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An IoT-Based System for Automated Health Monitoring and Surveillance in Post-Pandemic Life

Dr Anand Jatti[1], Arun K[2], Kiran K M[3]

Associate Professor, Dept. of EIE, RV College of Engineering, Bengaluru, Karnataka, India[1]

UG Student, Dept. of EIE, RV College of Engineering, Bengaluru, Karnataka, India[2]

UG Student, Dept. of EIE, RV College of Engineering, Bengaluru, Karnataka, India[3]

ABSTRACT: There have been attempts to use new technology in various areas to improve the quality of human life as technology has improved and sensors have been miniaturized. The healthcare sector is one major area of research that has seen technology adoption. People in need of healthcare services find it prohibitively expensive, particularly in developing countries. As a result, this project is an attempt to address a current healthcare issue in society. The project's main goal was to create a remote healthcare system. It is divided into three major sections. The first component was the detection of patient vitals using sensors, the second component was the transmission of data to cloud storage, and the final component was the provision of detected data for remote viewing.

KEY WORDS: IoT, Health Monitoring, Blood Pressure, Temperature, Heart Beat Monitoring

I. INTRODUCTION

One of humanity's global challenges is health. Healthcare has received a lot of attention in the last decade. The primary goal was to create a dependable patient monitoring system so that healthcare professionals could monitor patients who were either hospitalised or going about their normal daily lives. Because of improved technology, patient monitoring systems have recently become one of the major advancements.

There is currently a need for a more modern approach. Healthcare professionals play a key role in the traditional approach. They must go to the patient's ward for the necessary diagnosis and advice. There are two fundamental issues with this approach.First,health care professionals must be present at all times on the patient's site, and second, the patient must be admitted to a hospital with bedside biomedical instruments for an extended period of time. In order to solve these two problems, the patients are given knowledge and information about disease diagnosis and prevention. Secondly, a reliable and readily available patient monitoring system (PMS) is required. In order to improve the above condition, we can make use of technology in a smarter way. In recent years, health care sensors along with raspberry pi play a vital role. Wearable sensors are in contact with the human body and monitor his or her physiological parameters. We can buy variety of sensors in the market today such as ECG sensors, temperature sensors, pulse monitors etc. The cost of the sensors varies according to their size, flexibility and accuracy.

The SST which is a cheap, flexible, fully customizable and programmable small computer board brings the advantages of a PC to the domain of sensor network. In our system we are measuring patient's parameters (ECG, temperature, heart rate, pulse, etc) with different available sensors. These sensors collected data i.e. biometric information is given to raspberry pi and then it is transferred to server.

II. LITERATURE SURVEY

In 6LoWPAN, S. J. Jung and W. Y. Chung investigated the Flexible and scalable patient's health monitoring system. The combination of some technologies and a communications solution is the main advantage of this enabling factor. The outcomes of the Internet of Things are synergistic activities gathered from various fields of knowledge such as telecommunications, informatics, and electronics. K. S. Shin and M. J. Mao Kaiver investigated a cell phone-based health monitoring system with self-analysis that incorporates IoT, a new paradigm that uses smart objects capable of not only collecting information from the environment and interacting with the physical world, but also of being interconnected with

each other through the internet to exchange data and information. Tabilo Paniclo and Gennaro tartarisco had studied a Maintaining sensing coverage and connectivity in large sensor networks primarily entails learning how to construct or develop a new computational technology based on clinical decision support systems, information processing, and wireless communication, Data mining is also being kept in new premises in the field of personal health care.

Cristina Elena Turcua researched Health Care Applications, a solution based on the Internet of Things survey, with the goal to present a present in detail how radio frequency identification, multi-agent, and Internet of Things technologies can be used to develop and improve people's access to quality and health care services, as well as to optimise the health care process Gubbi, Jayavardhana, Buyya, Rajkumar, Marusic, Slaven, Palaniswami, and Marimuth conducted research on the Internet of Things (IoT): A vision, architectural elements, and future direction that proposes a system for demand positioning and tracking. It is based on GPS-enabled devices and is suitable for large environments. Smart phones are used to establish initial communication between two terminals. The synchronisation phase performs the initial communication.

J.L. Kalju created a system that can measure various physiological parameters and is used to design a system for heart rate reconstruction for rate adaptive pacing. Loren Schwiebert, Sandeep K.S. Gupta, and Jennifer Weinmann investigated the strength of smart sensors, which are created by combining sensing materials with combined circuitry for other biomedical applications. Gentili G.B proposed a straightforward microwave technique for monitoring cardiac activity. Changes in the modulation envelope of amplitude modulated waves passing through the body are required for this technique. It described how wireless microsensor networks can be used for medical monitoring and environmental sensing. Reza S.Dilmaghani (2016) discovered the design of a Wi-Fi sensor network capable of monitoring patients' chronic diseases at their home via a remote monitoring system in their study. Individual tests such as blood pressure, heart rate, temperature, and so on are now being conducted using wireless sensor technology Individual tests such as blood pressure, heart rate, temperature, and so on can be measured, but this research project enables all of these parameters to be measured together under a single system, and thus all can be worn by the patient and processed data sent toward the internet via the internet of things (IOT).

III. METHODOLOGY

In this project we have temperature, blood pressure, ECG and heart beat readings which are monitored using SST. These sensors signals are send to SST via amplifier circuit and signal conditioning unit (scu), because the signals level are low (gain), so amplifier circuit is used to gain up the signal and transmit the signals to the SST. IT is a Linux based operating system works as a small pc processor system. Here patients body temperature , blood pressure , ECG and heart rate is measured using respective sensors and it can be monitored in the screen of computer using SST as well as monitoring through anywhere in the world using internet source. The proposed method of patient monitoring system monitors patient's health parameters using SST. After connecting internet to the SST it acts as a server. Then the server automatically sends data to the website. Using IP address anybody can monitor the patient's health status anywhere in the world using laptops, tablets and smart phones. If these parameters goes abnormal it will automatically sends alert SMS to the doctors and relatives.

The main objective of this project is to monitor the patient health conditions like heart beat rate, Temperature and transferring data to a remote place using gsm & arm11 enabled smartphone. The receiver end is equipped with arm11 enabled smartphone, which is attached to the PC to check the status of the patient.
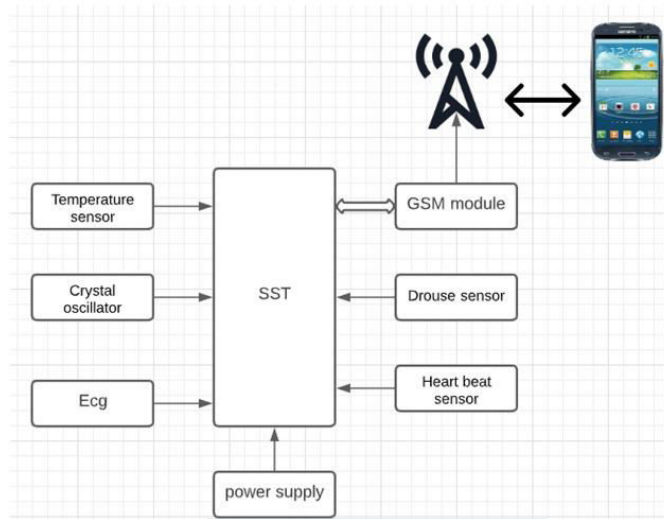
Fig: 1.1 Block Diagram.

The heart (Latin cor) is a hollow, muscular organ that pumps blood through the blood vessels by repeated, rhythmic contractions. The term cardiac means "related to the heart", from the Greek kardia (καρδια) for "heart.
The Heart Sounds are the noises a physician listens to using a stethoscope over the heart. They are the noises of the heart valves shutting.

These noises are not the same as the pulse, or the artery turbulence noises listened to when taking Blood Pressure. There are normal two distinct heart sounds, often called a lub and a dub.

Heart Rate Ranges from 20 to 300 beats per minute
Ave 220 Age =? Target 50 to 80%
If rate is less than 50, or more than 90, indicate with the LED & Alarm.

Blood pressure is the amount of force exerted by the blood against the walls of the arteries. Usually, blood pressure is expressed in two numbers, such as 120/80, and is measured in millimetres
Body temperature is a measure of the body's ability to generate and get rid of heat. The body is very good at keeping its temperature within a narrow, safe range in spite of large variations in temperatures outside the body
A normal body temperature is usually referred to as an oral temperature of 98.6 °F (37 °C), but that is an average of normal body temperatures

Thermistors are used to measure body temperature. This thermistor is a passive transducer whose output is determined by the excitation voltage applied to it. In the circuit, we've arranged the thermistor as a potential driver.
The patient dialled Switch consists of a switch that must be pressed when the patient requires the attention of a nurse or a doctor SMS Facility. SMS stands for Short Message Service. SMS is a digital network service that allows text messages of up to 160 characters to be sent and received to mobile phones via the network operator's message centre or from the Internet via an SMS gateway website.
Unlike paging, but similar to e-mail, short messages are stored and forwarded at the next opportunity if the phone is switched off or out of range.
In this Project, we can send the Parameter monitored to the Mobile Phone as per the requirements.

IV. RESULTS & DISCUSSIONS

Fig 2 shows the interfacing of controller to sensors & LCD.

Fig 2: Interfacing of LCD and sensors with Arduino

Fig 3: Setup of System

Fig 3 shows the Output on LCD of pulse sensor and temperature sensor.

Fig 4: Simulation of system on Arduino IDE

Fig 4 is the simulation window of Arduino IDE of program. These values will be sent to the mobile phone through text message and the hospital staffs will get the complete information about patient present situation.

V. CONCLUSION

Because, health care services are such an important part of our society, automating them reduces the burden on humans and simplifies the measurement process. This system's transparency also helps patients trust it. When the threshold value is reached, the alarm system, which includes a buzzer and an LED, alerts the doctors, allowing them to act more quickly. The goal of developing monitoring systems is to reduce health-care costs by reducing doctor visits, hospitalizations, and diagnostic testing procedures. The GSM technology assists the server in updating patient data on the website. Many more improvements to our system can be made to make it better and more adaptable, such as adding more advanced sensors. The patient's biometric information, which is stored and published online, can be given to scientists and researchers in medical fields to analyse the value and find patterns, as well as for other research purposes. We can use wireless sensors to simplify the hardware and reduce wiring.

VI. FUTURE SCOPE

More parameters can be sensed and monitored based on the availability of sensors or advancements in biomedical trends, which will significantly improve the efficiency of the wireless monitoring system in the biomedical field. A graph of the rate of change of health parameters over time can be displayed on a graphical LCD. The overall health monitoring We have designed a system that can be integrated into a small compact unit as small as a cell phone or a wrist watch. This allows patients to easily transport the device wherever they go. In addition to medical applications, we can use our system in industrial and agricultural settings by incorporating sensors such as humidity sensors, fertility check sensors, and so on.

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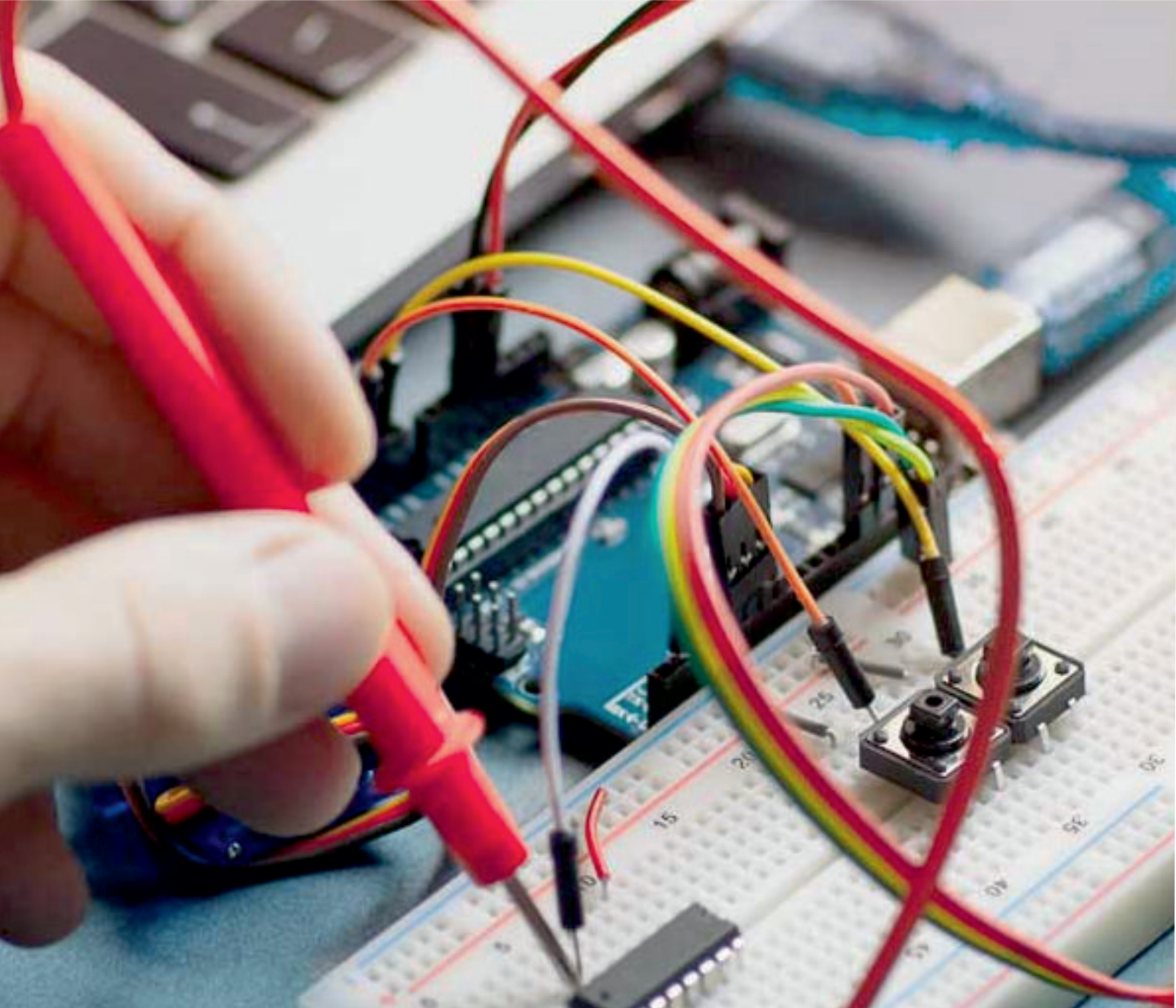
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