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Automatic Health Monitoring and Control using IOT

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Abstract:
IoT brings in many gadgets together and is a fundamental part in different methodologies like smart home mechanizations, savvy urban areas, traffic control, vehicle parking, agribusiness fields, smart environment etc. One such approach is to monitor the health state of a patient and screen it to the doctor or paramedical staff using IoT when it is hard to screen the patient continuously. It involves the collection, integration and inter-operation of data. The health parameters of a patient such as temperature, blood pressure, glucose levels and pulse rate are measured using non-invasive sensors. The sensors are associated with the Arduino UNO which gathers data, monitors the parameters regularly and displays it on an LCD. In case of emergencies, communication to the concerned is done through a notification using the ESP 8266 Wi-Fi module. In addition, when the glucose levels rise above normal the required amount of insulin is automatically administered with the help of an infusion device.

Key words: Arduino UNO, sensors, LCD, ESP8266.

I. INTRODUCTION

The automatic patient health monitoring system is one of the very critical monitoring systems used for monitoring physiological signals including ECG, respiratory rate, invasive and non-invasive blood pressure, body temperature, glucose levels and so on. It uses multiple sensors and electrodes for measurement of the signals. During treatment, it is highly important to continuously monitor the vital signs of the patient. Therefore, these systems have always been occupying a very important position in the field of medicine. The continuous improvement of technologies not only helps us to transmit the vital physiological signs to the medical personnel but also simplifies the measurement and as a result raises the monitoring efficiency of the patients. In the past, the dominant products manufactured by medical device manufacturers are mainly those for single parameter measurement. Nowadays however, a multi-parameter measurement is commonly used. Remote wireless health monitoring systems are generally based on using wearable sensor devices for collecting medical data from patients residing outside health institutions and transferring the measured biomedical parameters to a central storage with the help of emerging communication and information technologies. Remote institutions and transferring the measured biomedical parameters to a central storage with the help of emerging communication and information technologies. Remote wireless health monitoring systems are generally based on using wearable sensor devices for collecting medical data from patients residing outside health institutions and transferring the measured biomedical parameters to a central storage with the help of emerging communication and information technologies. This has lot of advantages when the patient is not in the vicinity of the doctor or medical staff all the time. Monitoring devices can be interfaced and messages can be sent to programmed mobile numbers if there is an abnormal activity recorded. On the whole, the objective of the system is to have a quantitative assessment of the important physiological variables of patients during critical periods of biological functions. The idea of this paper is to present a health monitoring system that uses the Internet of Things (IoT). Owing to a paradigm shift towards IoT, researches into its services have been conducted in a wide range of fields. As a major application field of IoT, health monitoring services have become one. The non-invasive measuring devices such as the heart beat sensor, pressure sensor, temperature sensor and NIR sensor are attached to the body of the patient who has to be monitored 24/7 and is away from the hospital or health center. These devices are also connected to the microcontroller based platform and the parameters are continuously monitored. An LCD interface is provided for the people near the patient to check the health status. The Wi-Fi module provides the facility to keep checking the status anywhere and anytime. This allows for the quick response to be taken. Also, if the glucose levels in the blood exceed the prescribed limit, insulin is administered into the blood stream through the infusion device.

Components Required: Regulated power supply, temperature sensor, heartbeat sensor, pressure sensor, NIR sensor, relay, Arduino UNO, LCD, ESP8266 Wi-Fi module.

II. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

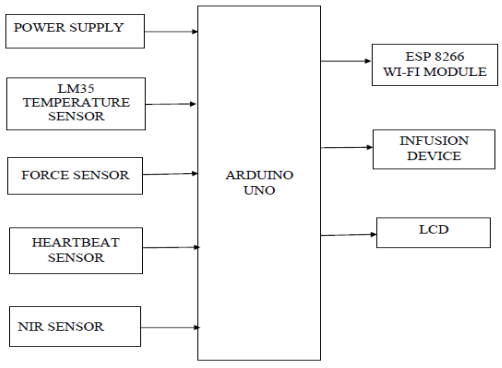

Figure.1. Block diagram.

Arduino UNO

Figure.2. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

WIFI module

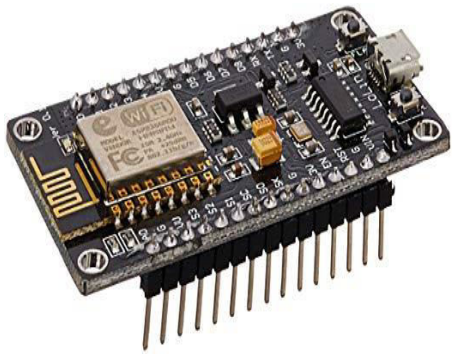

Figure.3. ESP8266 Wifi module

Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated high speed cache helps to increase the system performance and optimize the system memory. Also, ESP8266EX can be applied to any microcontroller design as a Wi-Fi adaptor through SPI / SDIO or I2C / UART interfaces. ES P8266EX integrates antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. The compact design minimizes the PCB size and requires minimal external circuitries.

LCD interfacing

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below.

The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multiprogrammer or a 5V fixed regulated power supply. The potentiometer RV1 is a contrast control that should be used to adjust the contrast of the display for the environment it is being used in.

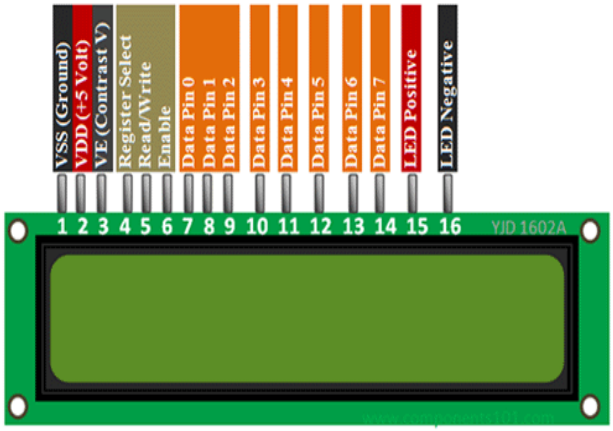

Figure.4. 16x2 LCD display.

Working

The heartbeat, pressure, blood glucose levels and temperature are measured using the various non-invasive sensors present in the system. They are connected to the microcontroller based arduino board which runs on a 5V supply from a regulated power supply source. The inputs to the arduino are analog signals which are received through the analog ports and then converted to the desired form using suitable computations. The LCD is interfaced and programmed in such a way that the parameters get displayed on its screen. The ESP8266 Wi-Fi module enables to update the parameters continuously onto the server at a certain frequency provided that the module is connected to a network source. The doctor or any other person concerned can see these vitals anytime on the server and take necessary steps in case of an emergency. Similarly, when the blood glucose levels exceed certain limit the insulin is automatically injected into the blood stream through an infusion device driven by a DC motor which takes the input from the digital pins of the arduino.

III. CONCLUSION

This paper is very helpful in case if the patient has to be remotely monitored and immediate action can be taken accordingly. Data can be accessed anytime and anywhere provided that the system is connected to a network. It also enables low cost and more accurate monitoring of the vital physiological parameters.

Future scope

This prototype can be further enhanced to notify the doctor and relatives of the patient through an GSM module.

IV. REFERENCES

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