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Design and Implementation of Real Time Embedded Tele-Health Monitoring System

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Abstract: The technology is growing rapidly, developments are occurring in every areas including the health care industry. The number of health care centres and super speciality hospitals, etc.. are increasing. People are becoming more conscious about their health. The paper presents a health monitoring system for the acquisition of the physiological parameters such as temperature, ECG, Heart rate and pressure using the Atmega328p microcontroller.

The values are displayed on the LCD 16x2 screen and as well as on the webpage created with the help of NodeMCU ESP8266 module. The data can be accessed from anywhere irrespective of the gadget used, only by knowing the IP address. We are using here a GSM module to send alert message to the doctor.

The usage of GSM module in the system overcome the lack of obtaining the data in the webpage in the absence of internet connectivity in a particular area, by providing alert message about the present health condition.

Keywords: GSM (Global System For Mobile Communication), LCD 16x2 (Liquid Crystal Display), ECG (Electro Cardio Gram), NodeMCU Esp8266 module, Temperature sensor(LM35), Heart beat and Pressure sensor, ECG sensor(AD8232).

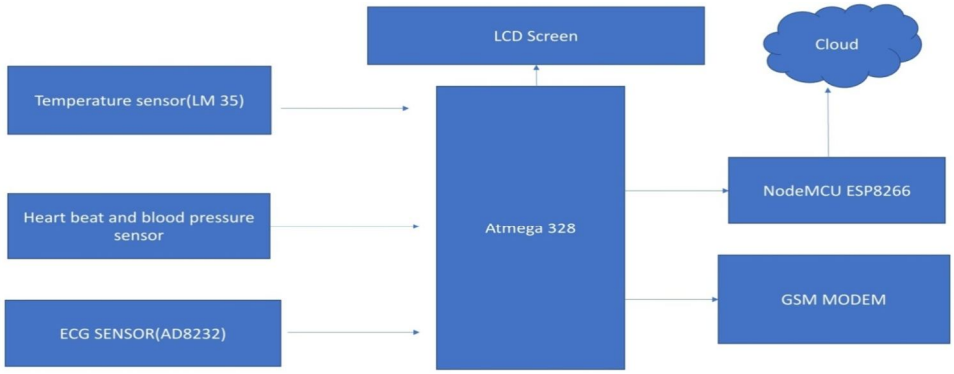
I. INTRODUCTION

The health monitoring systems are those systems that keeps track of the parameters such as the body temperature,heart rate, blood pressure and ECG values. The people are facing severe health related problems today especially due to their lifestyles. The affinity towards the consumption of junk foods, other genetical problems results in the creations of such problems. The need to visit the hospitals or health care centres monthly is becoming mandatory. Regular tracking of health conditions is required for the people especially for those above the age of 50 years. The regular visit to the hospitals will not be affordable to many people and it is time consuming .Also, the visits of people especially that of the aged ones are risky and is not promoted nowadays due to the pandemic condition of covid 19. The proposed system aims in the development of a homely real-time health monitoring system which helps the people to monitor their health conditions by avoiding unnecessary visits to the hospitals.

The proposed system is eco-friendly, displays real-time values, and are affordable to the common people. Even illiterate people can use this system even after having a basic training. The components used in the project are available at reasonable rate as compared to the cost that is spend in the hospital, and also can be handled easily. The system that is being developed is a prototype of the health monitoring system which mainly focus on homely usage. It can be made in to a wearable form for the purpose of using while moving from one place to other. In such cases,a GPS module can be incorporated for location tracking.

II. METHODOLOGY

A. Block Diagram and Description



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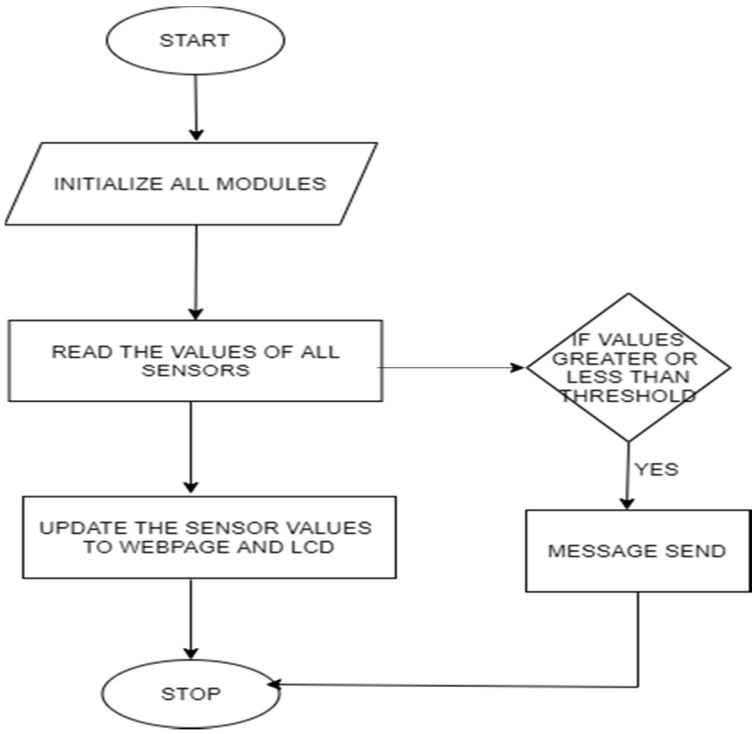
The real time health monitoring system is a system that is designed to monitor the body temperature, blood pressure, pulse rate and the ECG values by the person alone in a homely environment and to take immediate treatment or medicine if required. The system is developed using the blocks given below. The input blocks include the Temperature sensor(LM35),Pulse and Blood Pressure sensor, ECG sensor(AD8232).Atmega 328p is the controller used for the system, which is the core element of this health monitoring system. The output blocks include the NodeMCU, Liquid Crystal Display(16x2) and the GSM module. The sensors senses the values and sends the read value to the controller and the controller sends the signal to the LCD,GSM and to the NodeMCU module .The values that are displayed on the output screen determines the health condition of that particular person based on the sensor observed values.

The software used in the project include

1) Arduino IDE
2) Proteus Software

B. Flow Chart and Working



Flow Chart

The working principle of the Real Time Health Monitoring System is detailed below:
A 230V AC power supply is given to the step-down transformer as an input. A step-down transformer is a type of transformer that converts the high voltage to low voltage. The output from the transformer is 12V AC.A bridge rectifier is made and the conversion of AC to DC is done. The 12V DC from the bridge circuit is given to the 7805 Regulator IC. The IC has 3 pins such as the 12V, Ground and the 5V.The 5V is supplied to those operates in 5V through the Atmega 328p controller. The controller, the NodeMCU Esp8266, LCD 16x2, AD8232,the Pulse Rate Sensor and the LM35 works in 5V,whereas the GSM module works in 12V.
A clock pulse of 16MHz is provided. Serial communication occurs in all components used except in case of the temperature sensor LM35 and in the ECG sensor AD8232.The sensors senses the values and the controller processes the values received and the output values are displayed in the LCD screen and on the webpage created. A SIM is inserted in the GSM module. If the values of temperature , blood pressure goes below or above the range given, a text message will be send to the mobile number provided. The normal range for systolic pressure is set as between 100 – 130 mmHg and diastolic pressure range between 70 – 95 mmHg. Pulse rate is set to an average value of 60 – 80 times in a minute. The temperature is set between the range $25^{o}C$ – $37^{o}C$.

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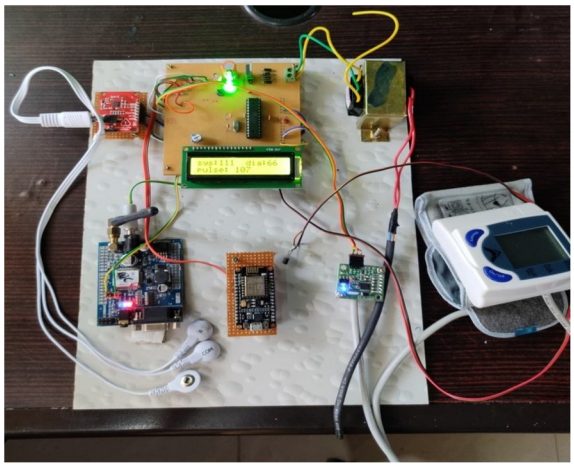

Working model

III. ADVANTAGES AND DISADVANTAGES

A. Advantages (For Patients)

1) Reduction in the money spend in cases of monthly check-ups.
2) Eliminates the need for utilization of expensive facilities.
3) Reduction in the need for transportation of the patients to the physicians and medical centres.
4) User-Friendly, as it does not require any particular training aside from the knowledge of standard internet tools.
5) Provides timely detection and action for specific conditions which require quick medical attention.

B. Advantages (For Doctors)

1) Helps to provide real time patient supervision.
2) Better utilization of medical resources such as equipment, medical staff etc..
3) Balances out the workload and time.

C. Disadvantages

1) Might be inconvenient for old aged people.
2) Not accessible for everyone.
3) Patient's and doctor's skepticism.
4) Security and privacy issue.

IV. APPLICATIONS

A. Hospitals and health care centres.
B. Sports
C. People having senility, diabetes and hypertension.

V. CONCLUSION AND FUTURE SCOPE

The system comes with lot of promises. It will continue evolving with times in terms of growth and innovation with increasing awareness, utilization and improving technologies. There will be an increase in people participation, adoption and utilization of this system. It will let the people live their life happy by being in their own environment, while at the same time afford constant medical attention.

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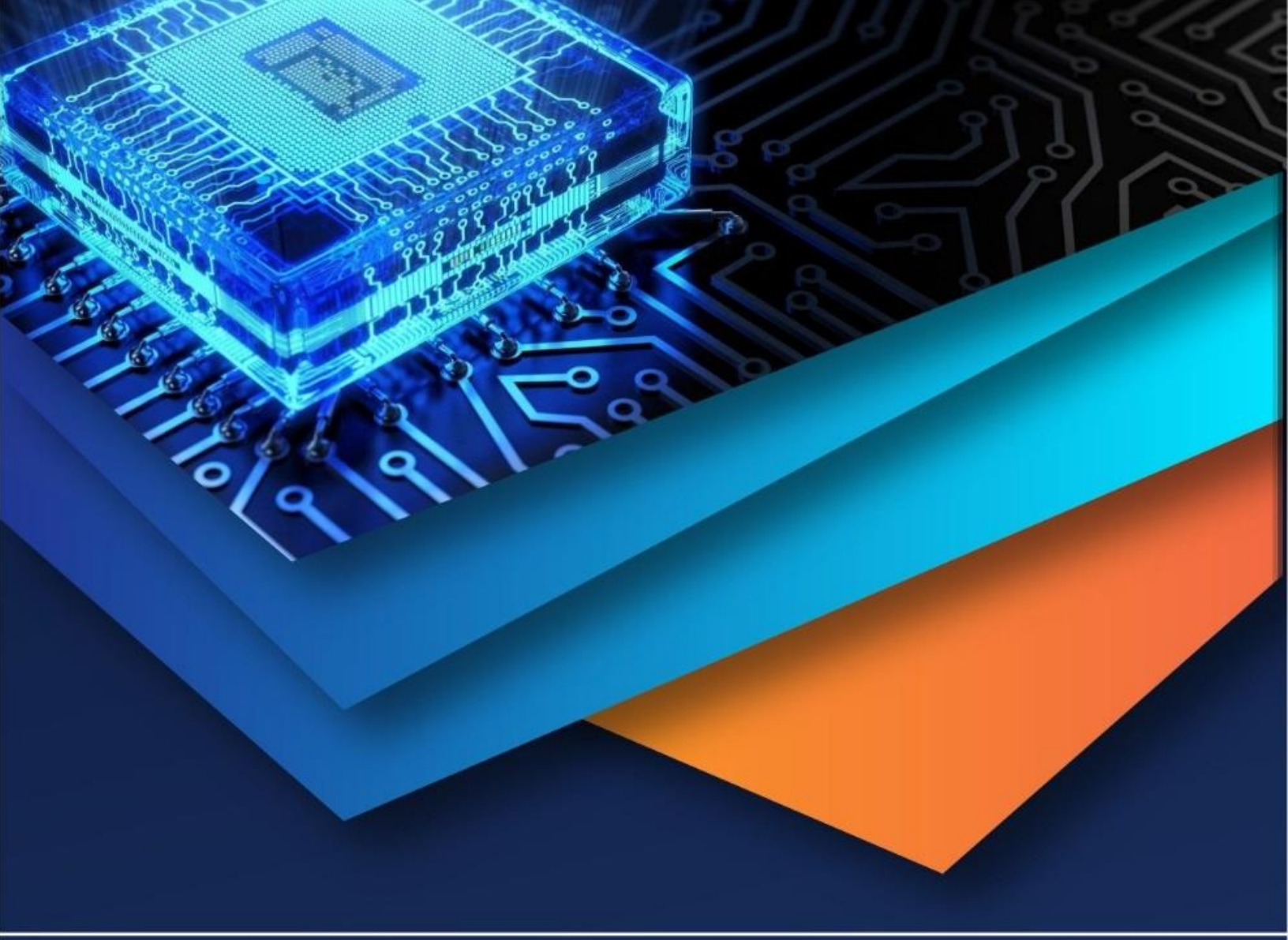

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