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IoT Based Smart Band for Doctor and Patient Communication Using Body Sensors

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ABSTRACT: In today's modern world, technology takes part an important role in the medical field. It is must necessary to monitor the patient's health continuously after the operation of the patient. In the healthcare field Internet of Things (IoT) plays the main rolein monitoring health with lots of applications. To monitor the health parameters of the patient, the smart wearable wristband monitoring system is implemented by using the IoT domain. In this article, the NodeMCU microcontroller act as a gateway between the hardware devices and the software. The parameters to be measured from the patient's body are temperature, heart rate, glucose level, oxygen level, and Blood Pressure (BP). These parameters are measured by using the sensors. The sensors are interfaced with the microcontroller. Then the microcontroller sends the data from the sensors to the cloud. The cloud will analyse the data from the normal values given in the microcontroller. If any of the parameter's data from the sensor are measured as abnormal values, the cloud will send the alert message and the location of the patient to the patient's relatives, to the doctor who is attending that patient, and to the patients' mobile via Global System for Mobile communication (GSM), and Global Positioning System (GPS) for location.

KEYWORDS: Internet Of Things (Iot),Global System For Mobile Communication,Spo2.Oxygen Level,

I. INTRODUCTION

In recent times self-monitoring is essential to continuously monitor the overall health. Smart healthcare bands help us to monitor the key vitals of the person and alert in case of emergency. The overall health is tracked based on the vital signs and action is suggested accordingly. To enable the collection of vital signs from patients and to be conveyed to a prime location, some medical monitoring systems have already been developed, which helps the doctors to monitor multiple patients in different areas simultaneously. However, many of such prior systems have not authorized the monitored patients to move outside the Hospital. So, here the smart health care band helps us to monitor the patient continuously remotely. The user interface of this smart watch is very simple to use. It also alerts call, SMS and e-mail notifications by using vibration motor present in the smart watch. It is powered by a 1000 mah Lithium-ion rechargeable battery. It also has the heart rate sensor which measures the heartbeat of a person. Various data from the Arduino microcontroller is communicated to the mobile using HC-06 Bluetooth module. They made a watch at a minimum cost which monitors the heart rate of the person and also displays time and notifications from apps like e-mail, SMS etc.

In case of emergency and dangerous situations we have to alert the doctor immediately. For this we are using a IoT based network for doctor to patient communication in the hospital and even to communicate and indicate the status of the patient through SMS. This way of communication is actually done with IoT network topology and with the Bluetooth or Wi-Fi network. Each patient will be given this module and with the help of this module the patient health condition is monitored and if there is any change in the condition of the health then immediately sends that changed. Data through Bluetooth Wi-Fi network to the local system. The heart beat is monitored with the pulse rate of the body.

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The high intensity light sensor senses the expansion and contraction of the heart with the help of the nerves. That beam will transmit the signal to the receiver and the minute change in the pulse is noticed as the heartbeat. If there is any change in the pulses then it is noticed as the change in the heart and then the controller will get a disturbed pulse count which indicates the fault or malfunction of the heart. The controller is fixed for a no. of pulses initially. If there is any change in the any of the pulse count then it onsiders as a malfunction of the heart and then it transmits the pulse count with the patients ID to the doctor in the hospital and at the same to it sends a sms to a fixed number in the microcontroller.

II. PROBLEM STATEMENT

An automated health monitoring system is to be developed that reacts or creates an alarm in the critical situation of the patient. The data are analyzed through Node MCU microcontroller to send messages via email and twitter to the doctors and concerned people. Additionally, it also records and maintains the earlier diagnostic information regarding the patient health. The patient's actual condition is sent through online portal to the medical professionals and the appropriate treatment can be taken to cure the patient. The smart patient health tracking system involves the installation of the heart rate, temperature and humidity sensors to be placed in the room to track the condition of the patients. After processing, all the values are sent to the doctor to check the state accordingly. The signals of sensors such as temperature, EEG and heart beat readings are passed through amplification and signal conditioning system to raise the gain of the signals. Using any microcontroller like Arduino or Raspberry pi or beagle bone black, data can be sent to cloud platform for storage and analysis . The IoT-based system is capable of providing real-time information about the patient parameters, as the internet is a prime communication channel, the security of the cloud and data is one of the challenging issues. With the advancement of internet technologies like cloud computing, edge computing, fog computing, the wearable healthcare monitoring system could be seen in everyday usage in the coming years. Portable biosensors integrated with wearable smart devices can provide the record of the individual daily activities and assist in managing the health and thus prevent the complications in the life-related diseases of the individual.

III. LITERATURE REVIEW

D. Acharya and S. N. Patil designed and implemented an IoT-based smart medical kit for critical medical conditions. This kit can provide a versatile connection to data from the IoT and can support emergency medical services such as intensive care units. The model collects, stores, analyzes, and distributes Big Data in real-time, enabling users to lower their health risks and reduce healthcare costs. This research aimed to reduce patient anxiety about regular doctor visits. With the help of this project proposal, patients' and doctors' time will be saved, allowing doctors to help patients in critical condition as much as possible.

Jennifer S. Raj proposed a novel information-processing system for IoT-based healthcare-monitoring systems to manage Big Data in an IoT environment effectively. The entire data-processing process is divided into three stages: collection and aggregation, the classification and analysis of collected data, and decision-making. The experiments were conducted using Python. This model was experimentally verified in a simulation by using different health sensors. The parameters were compared with existing hierarchical clustering and back propagation neural network models to validate the performance. This model leverages Apache Kafka and Hadoop to address the need for real-time data collection and offline processing. According to the authors of this study, the proposed method outperforms the more traditional hierarchical clustering model and the back propagation neural network model in data processing and information extraction; they claim that their proposed model achieves 97% accuracy. The study does not provide a comparative analysis of time-efficiency for the model.

SoonHyeong et al. Proposed an intelligent health-related monitoring system that detects abnormal movements such as falls based on sensor readings from accelerometers. After detecting abnormal movements, the system analyses basic bio-signals such as a person's BP, HR, and BT. Users, caregivers, and professionals can check that the patient has

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measured biometric data anytime, anywhere, using a smartphone. This monitoring system includes a JAVA-based Android service environment. The performance of this monitoring system was evaluated using datasets with information from fifty different individuals. In this model, block chain technology is used to protect individuals' medical data by increasing the data's reliability while maintaining its confidentiality. With the help of a sensor chip, technology that is part of the IoT, the accumulation of personal medical information is stored and monitored in real-time. The transmission of sensitive medical data occurs in real-time via a mobile device only, such as a smartphone.

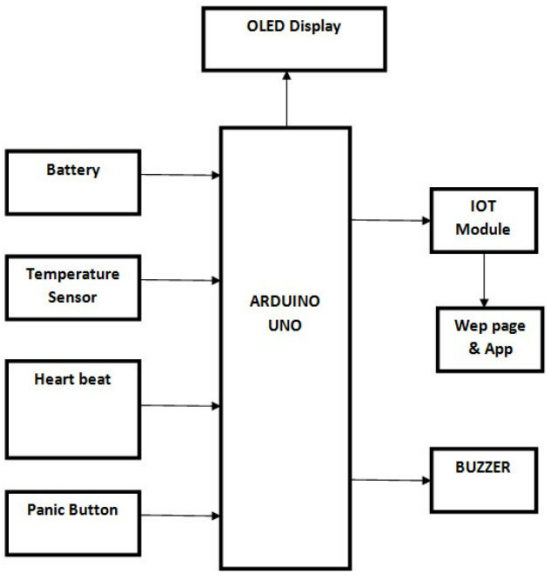
III. EXISTING SYSTEM

A smart health monitoring system is being developed using Internet of Things (IoT) technology which is capable of monitoring blood pressure, heart rate, oxygen level, and temperature of a person. This system is helpful for rural areas or villages where nearby clinics can be in touch with city hospitals about their patient health conditions. However, if any changes occur in a patient's health based on standard values, then the IoT system will alert the physician or doctor accordingly. The the measurement of heart rate, patient body temperature and SPO_2 was found to be 2.89%, 3.03%, 1.05%, respectively, which was comparable to the commercials health monitoring system. This health monitoring system based on IoT helps out doctors to collect real-time data effortlessly. The availability of high-speed internet allows the system to monitor the parameters at regular intervals.

IV. PROPOSED SYSTEM

Smart and connected health care is of specific significance in the spectrum of applications enabled the Internet of Things (IoT). Networked sensors, either embedded inside our living system or worn on the body, enable to gather rich information regarding our physical and mental health. In specific, the accessibility of information at previously unimagined scales and spatial longitudes combined with the new generation of smart processing algorithms can expedite an advancement in the medical field, from the current post-facto diagnosis and treatment of reactive framework, to an early-stage proactive paradigm for disease prognosis combined with prevention and cure as well as overall administration of well-being rather than ailment. This paper sheds some light on the current methods accessible in the Internet of Things (IoT) domain for healthcare applications.

BLOCK DIAGRAM



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V. RESULT AND DISCUSSION

The Internet of Things (IoT) is essential in innovative applications such as smart cities, smart homes, education, healthcare, transportation, and defense operations. IoT applications are particularly beneficial for providing healthcare because they enable secure and real-time remote patient monitoring to improve the quality of people's lives. This review paper explores the latest trends in healthcare-monitoring systems by implementing the role of the IoT. The work discusses the benefits of IoT-based healthcare systems with regard to their significance, and the benefits of IoT healthcare. We provide a systematic review on recent studies of IoT-based healthcare-monitoring systems through literature review. The literature review compares various systems' effectiveness, efficiency, data protection, privacy, security, and monitoring. The paper also explores wireless- and wearable-sensor-based IoT monitoring systems and provides a classification of healthcare-monitoring sensors. We also elaborate, in detail, on the challenges and open issues regarding healthcare security and privacy, and QoS. Finally, suggestions and recommendations for IoT healthcare applications are laid down at the end of the study along with future directions related to various recent technology trends.

ESP8266 12E (NODE MCU)

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit).Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits.The NodeMCU ESP8266 is an extensively employed development board in IoT applications, providing a versatile and cost-effective approach to connect devices to the internet. It features Wi-Fi and programming capabilities, facilitating speedy prototyping and deployment of IoT solutions.

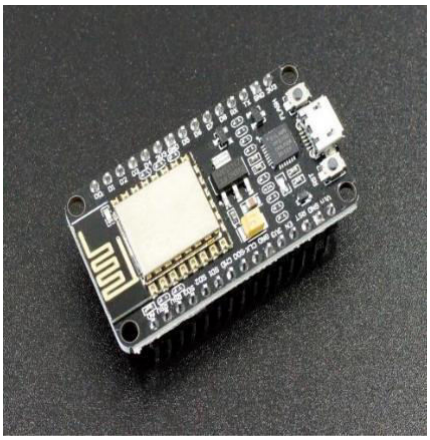

Fig ESP8266 (NODE MCU)

LIQUID-CRYSTAL DISPLAY (LCD)

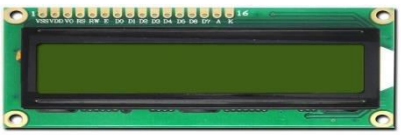

Fig -16*2 LCD Display

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A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome.[1] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as pre-set words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

HEART BEAT SENSOR

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heartbeat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse.

Fig - Heart Beat Sensor

IX. CONCLUSION

With the wide use of internet, this work is concentrated to execute the internet technology to establish a system which would communicate through internet for better health. Internet of Things rules the whole world in various fields, mainly in health care sectors. Hence the present work is done to design an Internet of Things based smart patient health tracking system using an Arduino microcontroller. In this, pulse rate sensor is used to detect the heart beat and temperature sensor to read the temperature and sends the data to the cloud using internet. This information is also sent to the LCD display, so patient can easily know their health status. During critical situations to alert the doctor, the warning message is sent to the doctor's phone and at the same time buzzer turns to alert the care taker. The doctor can view the sent data by logging the specific website or IP address. Hence continuous patient monitoring system is designed.

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