IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

HEALTH MONITORING SYSTEM

Chaitra P[1], Krupa A[2], Likitha H[3], Monika V Arya[4], Dr. Devika B[5]

Student, Dept. of Electronics & Communication Engineering, K.S. I. T, Bengaluru, India[1].
Student, Dept. of Electronics & Communication Engineering, K.S. I. T, Bengaluru, India[2].
Student, Dept. of Electronics & Communication Engineering, K.S. I. T, Bengaluru, India[3].
Student, Dept. of Electronics & Communication Engineering, K.S. I. T, Bengaluru, India[4].
Associate Professor, Dept. of Electronics & Communication Engineering, K.S. I. T, Bengaluru, India[5].

Abstract: Healthcare is given the extreme importance now a days by each country with the advent of the novel corona virus. So in this aspect, an IoT based health monitoring system is the best solution for such an epidemic. Internet of Things (IoT) is the new revolution of internet which is the growing research area especially in the health care. With the increase in use of wearable sensors and the smart phones, these remote health care monitoring has evolved in such a pace. IoT monitoring of health helps in preventing the spread of disease as well as to get a proper diagnosis of the state of health, even if the doctor is at far distance. In this paper, a portable physiological checking framework is displayed, which can constantly screen the patient's ECG, heartbeat, temperature, oxygen levels. We proposed a nonstop checking and control instrument to screen the patient condition and store the patient information's in server utilizing Wi-Fi Module based remote correspondence. A remote health monitoring system using IoT is proposed where the authorized person can access these data stored using any IoT platform like Thing-speak mobile application and based on these values received, the vitals are monitored and analysed by the doctors from a distance.

Keywords: Sensors , AD8232, LM35, ECG, Waveforms.

I. INTRODUCTION

Health is always a major concern in every growth the human race is advancing in terms of technology. Like the recent corona virus attack that has ruined the economy of China to an extent is an example how health care has become of major importance. In such areas where the epidemic is spread, it is always a better idea to monitor these patients using remote health monitoring technology. So Internet of Things (IoT) based health monitoring system is the current solution for it. Remote Patient Monitoring arrangement empowers observation of patients outside of customary clinical settings (e.g. at home), which expands access to human services offices at bring down expenses. The core objective of this project is the design and implementation of a smart patient health tracking system that uses Sensors to track patient health and uses internet to inform their loved ones in case of any issues. The objective of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure. Each of our bodies utilizes temperature and also pulse acknowledging to peruse understanding wellbeing. The sensors are linked to a microcontroller to track the status which is thus interfaced to a LCD screen and IOT platform . There is a significant capability between SMS based patient flourishing viewing and IOT based patient checking framework. In IOT based framework, subtle parts of the patient flourishing can be seen by different clients. The explanation behind this is the information should be checked by passing by a site or URL. In most of the rural areas, the medical facility would not be in a hand reach distance for the natives. So normally the people neglect any kind of minor health issues which is shown in early stages by variation of vital elements like body temperature, heartbeat rate etc. Once the health issue has been increased to a critical stage and the life of the person is endangered, then they take medical assistance, which can cause an unnecessary waste of their earnings. This also comes into account especially when certain epidemic is spread in an area where the reach of doctors is impossible. So to avoid the spread of disease, if a smart sensor is given to patients, who can be monitored from a distance would be a practical solution to save many lives.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

II. ESP32

Fig. 1 ESP32

The ESP32 microcontroller is a low-cost, low-power microcontroller that is commonly used in Internet of Things (IoT) applications. It is a dual-core microcontroller with Wi-Fi and Bluetooth capabilities. The ESP32 microcontroller is programmable with the Arduino IDE, making it easy to develop IoT applications. It also has a wide range of peripheral interfaces, including SPI, I2C, UART, and ADC. The ESP32 microcontroller is ideal for applications such as home automation, smart agriculture, and industrial automation.

The ESP32 microcontroller has a number of features that make it ideal for IoT applications. For example, it has a low-power consumption mode that allows it to run on a battery for long periods of time. It also has a high level of processing power and memory, which makes it suitable for complex applications. The ESP32 microcontroller also has built-in Wi-Fi and Bluetooth connectivity, which makes it easy to connect to other devices

.

III.LITERATURE SURVEY

The health monitoring system had been introduced to collect data related to health condition like blood pressure, temperature, sleep conditions, weight, etc., over quite a long time. Here data has been collected four times a day, morning, noon, evening and night and saved in the form a TOD (time-of-day) matrix and analysed later.[1]

The body temperature sensor, pulse rate sensor, room temperature and humidity sensor values are calibrated using the microcontroller. The complete prototype of the health monitoring system with the sensors, it shows the output values of the sensors calculated and displayed in a LCD display, so that these values are visible even to the patient. These sensor values are then sent to the database server. These data can be accessed from cloud by the authorized users using the IOT application platform.[2]

The developed system was tested with various subjects of different ages in different conditions. In the test cases, for heartbeat, body temperature, and room temperature sensors, we manually calculated the actual value and observed value from the developed system. Here, the room temperature sensor is used to measure the humidity only. From the data, we measured error rate to show the effectiveness of the system. As there is no alternative way to measure the toxic gas level, we just show the data of MQ-9 and MQ-135 in the web server.[3]

The summary of this review is done based on some criteria such as feedback devices, major hardware components, uses, and cost-effectiveness. Different frameworks employ different feedback systems. The summary of the reviewed system is depicted with the aforementioned criteria. The health monitoring system designed used a raspberry pi as MCU and the Lo-Ra module for data transmission and detection of hearing problems, headache, and rapid pulse rate, and used RFID tags for security and ZigBee for data transmission.[4]

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

The sensors and detectors detect the signals in analog form, which needs to be further converted into digital form. The inbuilt analog to digital conversion is performed through the microcontroller to get data in proper digital format. The data are sent to Raspberry Pi that is being used as a microcontroller.[5]

The proposed system sends an automated notification via text to the doctors or the relatives if the ECG signals and the temperature reading go above or below the threshold value. It will help doctors in many ways and will enhance the efficiency of monitoring and treatment for patients. In the future, it will be modified by adding the pulse oximeter to measure oxygen saturation in blood for a patient to make the system even more efficient.[6]

The proposed system consists of the LM35 temperature sensors are precision integrated circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 is rated to operate over a −55°C to +150°C temperature range. The Heart Beat-Sensor consists of an infrared (IR) LED as transmitter and an IR photo-transistor as a receiver that acts as a fingertip sensor.[7]

The proposed system uses the industrial temperature sensor i.e. LM 35 which gives us room temperature. That temperature is displayed on the LCD as shown in Implemented circuit in working condition .Temperature display on LCD. There is a cavity for measurement of the heartbeat, which consist of a arrangement of LED and LDR. By placing your finger in between a LED and LDR, we can detect the pulses of heart, the analog voltages are further processed with an operational amplifier LM 358, and this chip has two built in OPAMPs. Result is displayed on the LCD. This collected data is transmitted using ZigBee module. This data is received at the receiver section using same ZigBee module. Use of USB port of laptop Here there is a use of the laptop to show the results, so that ZigBee module is connected with the USB. Instead of using RS232 port of PC, use of the USB port of laptop.[8]

The DC component resembles the transmitted or reflected optical signal from the tissue which depends on the structure of the tissue and the average blood volume of both the arteries and veins. The changes in blood volume during the transition of phases, systolic to diastolic and vice versa, is exhibited by AC component; the heart rate is responsible for the fundamental frequency of the AC component which is then superimposed onto the DC component.[9]

The patient's personal home server can be a personal computer or mobile devices such as cell phone/PDA. We suggest mobile devices because it will be more suitable for the users to use their mobile devices for this purpose..[10]

A smart vest is essentially a wearable physiological monitoring system, incorporated in a vest. A variety of sensors integrated into the garment’s fabric, simultaneously collects bio-signals in a non-invasive and unobtrusive way. The parameters measured by the vest include ECG, photoplethysmography (PPG), HR, BP, body temperature, and galvanic skin response (GSR).[11]

The evolution of wireless technology is also extremely fast-paced. The 802.11b protocol for wireless computer networks came in large demand in 2000. In just over four years, wireless communications technology has become readily available for the general public, with 7.5 million households.[12]

The whole system of mobile health care using biosensor network places forward some future works such as finding the most effective mechanism for ensuring security in bio-sensors considering the severe restrictions of memory and energy, representing the collected data in the most informative manner with minimal storage and user interaction, modeling of data so that the system will not represent all the data but only relevant information thus saving memory. These are the generic works that can be done in future in the sector of mobile health care.[13]

Health care monitoring system is depicted. Patient’s vital parameters such as Heart Beat and temperature is continuously monitored via medical sensors and periodically stored in cloud service. The proposed system collects real time data from the patients and delivers an updated patient’s status to the medical professionals and to the caretakers using WSN.[14]

The proposed system will be most useful for the village side patient, who didn't get on time treatment with proper prescription, no doubt village side doctors also know prescription but still they refer the patient to specialized doctor. At this time system will be very useful. The proposed system involves various health parameters such as pulse rate temperature, heartbeat and innovative part over referenced systems which is camera unit which will monitor to the patient and also blood pressure measured using Sphygmomanometer.[15]

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

The worsening of patient can't be found in time, and then the patient can't be helped in time. For most of the patients can be monitored real-time in hospital, we should 10 find a new method. Consider that the movement of the patient is limited in hospital, we adopted the ZigBee and wireless sensors network to acquire the physical parameters of the patient.[16]

IV. BLOCK DIAGRAM AND METHODOLOGY

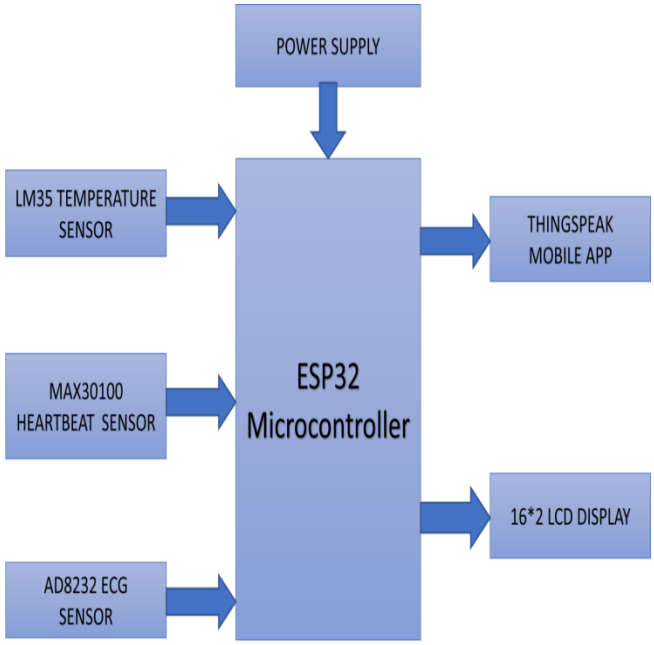

Fig 2. Block Diagram of Health Monitoring System

Health monitoring system consists of 3 sensors namely LM35 which is a temperature sensor used to measure temperature, MAX30100 Heartbeat sensor used to measure Heartbeat and oxygen levels of a body, AD8232 ECG sensor to get the waveform of heart. In addition ESP32 is the Microcontroller used. ESP32 includes a wifi module. ESP32 is powered by a power supply. Data is stored here. The same data is displayed on the LCD display. In Thingspeak mobile application waveforms are displayed.

Three sensors will be used in this project. ESP32 includes a wifi module. The ESP32 is powered by a power supply. Three sensors, such as temperature sensor, SPO2 sensor that measures heart beat and oxygen levels, and an ECG sensor which records the waveform of the heartbeat are used. The ESP32 microcontroller, which has an integrated wifi module, receives all the vital signs after being measured. The programme is called Arduino IDE. Embedded C is used to write the code. The data is processed and displayed on an LCD after being supplied into the ESP32.The utilised smart phone app is called Thingspeak. A username, password, and an IP address are formed, and the IP address is used in code to send the data. Data is now uploaded to the cloud and vitals are displayed on Thingspeak.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

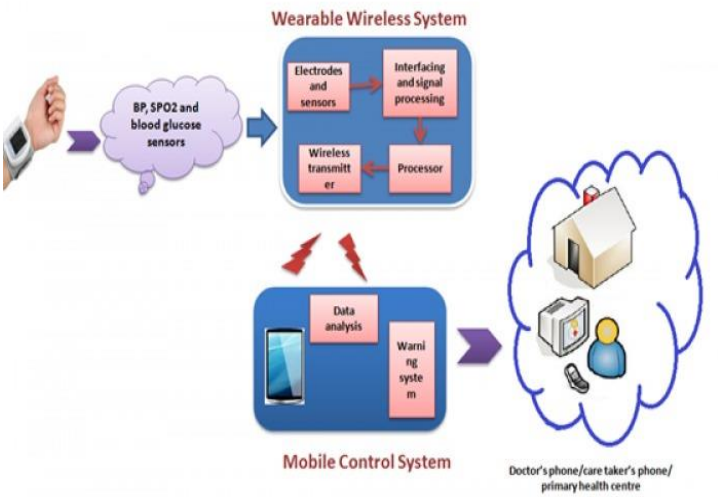

Fig 3. Project Demonstration

V. FLOWCHART

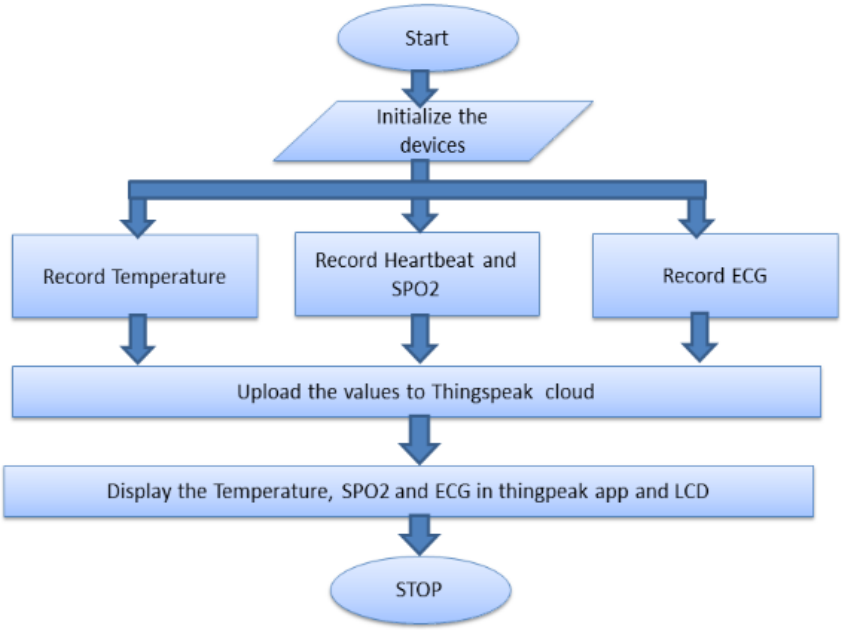

Fig 4 . Flowchart

The device is set up. All the devices are initialized. Vitals such as Heartbeat level, SPO2 level, Temperature, ECG are measured. All these vitals uploaded to thingspeak cloud. Values are displayed on LCD as well as Thingspeak. Care takers, doctors and patients can access these values through thingspeak application. After measuring all the vitals device is turned off.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.10515

VI. CONCLUSION

In conclusion, a health monitoring system can be highly beneficial in improving health outcomes and identifying health trends. By tracking and analyzing health data, individuals can make informed decisions about their health, healthcare professionals can provide better care, and researchers can gain valuable insights into population health. However, it is important to ensure that these systems are secure and protect individual privacy. Additionally, the accuracy and reliability of these systems should be carefully evaluated before use.

REFERENCES

[1]. Prajoona Valsalan, Tariq Ahmed Barham Baomar, Ali Hussain, Omar Baabood "Iot Based Health Monitoring System" Journal of Critical Reviews ISSN- 23945125 Vol 7, Issue 4, 2022.

[2]. Md. Milon Islam, Ashikur Rahaman, Md. Rashedul Islam, "Development of Smart Healthcare Monitoring System in IoT Environment" Published online: 26 May 2020 © Springer Nature Singapore Pte Ltd 2022.

[3]. NilanjanDey, Amira S. Ashour, Fuqian Shi, Simon James Fong and R. Simon Sherratt, "Developing residential wireless sensor networks for ECG healthcare monitoring" IEEE Transactions on Consumer Electronics, 63 (4) 2021.

[4]. Vivek, Wardha MH, Saurabh, Wardha MH, Swapnil, Wardha MH, Pankaj Hage "Health Monitoring Systems using IoT and Raspberry Pi – A Review", International Conference on Innovative Mechanisms for Industry Applications (ICIMIA) 2021.

[5]. Vaneeta Bhardwa · Rajat Joshi · Anshu Mli Gaur, "IoT Based Smart Health Monitoring System for COVID 19", Received: 10 August 2021 / Accepted: 3 January 2022 / Published online: 20 January 2020.

[6]. Alvee Rahman, Sazzad Hossain, Tahsinur Rahman, Nawab Haider Ghani, Jia Uddin, "IoT Based Patient Monitoring System Using ECG Sensor", International Conference on Robotics,Electrical and Signal Processing Techniques (ICREST), 2019.

[7]. K. Navya, Dr. M. B. R. Murthy, "A Zigbee Based Patient Health Monitoring System", K. Navya et al. Int. Journal of Engineering Research and Applications www.ijera.com Vol. 3, Issue 5, Sep-Oct 2021.

[8]. Manisha shelar, Sehore Jaykaran Singh. Sehore Mukesh Tiwari, "Wireless Patient Health Monitoring System", International Journal of Computer Applications (0975 – 8887) Volume 62– No.6, January 2021.

[9]. M. Figueroa, A. K. Jarmusch, H. A. Raja, T. El-Elimat,J. S. Kavanaugh, A. R. Horswill, R. G. Cooks, N. B. Cech,and N. H. Oberlies, "Polyhydroxyanthraquinones as quorumsensing inhibitors from the guttates of penicillium restrictumand their analysis by desorption electrospray ionizationmass spectrometry," J. Nat, vol. 77, no. 6, pp. 1351–1358,2020.

[10]. Sushama Pawar, P.W.Kulkarni, "Home Based Health Monitoring System Using Android Smartphone" ,International Journal of Electrical, Electronics and Data Communication, Vol-2, Issue-2, Feb-2020.

[11]. Clever Farm (EU-JOULE ERK6-6CT-1999-00006) Larsen, G.C., Hansen, A.M. and Kristensen, O.J.D., "Identification of Damage to Wind Turbine Blades by Modal Parameter Estimation", Ris0-R-1334(EN), April 2020.

[12]. Hadi Banaee, Mobyen Uddin Ahmed and Amy Loutfi Center for Applied Autonomous Sensor Systems, Orebro University, SE-70182 ¨ Orebro, Sweden.

[13]. Mowafaq Salem Alzboon, "Survey on Patient Health Monitoring System Based onInternet of Things", Inf. Sci. Lett. 11, No. 4, 1183-1190 1183Information Sciences LettersAn International journal.

[14]. Sasippriya Saminathan, K.Geetha, "A SURVEY ON HEALTH CARE MONITORING SYSTEM USING IOT" International Journal of Pure and Applied Mathematics Volume 117 No. 17 2020.

[15]. Yogesh Pandurang Pardhi, Prof.Shubhangi Borkar, "A Survey on Patient's Health Monitoring System in Real Time Using Raspberry Pi", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Website: www.ijareeie.com Vol. 6, Issue 6, June 2021.

[16]. O. S. Albahri1 & A. S. Albahri1 & K. I. Mohammed1,"Systematic Review of Real-time Remote Health Monitoring System in Triage and Priority-Based Sensor Technology", journal of Medical Systems 2020.

