Smart Human Health Monitoring System

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Abstract: This project is significant in various ways because in today's world, everyday many lives are affected because the patients are not timely and properly operated. Also, for real time parameter values are not efficiently measured in clinic as well as in hospitals. Sometimes it becomes difficult for hospitals to frequently check patient's conditions. Also, continuous monitoring of ICU patients is very difficult. To deal with these types of situations, our system is beneficial. Our system is designed to be used in hospitals and homes also for measuring and monitoring various parameters like temperature, ECG, heart rate, pulse rate. The results can be recorded using Arduino. Also, the doctors can see those results on android app. The system will also generate an alert notification which will be sent to doctor. Our system is useful for monitoring health system of every person through easily attach the device and record it. In which we can analysis patient's condition through their past data, we will recommend medicines if any emergency occurred through symbolic A.I.

Keywords: ECG, Heart rate, Temperature, Pulse rate.

I.   INTRODUCTION

Health is characterized as a full state of physical, mental, and social well-being and not merely a lack of illness. Health is a fundamental element of people's need for a better life. Unfortunately, the global health problem has created a dilemma because of certain factors, such as poor health services, the presence of large gaps between rural and urban areas, physicians, and nurses unavailability during the hardest time. IoT is making any objects internally connected in the recent decade and it has been considered as the next technological revolution. Smart health monitoring mechanism, smart parking, smart home, smart city, smart climate, industrial sites, and agricultural fields are some of the applications of IoT.

The most tremendous use of IoT is in healthcare management which provides health and environment condition tracking facilities. IoT is nothing but linking computers to the internet utilizing sensors and networks. These connected components can be used on devices for health monitoring. The used sensors then forward the information to distant locations like M2M, which are machinery for computers, machines for people, handheld devices, or smartphones. It is a simple, energy-efficient, much smarter, scalable, and interoperable way of tracking and optimizing care to any health problem.

Heart rate and body temperature are the two most significant indicators for human health. Heart rate is the per-minute amount of heartbeats, commonly known as the pulse rate. To measure the pulse rate, an increase in the blood flow volume can be used by calculating the pulses. Normal heart rate ranges between 60 and 100 beats per minute for healthy people. The typical restful heart for adult males is roughly 70 bpm and for adult females 75 bpm. Female with 12 years of age and above, typically have higher rates of heart in contrast with males. The temperature of human body is simply the heat of body and the sum of heat radiated by the body is scientifically determined. In healthy adults, it is likely to range between 97.8 °F (36.5 °C) and 99 °F (37.2 °C). Different factors such as flu, low-temperature hypothermia, or any other illness may lead to a change in body temperature. In almost all illnesses, fever is a typical indicator. There are several fatal diseases like heart disease, diabetes, breast cancer, liver disorder, etc. in medical sector but the main concern of our developed system is to monitor the fundamental signs of all types of patients. This paper proposes a customized healthcare system that monitors the pulse and body temperature of patients via sensors and transmits the data through Wi-Fi that enables the medical staffs to get data from the server. The developed system also provides a solution for the problem of maintaining a single database of patients in hospitals using a web server, apart from the personalization of critical health-related criteria.

II. LITERATURE REVIEW

The paper (1) proposes a smart healthcare system in IoT environment that can monitor a patient's basic health signs as well as the room condition where the patients are now in real-time. In this system, five sensors are used to capture the data from hospital environment named heart beat sensor, body temperature sensor, room temperature sensor, CO sensor, and CO2 sensor. The error percentage of the developed scheme is within a certain limit (<5%) for each case. The condition of the patients is conveyed via a portal to medical staff, where they can process and analyse the current situation of the patients. The developed prototype is well suited for healthcare monitoring that is proved by the effectiveness of the system.

The paper (2) proposes Body Area Network (BAN) is a sensor network technology for monitoring and logging vital signs of a person, such as cardiac frequency and blood pressure. The main goal of BAN is to make remote monitoring possible. In this paper a group monitoring approach is presented. The work differs from others because the idea is to monitor a group of patients in a hospital or clinic at the same time while having only one receiver for up to 32 people. There is no need to have a transmitter/receiver pair for each patient, making the system affordable. The solution presented also involves wireless transmission, i.e., the captured signs are transferred from the patient device to a host in a wireless fashion. Practical experiments are presented to demonstrate the feasibility of the system.

The paper (3) proposes even if the elderly and disabled need the assistance of their families, parents, and healthcare providers, they prefer to live in their homes instead of assisted-living centres. Therefore, their health and activities must be remotely monitored so that in case of an urgent unexpected situation, immediate help can be provided. In this respect, this paper proposes a wireless sensor network-based health monitoring system for the elderly and disabled, and focuses on its development steps. The proposed system is composed of low-cost off-the-shelf components and enables the monitoring of important health parameters of the elderly and disabled.

The paper (4) proposes a mobile device based wireless healthcare monitoring system that can provide real time online information about physiological conditions of a patient. Our proposed system is designed to measure and monitor important physiological data of a patient in order to accurately describe the status of her/his health and fitness. In addition, the proposed system is able to send alarming message about the patient's critical health data by text messages or by email reports. By using the information contained in the text or e-mail message the healthcare professional can provide

necessary medical advising. The system mainly consists of sensors, the data acquisition unit, microcontroller (i.e., Arduino), and software (i.e., LabVIEW). The patient's temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data are monitored, displayed, and stored by our system. To ensure reliability and accuracy the proposed system has been field tested.

The paper (5) presents the design and prototype of a wireless health monitoring system using mobile phone accessories. We focus on measuring real time Electrocardiogram (ECG) and Heart rate monitoring using a smart phone case. With the increasing number of cardiac patients worldwide, this design can be used for early detection of heart diseases. Unlike most of the existing methods that use an optical sensor to monitor heart rate, our approach is to measure real time ECG with dry electrodes placed on smart phone case. The collected ECG signal can be stored and analysed in real time through a smart phone application for prognosis and diagnosis. The proposed hardware system consists of a single chip microcontroller (RFduino) embedded with Bluetooth low energy (BLE), hence miniaturizing the size and prolonging battery life.

The paper (6) proposes IoT in healthcare is the key player in providing better medical facilities to the patients and facilitates the doctors and hospitals as well. The proposed system here consists of various medical devices such as sensors and web based or mobile based applications which communicate via network connected devices and helps to monitor and record patients' health data and medical information. The proposed outcome of the paper is to build a system to provide world-class medical aid to the patients even in the remotest areas with no hospitals in their areas by connecting over the internet and grasping information through about their health status via the wearable devices provided in the kit using a raspberry pi microcontroller which would be able to record the patient's heart rate, blood pressure. The system would be smart to intimate the patient's family members and their doctor about the patient's current health status and full medical information in case any medical emergency arises.

III. SYSTEM DESIGN

In this project, the user has to connect to the model via Bluetooth. Now after establishing the communication successfully, send some data to arduino in our scenario we have 4 module so we have 16 combination like patient want only temperature data or ecg, Blood pressure or temperature and ecg etc. so for these 16 combination we use hexa table which stars from 0 and ends at 'F' so after reading the incoming value arduino decide which type of data user wants. After that arduino start reading that data from sensors and transfer that data to arduino using HC05 and android receive that data and send to firebase which is real time database below is the structure of firebase database.
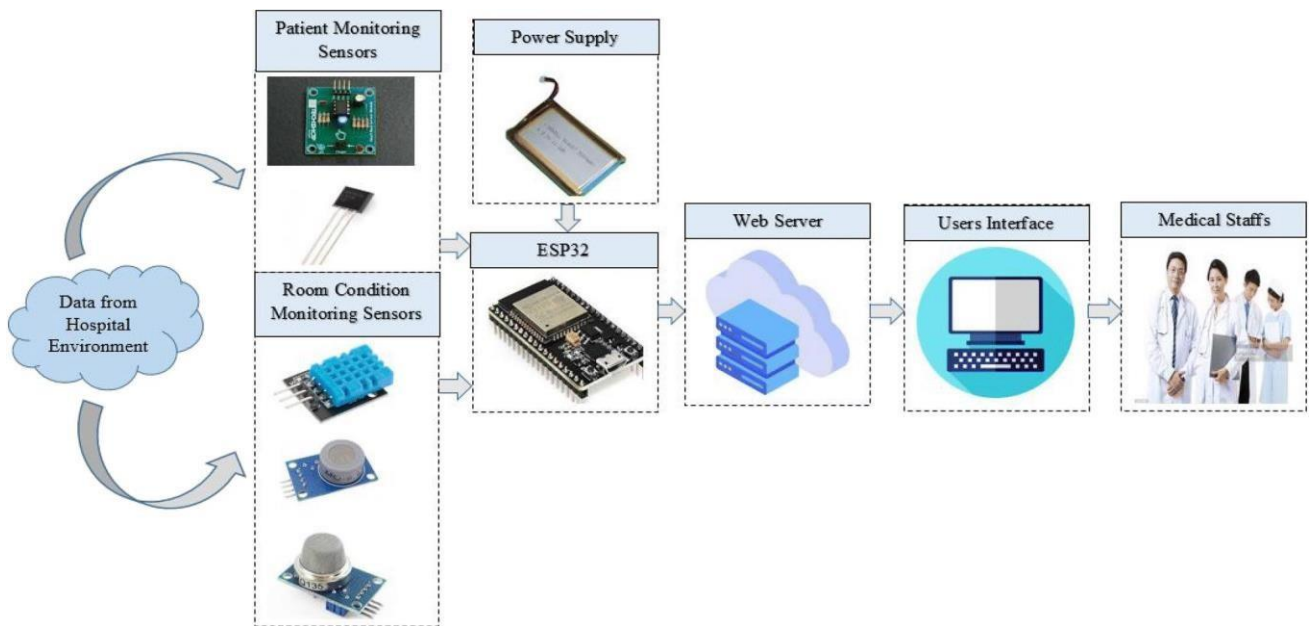
- **Architectural Design:**

Fig. Smart Human Health Monitoring System

IV. COMPARATIVE STUDY

S.R. NO	References papers	The system implemented currently
1.	They require specific application	We can use any Bluetooth application available on Play Store.
2.	They used to check room conditions as well	We only determine through temperature, pulse rate.
3	They had connectivity only through WiFi or bluetooth	We have both the connectivity's in this project
4.	They used different application for storing database	In this project data is directly stored in the WiFi application named as Blynk.
5.	They did not have any options for backup if the system does not work.	We have a reset button in the system so that even if the system is not working properly, after resetting it will work properly.

TABLE NO: I. COMPARISON BETWEEN THE REFERENCE PAPER AND THE SYSTEM IMPLEMENTED

V.   ADVANTAGES OF SYSTEM

- It will save time, reduce the effort and paperwork of both the patient as well as the doctor.
- The system focuses on improving the rate of attendance at healthcare appointments.
- The application will prove very beneficial to doctors and patients. This application is freeware, user-friendly and easily accessible.
- It supports an easy implementation as it is less expensive, trustable, adaptable, accessible to anyone with smart phone and do not require separate devices, packaging or extra hardware.

VI.   CONCLUSION

The system introduced smart healthcare to monitor the basic important signs of patients like heart rate, body temperature. The rate of success between the observed data and actual data is approximately greater than 95% for all cases of the developed healthcare system. Authentic medical staff can view and track the data in real-time even though the patients perform the tests outside of the hospital. The system can also benefit nurses and doctors in situations of epidemics or crises as raw medical data can be analyzed in a short time. The developed prototype is very simple to design and use. The system is very useful in the case of infectious disease like a novel coronavirus (COVID-19) treatment. The developed system will improve the current healthcare system that may protect lots of lives from death. Although the system looks somewhat bulky, it will be a tiny device by proper manufacturing in the near future.

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