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Smart Health Care Monitoring System on IoT

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ABSTRACT: An embedded system a microprocessor- or microcontroller-based system of hardware and software designed to perform dedicated functions within a larger electrical system. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded system is fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. Embedded technology uses PC or a controller to do the specified task and the programming is done using assembly language programming or embedded C. Medical Monitoring Systems are the most important in the fast-developing nation population increases demands for caretaking. To solve the problems of wiring complexity, high cost, poor mobility, and high energy consumption, which are occurred in current medical monitoring devices, a system is required to measure vital signs for medical evaluation of a patient. In the basis of analysing the devices and ESP32 network, a novel wireless medical monitoring network is designed based on Node MCU technology. This application consists of ESP32 based network, having various types of sensors connected to the transmitter section those are Heart rate sensor, Temperature sensor, Oxygen sensor, Blood pressure, ECG etc.

KEYWORDS: Embedded systems; Heart rate sensor; Temperature sensor; Oxygen sensor; ECG sensor; Blood Pressure Sensor; Wireless network; Cloud Computing

I. INTRODUCTION

In 20th century, personal health monitoring system like Holter monitors, were used only to collect data. In this system, analysis and data processing were performed offline, making such devices impractical and non-real time for continuous monitoring. Also, systems with multiple sensors for physical rehabilitation often feature unwieldy wires between the sensors and the monitoring system. These wires may limit the patient's activity and level of comfort and thus negatively influence the measured results. It is also difficult to keep track on abnormalities in heartbeat count for patient itself manually.

The average heartbeat per minute for 25-year-old ranges between 140-170 beats per minute while for a 60-year-old it is typically between 115-140 beats per minute and body temperature is 37 degrees Celsius or 98.6 Fahrenheit. Patients are not well versed with manual treatment which doctors normally use for tracking the count of heartbeat. So, there must be some device which would help patient to keep track on their health. To overcome these limitations a device, use to keep track on all the parameters of patient should be easy to use, portable. This system is proposed to be used for general ward patients as they are often associated with acute conditions that require regular supervision. The technology used here is Wireless Sensor Network (WSN). WSN is used worldwide due to its ability of self-organizing and scalability.

The vital signs associated with general ward monitoring are body temperature, Oxygen level, Heart pulse rate of the patient. Patients are monitored using high cost wired technology which makes difficult for the patient to move and hence it reduces mobility and introduces complexity. To overcome these limitations, Wireless technology is introduced in the hospitals. This paper describes the wireless sensor network based on Node MCU technology. It is mainly used for collecting and transferring the various monitoring information about the patients in hospital. This application consists of Node MCU based network, various sensors i.e., Heart rate sensor, Temperature sensor, Oxygen sensor, Blood Pressure Sensor, Urine level Sensor etc.



II. RELATED WORK

Patient monitoring systems become an important topic. These systems use wireless technologies to transmit vital signs for medical valuation.

Karandep et al. [1] is proposed to monitor the heart beat using the C8051F020 micro-controller and also the body temperature. We use to extract the data from sensors and it would be transferred to the controller. This has been connected with the ZigBee wireless device and then transfer data to the nearest receiver.

Nithin et al. [2] is monitors the human body temperature, blood pressure, heartbeat. These sensors were embedded with micro-controller AT Mega 32. And this micro-controller yields a GSM. After, collection of data, we need to perform diagnosis. If the diagnostic value is lower than normal values, then the device can do an SMS to the doctor.

Mohammad et al [3] oversees the OTG microcontroller in the world. Android app used to create an ECG monitoring system. The OTG micro-controller is used to connect the USB cable to the mobile phone (or) a wireless device. Once the data collected, that will be sent to the mobile application as ECG wave format.

S. Jassay et al [4] discussed about the human body temperature using the Raspberry Pi platform for the cloud. In this paper, Raspberry Pi monitors the patient's body temperature and then these data have been transferred via WSN. After that, the data has been added into the cloud

III. METHODOLOGY

The primary objective of this system is to monitor the basic physiological parameters of patients like heart rate, body temperature, oxygen rate, ECG, Respiratory, blood pressure etc. Standardize the medical terminology and networking protocols so that medical records can be stored on cloud and can be instantly sent to the doctor. It will provide a health care system which reduces the human intervention and diagnostics testing procedures and provide multiple options to change the traditional management of the patients.

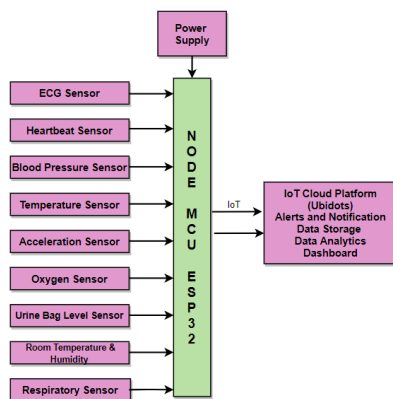


Fig. Block Diagram of The System

The above diagram shows monitoring health care system which consists of Node MCU ESP 32 network which is made up of sensor nodes as shown. To keep the moment of the patient intact with the sensors on the body the wireless sensors are required to be minimized and portable. These sensors are Temperature, Heart rate, Blood pressure, Acceleration Sensor, Oxygen, Room Temperature and humidity, ECG and Urine level measurement sensors which are the basic requirements wards of patient. There is a microcontroller to which sensors and power supply is connected. The Node MCU ESP32 module is used for transferring the data to the receiver connected to other part of circuit.

A. Node MCU ESP32

NodeMCU is an open-source based firmware and development board specially targeted for IOT based Applications. It includes firmware that runs on the ESP32 Wi-Fi SOC from Espress if Systems, and hardware which is based on the ESP-12 module



Fig. Node MCU ESP32

B. ECG Sensor

The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement. This design allows for an ultralow power analog-to-digital converter (ADC) or an embedded microcontroller to acquire the output signal easily.



Fig. AD8232 ECG Sensor

C. Heartbeat Sensor and Oxygen Sensor

The MAX30100 is an integrated pulse oximetry and heart rate monitor sensor solution. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart rate signals. The MAX30100 operates from 1.8V and 3.3V power supplies and can be powered down through software with negligible standby current, permitting the power supply to remain connected at all times.



Fig. MAX30100 Pulse Oximeter Heart Rate Sensor Module

D. Blood Pressure Sensor

This user-friendly upper arm cuff-based blood pressure monitor measures systolic & diastolic blood pressure levels (in mmHg) with ± 3 mmHg accuracy. The built-in colour LCD display displays all measured blood pressure values and additional heart rate information (bpm) and allows this sensor to be used both as a standalone device.



Fig. Blood Pressure Sensor

E. Human Body Temperature Sensor

The MLX90614 is an infrared thermometer for non-contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASIC are integrated in the same TO-39 can. Integrated

into the MLX90614 are a low noise amplifier, 17-bit ADC and powerful DSP unit thus achieving high accuracy and resolution of the thermometer.



Fig. MLX90614 on-Contact Human Body Infrared Temperature Measurement Module

F. Acceleration Sensor

Accelerometers measure both static (e.g. gravity) and dynamic (e.g. vibration) acceleration. They consist of a moveable bar suspended on micro-machined springs that provides resistance against acceleration. Deflection of this bar is then converted into an acceleration reading. Three accelerometers can be incorporated into a single device providing information on three-dimensional movement (tri-axial accelerometer). Accelerometers are an ideal choice for evaluating variability of movement and balance providing a non-invasive, portable method of measurement. They can also accurately measure simple parameters of gait such as stride time, stride symmetry and speed. Acceleration sensors or accelerometers let you make precise measurements of vibration or shock for a variety of applications. They are used to measure vibration, shock, displacement, velocity, inclination, and tilt.



Fig ADXL335 Accelerometer

G. Urine Bag Level Measurement Sensor

This sensor can be used to measure the urine level in the urine level. If the bag is full the the module output is at high level, else the output is at low level. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

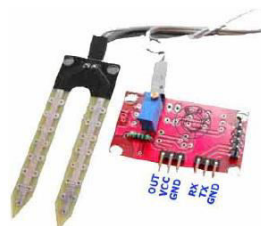


Fig. Urine Level Measurement Sensor

H. Respiratory Sensor

A device that is used to detect or measure or monitor the gases like ammonia, benzene, sulfur, carbon dioxide, smoke, and other harmful gases are called as an air quality gas sensor. The MQ135 air quality sensor, which belongs to the series of MQ gas sensors, is widely used to detect harmful gases, and smoke in the fresh air. This article gives a brief description of how to measure and detect gases by using an MQ135 air quality sensor.

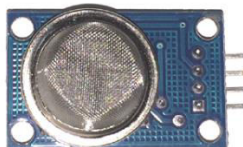


Fig. MQ135 Air Quality Sensor

I. Room Temperature and Humidity Sensor

Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. DHT11 output calibrated digital signal. It utilizes exclusive digital-signal-collecting technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements relates to 8-bit single-chip computer.

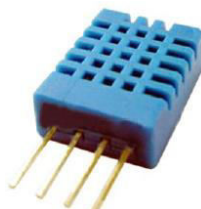


Fig DHT11 Humidity and Temperature Sensor

IV. ARCHITECTURAL DIAGRAM

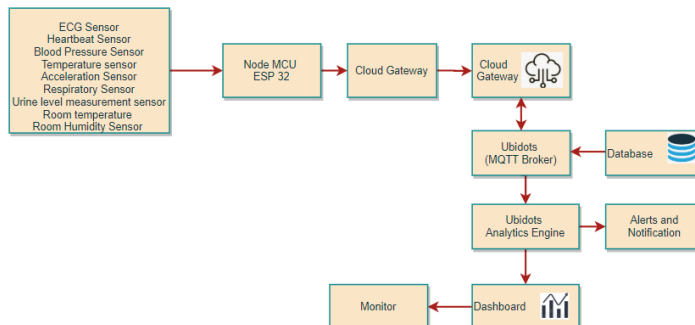


Fig. Architectural Diagram

The sensors have been connected with the patient’s skin and the other end has been connected with the Node MCU. Every sensor(s) value(s) is/are stored in the server and also displayed very recent values. The doctor may see the patient's data. A doctor can see the patient's history records and suggest changes in drugs and prescription. This application adopted the Node MCU tool, due to the multi-capacity efficiency of low power consumption. The system can be easily installed at the end party and can be obtained from the database. And this data is very valuable. The system is mainly focused to know the patient's health condition:

This system is also useful for hospitals and clinics because the system values parameters in real time. Through this system, the doctor can be calibrated the patient's body temperature, ECG, heart rate parameter efficiently and the Node MCU device can store data temporarily. We are receiving heart rate in the form of pulses; body temperature in the form Celsius, ECG received in the form of a percentage, and is displayed on a special health care device or website. Import all modules information to UbidotsDB using serial communication: Communicate ECG with the Node MCU device and find a heart rate from input source.. Besides, the buzzer alarm to alert the staff two other alert system is also used here. All the components are connected according to requirement and mounted on PCB.

The Internet of Things (IoT) is a network of physical devices that connect to and exchange data with other devices and services over the Internet or other network. IoT Hub is a managed service hosted in the cloud that acts as a central message hub for communication between an IoT application and its attached devices. Ubidots create workflows that integrate data and logic from disparate systems. Using this workflow one can send and receive notifications. SQL Database is a fully managed platform as a service (PaaS) database engine that handles most of the database



management functions. UbidotsStream Analytics is a real-time analytics and complex event-processing engine that is designed to analyze and process high volumes of fast streaming data from multiple sources simultaneously. It analyzes real time telemetry streams data from IoT devices.

V. EXPERIMENTAL RESULTS

Below are the experimental results for the proposed system.

Sensor	Observed Value	Expected Value	Sensor	Observed Value	Expected Value
Temperature Sensor(°F)	98.2°F	97°F to 99°F	Temperature Sensor(°F)	99.6°F	97°F to 99°F
Blood Pressure Sensor (mmHg)	118/75 mmHg	120/80 mmHg	Blood Pressure Sensor (mmHg)	124/86 mmHg	120/80 mmHg
Oxygen Sensor (mg/L)	89mg/L	80 to 100 mg/L	Oxygen Sensor (mg/L)	96mg/L	80 to 100 mg/L
Heartbeat Sensor	70 BPM	60 to 100 BPM	Heartbeat Sensor	66 BPM	60 to 100 BPM
Room Temperature	22 °C	20°C to 22 °C	Room Temperature	23.5 °C	20°C to 22 °C
Room Humidity	44%	30% to 60%	Room Humidity	56%	30% to 60%

Inconclusive - 91 BPM Average
 This ECG is inconclusive.
 If you repeatedly get this result or you're not feeling well, you should talk to your doctor.

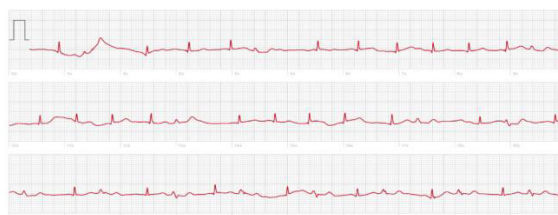


Fig. ECG output of the patient.

VI. CONCLUSION

The wireless patient health monitoring system of measures temperature, heartbeat, blood pressure, respiratory sensor, room temperature and humidity sensor, urine level measurement sensor using Node MCU ESP32 and IoT providing low cost-effective solution. As it is wireless device it more comfortable and reliable for patient as well as medical representative. It provides continuous monitoring of the vital signs of the patient over long periods of time until an abnormal condition is captured, and hence critical situations can be overcome. This system generates alert messages to the health care emergency staff using the cloud computing and quick action can be taken on the patient. This system can store the data of the patients which is previously monitored by the system. It will also provide an analytics report.

REFERENCES

- [1] Amruta Nagarkar, M.N. Kakatkar, — Zigbee based wireless patient monitoring. | IJSETR, Volume 2, Issue 2, February 2019,
- [2] Malika, Charu Rana, —An Indoor Wireless Zigbee Based Patient Monitoring System for Hospitals. IJESR, Vol 04, Issue 02; March-April 2013.
- [3] Manisha Shelar, Jaykaran Singh, Mukesh Tiwari, —Wireless Patient Health Monitoring System. International Journal of Computer Applications (0975 – 8887) Volume 62– No.6, January 2019.
- [4] Rajasekaran, Kumaran, —Human health monitoring using wireless sensor network (WSN). | 12, December 2018.
- [5] Shyr-Kuen Chen, Tsairkao, Chai- Tai Chan, Chih-Ning Huang, Chih-Yen Chiang, Chin-Yu Lai, —A Reliable Transmission Protocol for ZigBee Based Wireless Patient Monitoring. || IEEE Trans Inf. Technol. Biomed., vol.16, No.1 JANUARY 2012. y



- [6] J. S. Choi and M. Zhou, —Performance analysis of Zigbee based body sensor networks. | In Proc. IEEE Conf. Syst., Man Cybern.,2010, pp. 2427–2433.
- [7] Goutam Motika, AbinashPrusty, —Wireless Fetal Heartbeat Monitoring System Using ZigBee & IEEE 802.15.4 Standard. || 2011 Applications of Information Technology, 978-0-7695-4329-1/11 \$26.00 © 2011 IEEE DOI 10.1109 /EAIT.2011.89.
- [8] Guojin Li, Jing Han, —Application of the Medical Care System Based on ZigBee Technology. || 2018 IEEE Symposium on Electrical & Electronics Engineering (EEESYM) pp 301-303



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