worst scenarios it sends a message through GSM and uploads to the cloud. It also buzzers when it receives a risk message. In this way our project truly automates caretaking ability of the patient which ensures periodically.**

Keywords: IoT, Blood pressure, Patient

I. INTRODUCTION TO PATIENT MONITORING SYSTEM

Patient Monitoring system is a process of continuously tracking the patient's vital parameters suggested by the doctor that has to be continually monitored. Usually, the patient monitoring is carried out by attaching the sensors like heat rate sensor, blood pressure sensor, temperature sensor, ECG probes etc. The components involved in the conventional patient monitoring system usually include the sensors network, Display Devices, Communication Wireless [1] [2].

nodes and other supporting components Sensors are nothing but the Transducers which is used to capture all the physical quantities of the patient and converts them into its equivalent electric signal for data processing [3].

Display devices are the devices which are used to accumulate the desired received signal and display in the appropriate content in the LCD or HMI displays. Communication devices, are usually shorter distance communication devices which is used to transmit the captured sensor data to the nearest sensor nodes where the display devices have been attached. Usually, the other supporting components involved in the patient monitoring system are the microcontroller units which is used to decode the received signal additionally the microcontroller are used to take appropriate decisions when it is required.

II. EXISTING SYSTEM

In existing system of methodology, only there exists the technology of monitoring the patient heart rate in the nearby terminal display unit and the remote monitoring is enabled only when there exists the WIFI connectivity [4].

This system of methodology forms the drawback of data missing when there is interruption in WIFI network and hence there need to be a constant and stable WIFI network in order to have a constant connectivity to transmit the collected data to the remote server.

978-1-6654-0521-8/21/$31.00 ©2021 IEEE

2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS) | 978-1-6654-0521-8/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICACCS51430.2021.9441910

III. PROPOSED SYSTEM

In the proposed system of methodology, the vital parameters of patient like Heart rate, Blood pressure level and the Temperature is continually monitored and displayed in the local display unit with the help of 16X2 LCD Display [5]. Additionally, the measured values from the sensor are decoded, processed and transmitted to the remote server with the help of SIMCOM GSM modem by utilizing the TCP/IP protocol. Our project has also included smart decision-making algorithm in order to predict the patient critical position and automatically provide the triggered SMS notification and Call alert to the concern person (here we have used for Nurse Station and corresponding Doctor). In the SMS which has been sent to the Doctor, the URL of the static webpage which is allocated to the patient is sent. In the Static webpage, the dynamic channel of the patient vital data is embedded and made available to the doctor or the concern person whoever has the webpage link. The dynamic channel for data logging is created by using thinkspeak server database and hence not only the data monitoring but also the analysis of data is possible by tracking the historical data available in the graphical representation. This kind of graphical representation of data is more helpful for doctors for taking immediate decision and to suggest the immediate first aid even through phone calls [6-8]

A. BLOCK DIAGRAM

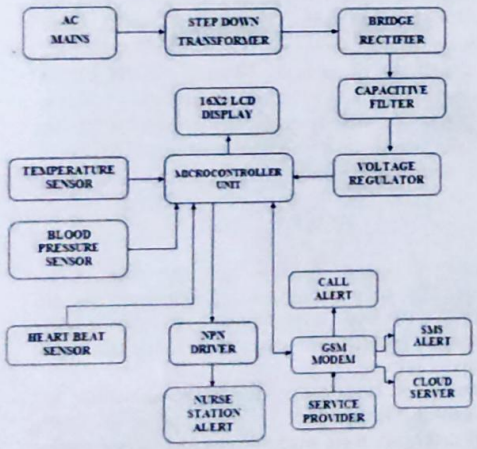

Fig 1: Block Diagram

The above figure represents the systematic block diagram of this project "IoT Based Patient Monitoring System Using TCP/IP Protocol". As shown in the block diagram, AC mains are described in order to fetch the power from the AC main source and which is further step downed by the step-down transformer in order to get the low voltage AC signal from the high voltage Ac signal. Thus, obtained AC signal is processed through bridge rectifier in order to extract the DC voltage which is required to operate the microcontroller. Thus, the obtained DC source is an unregulated and rippled DC power source, the capacitive filter and voltage regulator like 7805 are used to obtain regulated DC power source for the microcontroller operation [9-10].

The LM35 Temperature sensor is used in our project in order to determine the patient body temperature. This sensor is capable of measuring the temperature ranging from -55 degree to 150 degree Celsius. LM35 temperature sensor can be calculated more precisely than with a thermistor.

The Heartbeat sensor module is used to determine the patient heart rate which works basis of the light intensity that penetrates in to the blood vessels and hence the reflected back light is captured by the photo transistors. The value of the blood in the finger changes with time. The sensor glows a light lobe (a small luminous LED) through the light that gets transmitted to the Light Dependent Resistor.

Thus, measured reception light ray analog value will be varying based on the blood stream that flows through the blood vessels. By calculating the threshold values and decoding the received signal, the heart rate of the patient has been calculated.

GSM module establishes communication between a computer and a GSM system. GSM works on the mobile communication bands. It has harmonized spectrum, that is it works on dissimilar frequency bands in various countries, users can exchange numerous information's between networks and they can keep the same number

The other supporting component like 16X2 LCD display is used to monitor the patient current state of blood pressure, heart rate and temperature locally. It is in the form of an integrated circuit that plays as a transducer Also, once the patient falls critical based on the blood pressure or based on the high temperature, the nurse station is alerted through buzzer and the SMS notification and Phone Call will be generated at the same instant of time for taking immediate action.

B. DESIGN METHODOLOGY

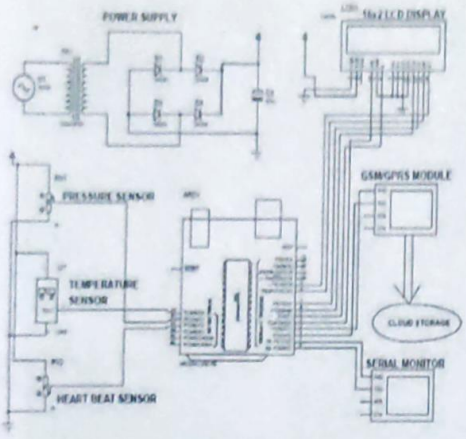

Fig 2: Circuit Diagram

The above design describes the entire circuit diagram of this project "IoT Based Patient Monitoring System Using TCP/IP Protocol"

IV. OUTPUTS AND RESULTS

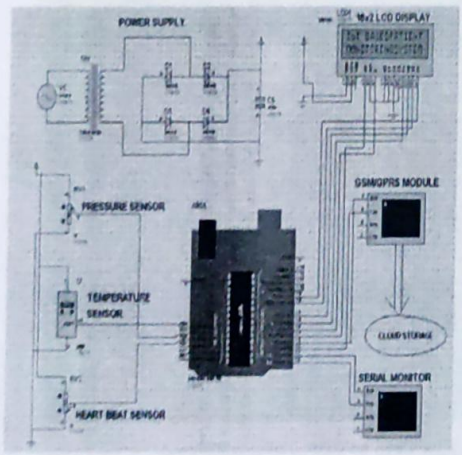

Fig 3: Simulation Result 1

The above figure represents the system initialization in order to give hardware stabilization by providing on time delay by the microcontroller unit.

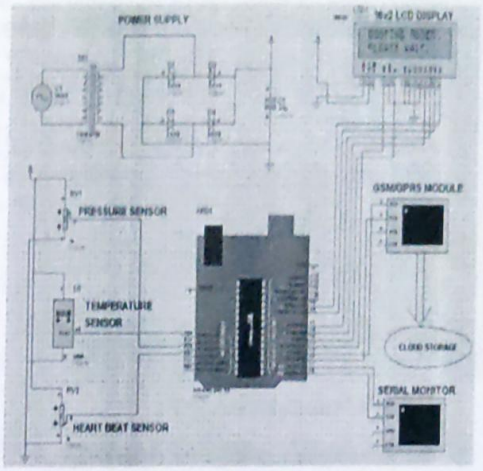

Fig 4: Simulation Result 2

The above figure represents the booting of modem in order to establish network connectivity.

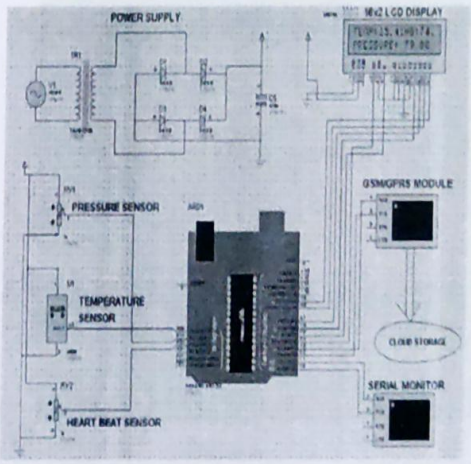

Fig 5: Simulation Result 3

The above figure represents the Heartbeat, Temperature and Pressure of the patient is being monitored in the 16X2 LCD Display.

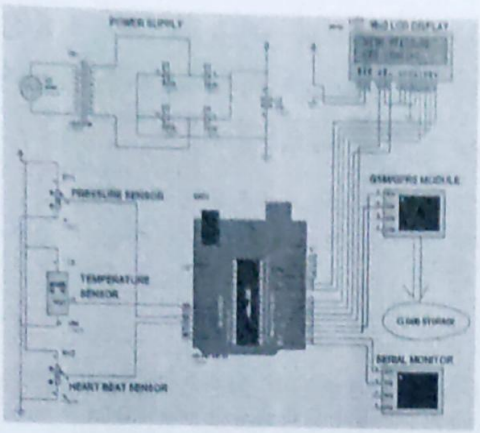

Fig 6: Simulation Result 4

The above figure represents the critical stage of patient and hence the SMS notification to the registered phone number is sent and call alert is generated. Along with the SMS notification, the IoT webpage link carrying the patient details is also sent for enabling the doctor to track the patient from the remote end.

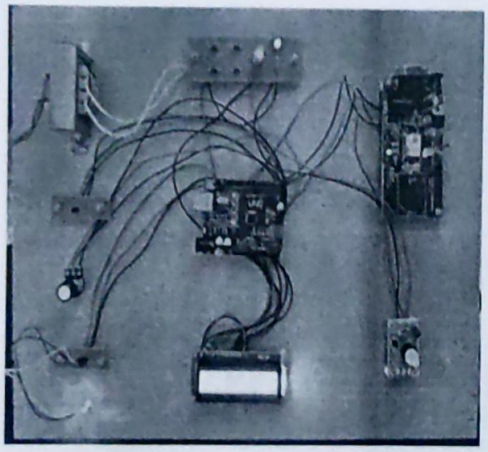

Fig 7: Hardware Implementation

The above figure represents the hardware implementation of our project and its demonstration.

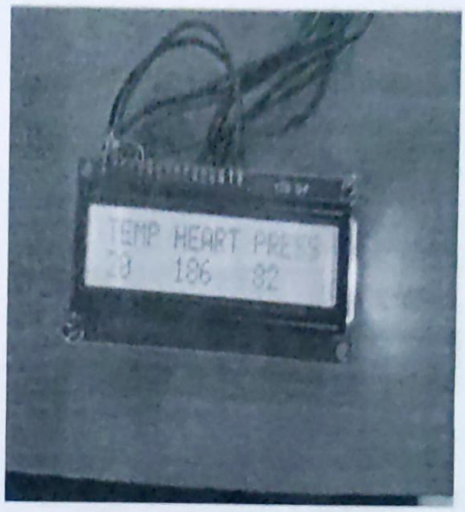

Fig 8: Hardware Output

The above figure represents the temperature, Heart Beat and Pressure of the Patient body.

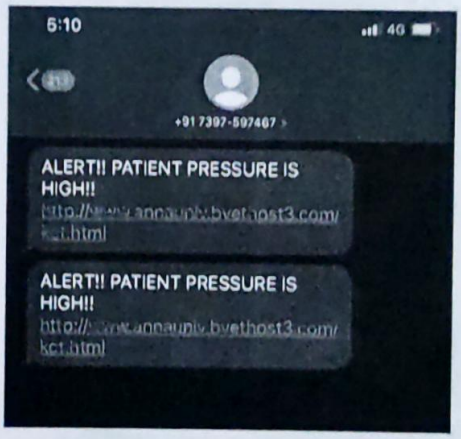

Fig 9: Message Notification

The above figure represents the SMS notification of the patient critical state along with the web URL link for patient live tracking.

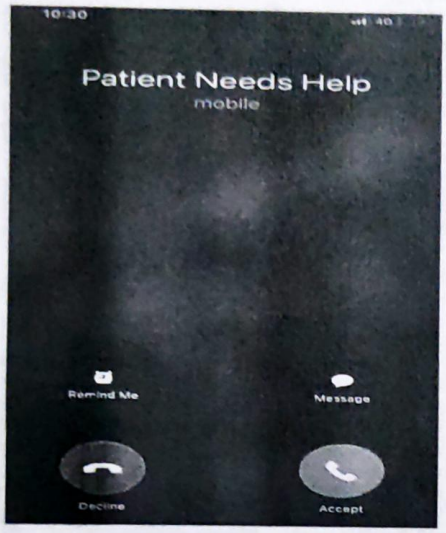

Figure 10: call Alert

The above figure represents the call alert for the care taker for immediate attention.

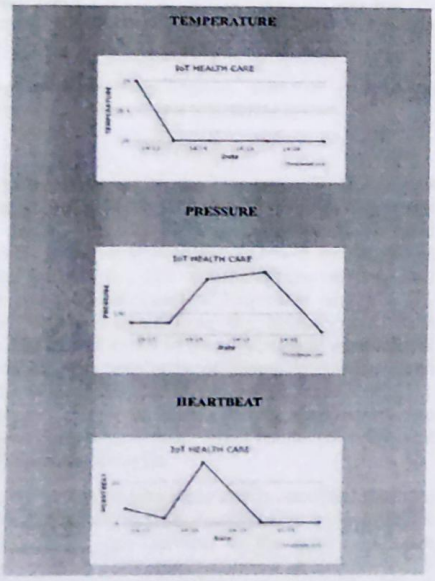

Figure 11: Web Panel

The above figure represents the webpage of the patient dashboard showing the patient vital data.

V. CONCLUSION

By using this project "IoT Based Patient Monitoring System Using TCP/IP Protocol" the patient health is continually tracked even from the remote end. Additionally, with the help of triggered notification SMS and call alert we can aid the valuable human life by taking necessary decisions immediately. And enabling the doctor to give first aid remotely my monitoring the patient health condition remotely which is made available globally.

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