A Real Time Non-Invasive Cholesterol Monitoring System

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Abstract - The fundamental element of people's needs is health. Humans face a haul of surprising death and plenty of diseases because of varied diseases that are a result of lack of treatment to the patients at right time. The main objective of this project is to develop reliable sensible patient health observance system victimization IOT so the attention professionals will monitor their patients. The sensors will be either worn or be embedded into the body of the patients, to unendingly monitor their health. The knowledge collected in such a fashion will be hold on, analyzed, and well-mined to try and do the first prediction of diseases. A mobile device-based attention observance system is developed which may offer period on-line data regarding physiological conditions of a patient primarily consists of sensors, the information acquisition unit, Arduino, and programmed with code. The patient's heartbeat rate, ECG, graph knowledge square measure monitored, displayed, and hold on by the system and sent to the doctor's and patient's mobile containing the appliance. The sensible Health Observance System monitors health standing and saves it on the online page.

Keywords: Physiological conditions, IOT, heart bit rate, ECG, etc.

I. INTRODUCTION

Cholesterol is found in every cell in the body and is produced by the body or consumed through dietary food, with lipoproteins transporting it through the bloodstream. The cholesterol can be transported by two types of lipoproteins viz low-density and high density lipoproteins referred as LDL and HDL respectively. It's crucial to keep both types of lipoproteins at the right levels, because high LDL levels signal a higher risk of heart disease, but high HDL levels indicate a healthy heart. VLDLs, or very low-density lipoproteins, transfer cholesterol from the liver to the body's organs and tissues. Total cholesterol is made up of LDL cholesterol, HDL cholesterol, and VLDL cholesterol. Ideal cholesterol level should be less than 200mg/dL according to the clinical investigation. The cholesterol level of more than 240 mg/dL is harmful for the human body.

Diabetes mellitus (DM), commonly referred to as Diabetes, is a prominent cause of death and morbidity around the world. Our blood sugar levels are controlled by the insulin hormone. A diabetic's body, on the other hand, either does not generate enough insulin or does not utilise it properly. The blood sugar level rises as a result. This causes a plethora of issues, including the degeneration of various organs in the body. Type 1 diabetes, type 2 diabetes, and gestational diabetes are the three kinds of diabetes.

Type 1 diabetes is caused by the body not producing enough insulin, but Type 2 diabetes is caused by the body producing too much insulin that is not used properly. Gestational diabetes is more common in pregnant women. The three main categories of blood glucose levels are hypoglycemia, normal blood glucose level, and hyperglycemia. Blood glucose monitoring on a regular basis can help to lower the risk of fatal diabetic complications.

Invasive, Minimally Invasive, and Non-invasive are the three systems available. An invasive method is a medical procedure that involves cutting or puncturing the skin or inserting instruments into the body to invade or enter the body. In a minimally invasive procedure, tiny incisions are produced with the help of small flexible instruments rather than a huge opening. There is less pain and a faster healing time because the incisions are smaller. Without cutting or inserting tools into the body, the skin is not damaged in the Non Invasive approach. The main distinction between invasive and non-invasive tests is that invasive tests entail cutting or entering a body part with medical equipment, whereas non-invasive tests do not.

The invasive method is the traditional and conventional existing method which includes tests like biopsy, endoscopy, cryotherapy etc which are carried out by medical providers using instruments that cut the skin. There are many drawbacks of the invasive procedure as it is painful, expensive and causes discomfort and damage to the patient skin leading to infections and the usage of invasive technique for pregnant woman increases the chances of abortion and mental stress. Thus, puncturing of skin is not an advisable method for continuous monitoring. A Non Invasive system which is simple, reliable

and painless due to absence of incision of skin surface can overcome the drawbacks of an invasive system.

II. LITERATURE REVIEW

Peter Leijdekkers et al. [1] of University of Technology, Sydney proposed an arrangement of individual trial application, which diminishes defer time between beginning of heart assault and a notification to the crisis administrations. The individual test comprehends these issues by utilizing inescapable innovation: a cellular device and a little ECG sensor which can be worn and is effectively conveyed by the individual. By soliciting a set from inquiries, the individual acknowledges what they went through can be a heart assault. The application additionally investigations two ECG chronicles on the cellular device for heart assault signs to affirm this. In this way, the application can rapidly survey the client's condition and give suitable exhortation without the intercession of a therapeutic expert. It additionally directs the client and spectators in getting the correct help via computerizing the call. The ECG is recorded and dissected progressively on the cellular device utilizing a 2 terminal, 1-lead heart monitor. The calculation utilized here can identify the heart beat anomalies, for example, ventricular tachycardia. In the event that the application finds out that the user is in danger it encourages the user to notify the authorized administration right away. In a situation that user has a heart failure the system consequently decides the present area of the user and alarm the emergency ambulance and other required people to the user's area.

Dr.A.A.Gurjar et al. [2] of Sipna COET, Amravati, proposed a framework where heartbeat is checked and heart assault location is noted. The sensor used is interlinked to a microcontroller that allows reading pulses and sending them over Internet. The user may set the high and low limits of heartbeat. Later, monitoring begins to check if the heartbeats are crossing the limits either way. The transmitting circuit with the patient and the other circuit with the authorized personnel are used. Heartbeat sensor is used to identify the current pulse rate and display it on the LCD screen. This suggested system can be used in all places without any constraints. There is no obligation to stay at home and use the device.

Nikunj Patel et al. [3] of CSPIT, CHARUSAT proposed a framework which has a distinction of identifying heart assault with assistance of watching pulse dependent on web of thing. Our strategy utilizes a heartbeat sensor, Arduino board and a Wi-Fi module. In the wake of setting up the framework, the beat sensor will begin detecting pulse readings and will show the heartbeat of individual on LCD screen. Likewise, with the utilization of Wi-Fi module it will transmit the information

over web. Framework permits a set point which can help in deciding if an individual is sound or not by checking his/her pulse and contrasting it and set point. In the wake of setting these limits, the framework will begin checking the pulse of patient and quickly the pulse goes above or beneath as far as possible the framework will send an alarm message. As a piece of this undertaking we are executing an android application show that will follow the heartbeat of specific patient and screen it effectively and give the crisis message on odds of heart assault.

K.S.Abbirame et al. [4] of KVCET, Chennai, Tamil Nadu, India proposed a developing framework which will diminish the demise rate because of heart assault by early location of heart assault. In our framework we are utilizing pulse sensor, GSM and GPS to quantify the pulse and offer the data. The pulse sensor will ceaselessly screen pulse of a client. We effectively set the edge an incentive in the framework. When it goes beneath or over the edge esteem, the microcontroller will initiate the GSM and GPS to share the data with area of the client to the closest wellbeing division and to the relatives. The structure will create a message at whatever point the client's pulse ends up unusual, with his/her area to the closest wellbeing area and to the recently put away relatives number.

A.Dutta et al. [5] of Institute of Engineering and Management, Salt Lake, Kolkata , built up a gadget utilizing miniaturized scale controller and heart beat sensor. It identifies beat rate as well as demonstrates the infection suggested by the example portrayed by the pulse. The client first sets his age and sexual orientation before running the machine. The miniaturized scale controller checks the bit rates consistently and passes on the patient through its presentation and alert segment the state of the patient. Understanding is additionally guided for the need of any crisis drug or discussion with a specialist. There will likewise be arrangement for demonstrating the client his/her most extreme work force with the goal that they can push their limits prompting a sound way of life. Gadget is utilized for 24 hours and recorded information stays accessible for examination. The client can comprehend what is the genuine state of the working of his heart without relying upon doctors. This gadget is a stage forward to bio-electro joint effort. This is a wired gadget further act of spontaneity of remote element can be introduced to it. Direct specialist video connection can be give or appended to it. Wi-Fi association with the Smart gadgets can be set up in it. This gadget all in all substance cannot just control (to some degree) essential heart issues which is an issue of each family unit yet can likewise give an inspiration to expanding working limit by demonstrating the individual the degree of his pulse. This gadget can even control demise the same number of individuals bites the dust on their

approach to clinics since they can't be furnished with the essential controlling drug which can deal with their circumstance for some additional time.

Samar Ali et al. [6] of Abu Dhabi University, UAE, they proposed a system that checks for vehicle impact through the identification of heart assaults that drivers may experience the ill effects of. They introduced the system of the administration empowered through a technology for IoT systems and two varieties. They proposed a voice controlled mobile heart attack detection service display and a motion controlled show. Both fuse sensors from savvy; provided its fame with clients and expanding accessibility. The principal variety of real time mobile heart detection system just thinks about what the client could utilize administration in vehicles, while second variety helps the client outside vehicular system settings. They additionally talked about the system and presented associated work and foundation data of the innovations that it uses. They likewise wanted to consider programmed recognition of heart assaults through the usage of the heart's movement when solid FDA-endorsed ECG sensors are fused in wearable gadgets.

Pughazendi N et al. [7] implemented a system where protection evaluative measures for both driver and the vehicle are enhanced. The paper suggests the usage of sensors. Heartbeat sensor is utilized for screening heartbeats in 60 seconds of the driver continually and keeps mishaps from occurring by controlling through internet. Internet is connected to various devices and thus passes on the crisis notification to the required authorized people. Traffic light sensor is utilized to pursue the traffic principles and guidelines by the driver. In the event of the red light being ON,at that point the vehicle consequently stops before it reaches the said fixed line. Fuel level sensor is utilized to quantify fuel level of the vehicle and figure if accessible fuel is sufficient to achieve to goal or not, in the event that it isn't sufficient, at that point guide will recommend the driver to achieve the close-by petroleum bunks.

Arulananth T.S et al. [8] suggested in the respective paper that heart rate is measured by either the ECG waveform or by sensing the pulse of the user. The cadenced development and withdrawal of a supply route of blood is constrained through it by the customary withdrawals of the heart. The beat can be felt from those zones where the course is near the skin. Portrayal of a method of estimating the pulse through the tip of the finger and Arduino microcontroller is performed. It depends on the chief of Photo-Phelthysmography, which is non-intrusive strategy for estimating the variety in blood volume in tissue utilizing a light source and indicator. While the heart is pulsating, it is siphoning blood all through the body, and that makes the blood volume inside the finger course to change as well. This variance of blood can be distinguished through an optical detecting instrument put around the fingertip. The flag can be enhanced and is sent to Arduino with the assistance of sequential port correspondence. With the assistance of preparing and programming, pulse observing and tallying is performed.

III. PROBLEM STATEMENT

In rural hospitals, the facilities for health caring are limited. The poor quality of health management enables issues in health care system. In developing countries there is lack of resources and management to reach out the problems of individuals. A common man cannot afford the expensive and daily check-up for his health.

IV. OBJECTIVES

The Cholesterol Monitoring system is developed using IOT Technology with an objective of detecting the heartbeat of the patient in order to monitor the risk of heart attack and also the regular check-up. Body health monitoring is very important to us.

- The main objective of the system is to implement cholesterol monitoring and heart attack recognition system using IoT.
- To extend the benefits of Internet with remote control ability, data sharing, constant connectivity and so on.
- To save the lives of many humans.
- To detect and monitor the heart rate of a patient.
- To notify and provide data in real-time.
- To reduce the death rates by controlling the heart attacks.

V. METHODOLOGY

- In our proposed system, we are using the ESP 32, ECG Sensor, Pulse Sensor, LCD Display, IOT Module, and Power supply.
- A Smart Cholesterol Monitoring System will not only help in maintaining health but also reducing the work of doctors and saving the time of patients.
- The proposed method of cholesterol monitoring system monitors patient's health parameters using ESP32 microcontroller.
- After connecting internet to controller, it is connected to cloud database system which acts as a server. Then the server automatically sends data to the receiver system.
- Hence, it enables continuous monitoring of the patient's health parameters by the doctor. Any abrupt increase or decrease in these parameter values can be detected at the earliest and hence necessary medications can be implemented by the doctor immediately.

- Various varieties of sensors are interfaced with the microcontroller to create the system smart. The info will display on both LCD and in their webpage.
- The most ideal of the system is to transmit the knowledge through the webpage to continuous monitoring of the patient over the internet.
- The one can simply access the health anytime from anyplace. An LCD is additionally connected to the microcontroller for the patients to look at their health status live.
- The methodology is divided into three parts.
- The first part is on the design structure, followed by hardware description and the finally on the programming design.
- All these three parts were assembled together and experiments were then performed.

VI. SYSTEM DESIGN

- The proposed system has eminence of detecting heart attack with help of observing heart rate based on internet of thing.
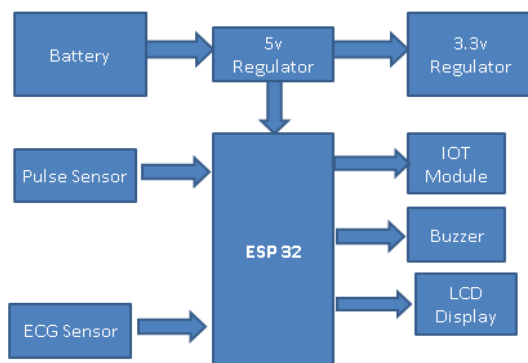

Figure 1: Block Diagram

- Our method uses a pulse sensor, ECG Sensor, ESP 32 microcontroller, LCD Display, Buzzer and Wi-Fi module.
- After setting up the system, the pulse sensor and ECG sensor will start sensing readings and will display the it on LCD screen.
- Also, with the use of Wi-Fi module it will transmit the data over internet.
- System allows a set point which can help in determining whether a person is healthy or not by checking his/her cholesterol level and comparing it with set point.
- After setting these limits, the system will start monitoring the cholesterol of patient and if the cholesterol goes above or below the certain limit the system will send an alert message.
- As a part of this project we are implementing an android application model that will track the heartbeat of

particular patient and monitor it correctly and give the emergency message on chances of heart attack.

VII. RESULT AND DISCUSSIONS

This project presents IOT Based Cholesterol Monitoring System and it is designed and implemented with ESP32 Microcontroller in embedded system domain. Experimental work has been carried out carefully. The result shows that higher efficiency is indeed achieved using the embedded system.

The proposed system detects the health of the person and monitors their cholesterol level. All data taken from the sensors will be stored in cloud and analyzed at regular intervals and notification about the events and the view images captured are uploaded to cloud server. The pulse rate and ECG data of the person will be displayed on 16x2 LCD display.

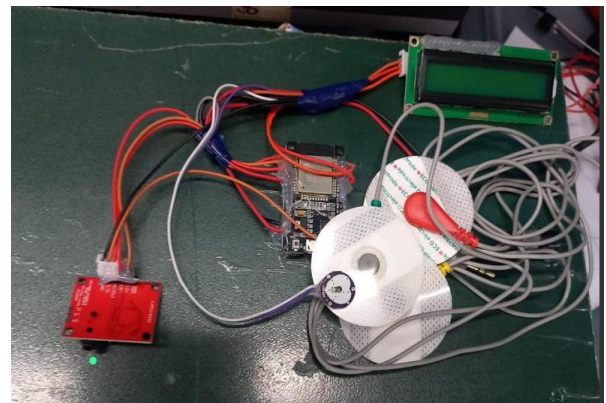The Following figure shows the hardware setup of the proposed system:

Figure 2: Result of Hardware

VIII. CONCLUSION

In this project, an IoT based cholesterol monitoring system was developed. The system monitored pulse rate and ECG using sensors, which are also displayed on a LCD. These sensor values are then sent to a medical server using wireless communication. These data are then received in an authorized personals smart phone with IoT platform. With the values received the doctor then diagnose the disease and the state of health of the patient. The main objective of the experiment was successfully achieved. All the individual modules like Heartbeat detection module, fall detection module etc. and remote viewing module gave out the intended results. The designed system modules can further be optimized and produced to a final single circuit. More important fact that came up during project design is that all the circuit components used in the remote health detection system are available easily.

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