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Monitoring health parameter of remotely located patient

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***Abstract*— As we know in this pandemic situation social distancing is key to be safe. So, we have to keep safe distance in every situation whether it's working site or in providing service to people. For this situation most important service required by the people is medical. So, we have to style a module which help hospitals to provide implementation to this problem. By keeping this situation in mind project for hospital is going to design. Basically, in this project we are going to measure and monitor the heath parameter of patient like temperature, heartbeat, blood pressure, blood sugar level etc. Those sensed value will be either send directly to controller (Arduino) or will be added to GUI and then send to controller. Then this value will be sent over WIFI network and store in database so that those value can be access whenever patient has appointment by doctor's side system. By implementing this project no Doctor or patient will have direct interaction, to avoid spreading of dangerous virus. Advantage of this system is that Dr. can access patient health parameter at any time and can medicate his patient.**

Keywords— WIFI, Database, LM-35, Xbee, Bluetooth.

I. INTRODUCTION

In this pandemic situation there is need of remote system for every application it may be medical, security & etc. If we consider medical area, it played important role in this pandemic situation. So in this situation for simple routine check-up, we can't visit hospital because it is not safe. But it is necessary also, as some diseases like heart disease may be dangerous to avoid so by analyzing this situation remote health monitoring system is designed. In this model most preferred method for monitoring the health constraint of remotely located patient in hospital is illustrated. [12] Where in designing system which firstly sensing value from medical sensors is needed. The parameter like temperature, heartbeat, blood pressure etc. have to sense. These values, we have to send to doctors' system.

These health parameters will be shown on webpage according to patient id specified by doctor. For giving this project real time use database has to include so that health parameter can be accessed by doctor to do proper medication to patient depending on his health observed by its parameter.

Remote health monitoring was developed which is regarded as a hot topic in the ground of research. As we know number of aged people is increasing, it is definite that the need of a remote medical care system providing remote monitoring aiming to reduce the rising healthcare expenditure is very urgent. Also author discussed that World Health organization mentioned, that in Bangladesh, about 17% of deaths are caused by cardiovascular diseases. Frequent health monitoring and rapid recognition can save up to 60% of lives. For these reasons, a wireless, wearable, low cost and automatic health monitoring system is a solution [1].

Using Internet of Things (IoT) we can observed that as enabling user-specific interoperable communication services by integrating sensing and actuation technologies with technologies [11], such as telecommunication,

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networking, security and cloud computing etc [7]. Application of the IoT technologies is prone to unpredictable, disruptive cyber-attacks. So, author suggested that Information and communication security is of utmost important as medical devices or sensors installed to monitor and collect personal medical data are highly susceptible to malicious hacker attacks [2].

III. Research methodology

A. *Health parameter*

1. ECG

An ECG is digital recording of the electrical signals in the heart. It is too called an electrocardiogram or an EKG. The ECG is used to determine heart rhythm, heart rate and other information regarding the heart's condition [9]. ECGs are used to diagnose heat attacks, pacemaker function and heart failure. ECG can be analyzed by reading components of the waveform.

2. SpO_2

SpO_2, means oxygen saturation, it is the measure of the amount of oxygen-contain hemoglobin in the blood with respect to the amount of hemoglobin not carrying oxygen. This is important aspect of body it has to be present in body at certain level of oxygen in the blood or body will not function as effectively. Because very low levels of SpO2 can cause very serious symptoms [3]. This health condition is known as hypoxemia. It affects the skin & visible on the skin, called as cyanosis due to the blue (cyan) tint it takes on. Hypoxemia (due to low levels of oxygen in the blood) skin can turn into hypoxia (low levels of oxygen in the tissue). This change & difference between the two conditions is important to understand. Normal SPO2 level is above 95% and for the person who have chronic lung disease then his normal temperature can be 90%.

3. Temperature:

In this Covid-19 temperature is first symptom which can be observed. So, monitoring this is important. Generally normal human body temperature is 98.6F [4].

4. Heart Rate

It is the factor which determine how times our heart beat per minute. Indirectly it means how many times heart get contract and expand to flow blood. Normal resting heart rate is between 60 to 100 beats per minute, it may vary from time to time, age by age. Heart rate can change due to rapid exercise, fever, dehydration, anxiety, medication & etc. Having low & high heart rate is risk prone, so it is very important to monitor it for heart patient.

B. *Thing Speak*

ThingSpeak is an open source give hand to Internet of Things (IoT) application to make those application real-time and API to store and retrieve data from things using the HTTP protocol available on the Internet or normal or through a Local Area Network. It makes the development of sensor logging applications, location tracking applications, and a social network of things with status updates. ThingSpeak is an Internet of Things (IoT) platform that make us to collect and store sensor data in the cloud and develop IoT applications.

C. *HTML*

Html is Hyper Text Markup Language, or standard markup language for documents designed to be showed in a web browser. If we want to make our HTML pages more attractive then we can use technologies such as Cascading Style Sheets (CSS) and scripting languages like JavaScript.

Web browsers receive HTML page from a web server and send the page into multimedia web pages. HTML element such as heading, paragraph, body, & etc. are the building blocks of HTML pages because without them our page may not readable. With HTML we can add constructs, images and other objects such as interactive forms can be implemented to rendered page. HTML provides structured documents by denoting proper semantics for text such as headings, paragraphs, lists, links, quotes and etc. HTML elements are defined in tags, written using angle "< >" brackets.

D. *ESP 32 STA & AP Modes*

The ESP32 is actually a microcontroller chip. For ESP32 there are some low-cost modules also available [5]. The ESP32 is updated version of the ESP8266. ESP-01 called original module of ESP8266.

Feature are as follows-

- It has an internal low-dropout regulator.
- It can have 18 12-bit Analog to Digital converters.
- It has two 8-bit Digital to Analog converters.
- It also contains two I2C interfaces.
- Contain 8 channels of IR remote control.
- It has 10 capacitive touch switch sensors.
- Has ultra-low-power analog preamp.
- Four SPI channels.
- It contains Two I2S interfaces (for digital audio).
- Three UARTs for communications.
- It has up-to 16 channels of LED PWM (pulse width modulation).
- It also has integrated Hall-effect sensor.

IV Implementation

Above figure 1 show implementation of required project. Firstly, we have to sense value form physical sensor like here for sensing where AD8232 ECG sensor [6] is used for sensing ECG, MAX 30100 pulse oximeter & heart rate sensor is used for sensing SP02 level in blood and heart rate [8].

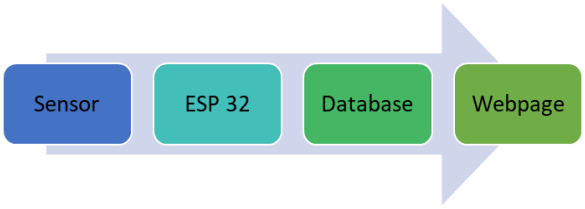

Fig.1: Block Diagram

This sensed value will be sent to ESP32 Wroom this will manipulate data and using AP mode of ESP 32 this sensed value will be send to database their data will be there for future use. [10] Then this data will display on webpage created by html & CSS.

Through this web page doctor can monitor the health condition of patient and can medicate him/her remotely. That's the main goal of this project.

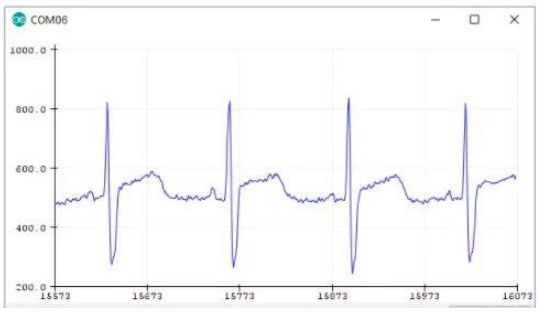

Fig.2: ECG graph observed on Arduino IDE

V. Conclusions and Future Scope

In this way, we went from pillar to post to make our problem statement a reality. We studied various new concepts such as creating web page using html & CSS, ThingSpeak, interfacing of various medical sensor with ESP32, keeping sensed value in database using ESP32 STA and AP mode.

The future scope of the work are as follows:

- As here in model ECG, spo2 & pulse rate is observed but in future we can monitor more health parameter such as temperature, blood sugar level, Blood pressure & etc and also can be displayed on webpage to generate decorative graph in webpage.
- We can add a display sensed data on display
- We can also add feature so that patient can also access & add his/her data in the record.
- We can add feature to book appointment through web page.

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