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"REMOTE HEALTH CARE MONITORING SYSTEM USING IOT"

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Abstract: The Internet of Things (IoT) has revolutionized healthcare by facilitating the development of innovative solutions for remote health monitoring. This paper introduces an IoT-based health monitoring system tailored to address the challenges of monitoring vital health parameters, particularly in rural or remote areas. The system incorporates a comprehensive array of sensors, including the MAX30100 for Blood Pressure Monitoring (BPM) and Blood Oxygen Saturation (SpO2), the DS18B20 temperature sensor for precise temperature monitoring, a DHT11 sensor for humidity measurement, and a GPS module for accurate location tracking. These sensors are seamlessly integrated into a dedicated PCB board, optimizing space and efficiency. Data collected from the sensors are wirelessly transmitted to a centralized server through the Blynk IoT platform, enabling real- time analysis and visualization. An intuitive user interface empowers healthcare providers and patients to monitor health parameters and receive alerts promptly in case of deviations from normal values. Rigorous testing and validation ensure the system's reliability and accuracy across various environmental conditions. This IoT-based health monitoring system holds significant promise for enhancing.

Key components: iot devices, internet connectivity, cloud platform, data security, mobile or web application, data analytics, alerting mechanisam, integration with electronic health records.

I INTRODUCTION

In this introduction, we will provide an overview of the project objectives, the rationale behind itsdevelopment, and the significance of leveraging IoT in healthcare. We will also outline the structure of the project document and provide a roadmap for the subsequent sections. The Internet of Things (IoT) has emerged as a transformative force in healthcare, offering unprecedented opportunities for remote health monitoring. In response to the challenges faced by traditional healthcare systems, particularly in rural or remote areas, this project endeavors to develop an IoT-based health monitoring system. By leveraging IoT technologies, this system aimsto address the limitations of conventional monitoring methods and improve healthcare accessibility for underserved populations. In many rural or remote areas, access to healthcare services is limited due to factors such as geographical isolation, inadequate infrastructure, and socioeconomic disparities. As a result, individuals living in these regions often experience delays in accessing medical care, leading to poorer health outcomes and increased morbidity and mortality rates. By introducing an IoT-based health monitoring system tailored to the needs of these populations, we can bridge the gap in healthcare access and empower individuals to take proactive measures towards managing their health. The integration of IoT technologies into healthcare has the potential to revolutionize the way healthcare services are delivered and consumed. IoT-enabled devices and sensors can continuously monitor vital health parameters, collect real-time data, and transmit it to healthcare providers for analysis and intervention. This seamless connectivity enables remote monitoring, early detection of health issues, and timely interventions, ultimately leading to improved patient outcomes and reduced health care.

II EXISTING METHOD

This existing health care monitoring system utilizing Arduino, heartbeat sensor, temperature sensor, GPS, and GSM module works by gathering data from these components. The Arduino board acts as the central hub, receiving inputs from the heartbeat sensor (which tracks pulse rate), the temperature sensor (which monitors body temperature),and the GPS module (which provides location data). These inputs are processed and formatted into a cohesive structure suitable for transmission. The GSM module then sends this data to a remote server or designated phone number via SMS or data connection.

Thresholds are set for heartbeat rate and temperature, and if these thresholds are exceeded, the system triggers alerts. These alerts, sent through SMS or phone calls using the GSM module, notify caregivers or users of potential health issues. Reliable power sources ensure continuous operation, while thorough testing and calibration guarantee accurate sensor readings. Once validated, the system can be deployed for monitoring health in various environments, offering valuable insights and timely alerts for proactive health management.

III PROPOSED SYSTEM

In the proposed system, we integrate IoT (Internet of Things) technology for wireless communication instead of relying solely on GSM modules. By leveraging IoT, the health care monitoring system gains several advantages. Firstly, IoT allows for seamless connectivity and communication between devices over the internet, eliminating the need fora separate GSM network. This enhances flexibility and scalability, as the system can be accessed and controlled remotely from anywhere with an internet connection. Additionally, IoT enables real-time data streaming and analytics, facilitating more advanced health monitoring and predictiveanalysis. With IoT, the system can also benefit from interoperability, enabling integration with other smart devices and platforms for comprehensive health management.

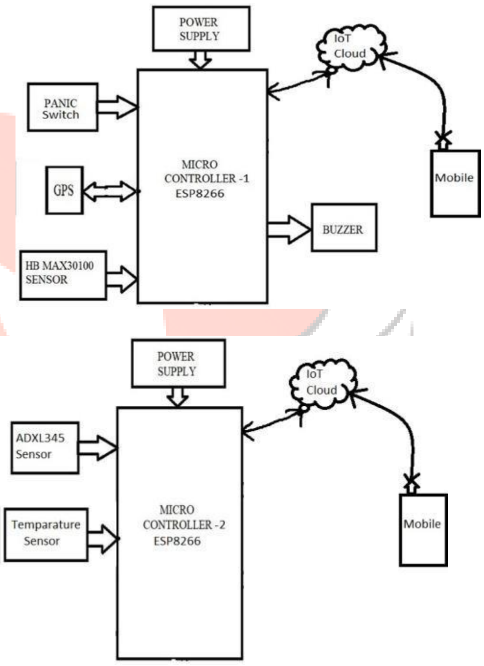

Fig: Block Diagrams

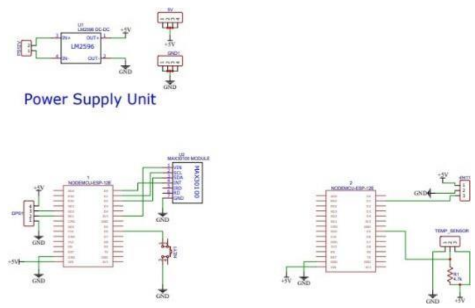

Fig: Schematic Diagrams

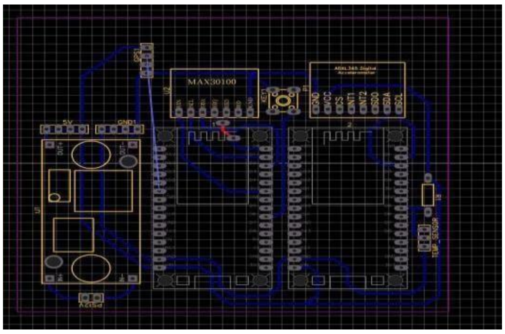

Fig: Circuit Layout

IV HARDWARE COMPONENTS Node

MCU ESP8266:

Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module.

Fig: Node MCU LM2596(DC-

DCCONVERTER):

The LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V,5 V, 12 V, and an adjustable output version. Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed frequency oscillator. The LM2596 series operates at a switching frequency of 150 kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. Available in a standard 5-pin TO-220 package with several different lead bend options, and a 5- pin TO-263 surface mount package. The new product, LMR33630, offers reduced BOM cost, higher efficiency, and an 85% reduction in solution size among many other features. Start WEBENCH Design with LMR33630. Overview The LM2596 SIMPLE SWITCHER regulator is an easy- to-use, nonsynchronous, step-down DC- DC converter with a wide input voltage range up to 40 V.

Fig: LM2596(DC-DC Converter

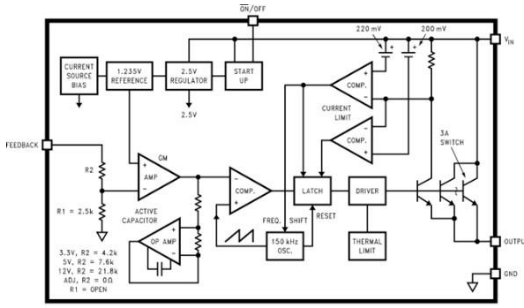

Fig: Functional Layout MAX30100:

In this project we will be Interfacing MAX30100 Pulse Oximeter Sensor with Arduino. The MAX30100 Sensor is capable of measuring Blood Oxygen & Heart Rate. We can use any display likea 16x2 LCD Display to view the value of SpO2 and BPM. The blood Oxygen Concentration term SpO2 is measured in Percentage and Heartbeat/Pulse Rate is measured in BPM. The MAX30100 is a Pulse Oximetry and heart rate monitor sensor solution. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart-rate signals. You can use this sensor with any microcontroller like Arduino, ESP8266, or ESP32 and easily measure the patient’s health parameters.

Fig:MAX30100

DS18B20(TEMPERATURES SENSOR):

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has analarm function with nonvolatile user-programmable upper and lower trigger points. The DS18B20 communicates over a 1-Wire bus that requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply. Each DS18B20 has aunique 64-bit serial code, which allows multiple DS18B20s to function on the same 1-Wire bus. Thus, it is simple to use one microprocessor to control many DS18B20s distributed over a large area. Applications that can benefit from this feature include HVAC environmental controls, temperature monitoring systems inside buildings, equipment, or machinery, and process monitoring and control systems.

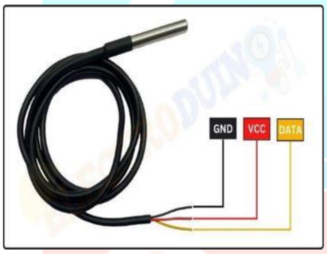

Fig:DS18B20(TEM SENSOR)

ADXL345:

Board is a small, thin, low-power, 3-axis accelerometer with a high resolution (13-bit) measurement at up to ±16*g*. Digital output data is formatted as a 16-bit two's complement and is accessible through either anSPI (3- or 4-wire) or I^2C digital interface. The ADXL345 Tripple Axis Accelerometer Board is well suited for mobile device applications. It measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (4 m*g*/LSB) enables measurement of inclination changes to less than 1.0°. Several special sensing functions are provided. Activity and inactivity sensing detect the presence or lackof motion and if the acceleration on any axis exceeds a user-set level. Tap sensing detects single and double taps. Free- fall sensing detects if the device is falling. These functions can be mapped to one of two interrupt output pins. An integrated, patent-pending 32-level first-in, first-out (FIFO) buffer can be Used to store data to minimize host processor intervention. Low power modes enable intelligent motion-based power management with threshold sensing and activeacceleration measurement at extremely low power dissipation.

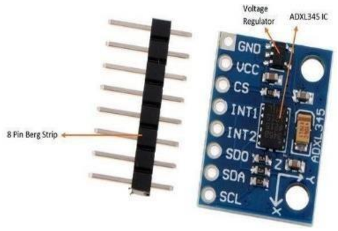

Fig: ADXL345

Accelerometer is used to measure both static accelerations i.e. gravitational and dynamic acceleration i.e.motion or shock. In most robotics applications, it is used to measure the tilt of the object. The ADXL345 is a low power, MEMS, three-axis accelerometer module with both SPI and I2C interfaces to communicate with your controller like Arduino, Raspberry Pi, PIC, etc. It also has user-selectable sensitivity and 10- 13bit resolution. This Digital Accelerometer has a voltage regulator on board hencecan be connected to both 5V and 3.3Vpowered controllers. Its high-resolution 4mg/LSB also enablesit to measure less than 1° change in the orientation of the object. The ADXL Sensor can be used in Robotics applications, measuring vibration in a machine, in the data acquisition system of a vehicle, measuring the motions of a bridge, etc. It can also be used to detect taps on an object.

Panic Button:

A Panic Button is used to send an emergency signal to the doctor or respective member in an emergency like cardiac arrest or any serious health issue where urgent help is needed. It can send notification to the respective doctor with the current location of the personin danger. As shown in the below figure after pressing the Panic button a message from the patient is sent to the mobile, which indicates that He/She is in Danger, and they need help.

Fig: Panic Button GPS Module:

Give your next Arduino project the ability to sense locations with NEO-5M GPS Module that can track up to22 satellites and identifies locations anywhere in the world. It may serve as a great launch pad for anyonelooking to get into the world of GPS.They are low power (suitable for battery powered devices), inexpensive, easy to interface with and areinsanely popular among hobbyists.

Fig: GPS module

The receiver then calculates how far away each satellite is by figuring out how long it took for the signals toarrive. Once it has information on how far away at least three satellites are and where they are in space, it can pinpoint your location on Earth.

NEO-6M GPS Module Pinout:

GND is the Ground Pin and needs to be connected to GND pin on the Arduino. TxD,Rx pins are used for serial communication.

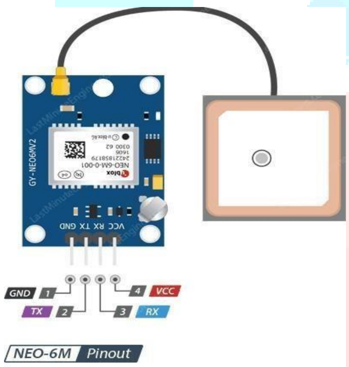

Fig: NEO-6M GPS Module Pinout V SOFTWARE

COMPONENTS

IDE stands for "Integrated Development Environment" it is an official software introduced by Arduino.cc, that is mainly used for editing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatiblewith this software that is an open source and is readily available to install and start compiling the code on the go. In this article, we will introduce the Software, how we can install it, and make it ready for developing applications using Arduino modules.

Fig: Ardunio first page

Fig: : Number of subdivisions of file in Arduino IDE

Fig: : Libraries in Arduino IDE

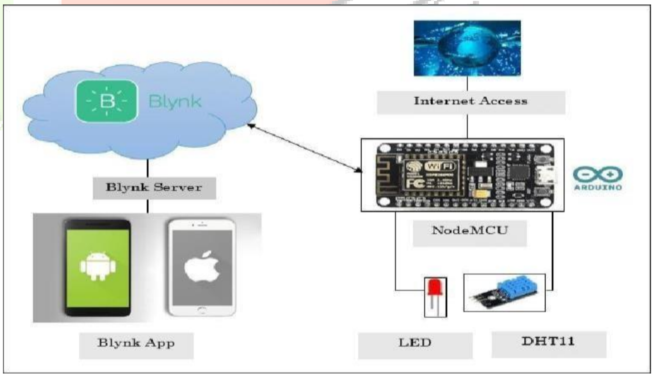

Fig: Working Of Blynk app

else

Code for max30100,gps & Panic Switch:

```
#define BLYNK_TEMPLATE_ID "TMPL3XFoe_pnB"

#define BLYNK_TEMPLATE_NAME "health monitoring system"

#define BLYNK_AUTH_TOKEN

#define help D6 #define buz D8 #include <Wire.h>

#include "MAX30100_PulseOximeter.h" #define BLYNK_PRINT Serial

#include <ESP8266WiFi.h> #include <BlynkSimpleEsp8266.h>

#define REPORTING_PERIOD_MS 1000

char auth[] = BLYNK_AUTH_TOKEN; // You should get Auth Token in the Blynk App. char ssid[] = "iotpro"; // Your WiFi credentials.

char pass[] = "iotpro123";

// Connections : SCL PIN - D1 , SDA PIN - D2 , INT PIN - D0

PulseOximeter pox; float BPM, SpO2; uint32_t tsLastReport

= 0;

void onBeatDetected()

{

Serial.println("Beat Detected!");

}

void setup()

{

Serial.begin(9600); pinMode(16, OUTPUT);

pinMode(help, INPUT_PULLUP); pinMode(buz,OUTPUT); digitalWrite(buz,0); Blynk.begin(auth, ssid, pass);

Serial.print("Initializing Pulse Oximeter..");

{

Serial.println("SUCCESS"); pox.setOnBeatDetectedCallback(onBeatDetected);

}

} "dCmCbfGgG29egbLgasKyRvlMPmE-rH3M"

void loop()

{

pox.update();

Blynk.run();

BPM = pox.getHeartRate(); SpO2 = pox.getSpO2(); int BPM2

= map(BPM, 60, 200, 60, 100);

if (millis() - tsLastReport > 3000)

{

Serial.print("Heart rate:"); Serial.print(BPM2); Serial.print(" bpm / SpO2:"); Serial.print(SpO2); Serial.println(" %"); Blynk.virtualWrite(V0, BPM2); Blynk.virtualWrite(V1, SpO2); tsLastReport = millis();

}

else

{

if (digitalRead(help) == LOW)

{

Blynk.loEvent("notify", "help me...@ https://www.google.com/maps/@16.2551159,80.3240751,19z?entry=ttu ");

Serial.println("Help Me!!!! I'm in Panic State"); digitalWrite(buz,1);

delay(5000); ES.restart();

}
if (!pox.begin())
}
{
}
Serial.println("FAILED"); for (;;);

}
```

Code for Temparature & ADXL sensor:

```
#define BLYNK_TEMPLATE_ID "TMPL3sYx_awHv"
#define BLYNK_TEMPLATE_NAME "motion detection"

#define BLYNK_AUTH_TOKEN
"mI0R9Jcfg8kh05vjSe0SO83HZk4l-M7f" #include
<OneWire.h>

#include <DallasTemperature.h> #define BLYNK_PRINT
Serial #include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h> #define
ONE_WIRE_BUS D5 OneWire
oneWire(ONE_WIRE_BUS); DallasTemperature
sensors(&oneWire);

char auth[] = BLYNK_AUTH_TOKEN; char ssid[] =
"iotpro";

char pass[] = "iotpro123"; #include <Wire.h>

#include <Adafruit_Sensor.h> #include
<Adafruit_ADXL345_U.h>

Adafruit_ADXL345_Unified accel =
Adafruit_ADXL345_Unified(); int x, y, z;

void setup() { Serial.begin(9600); Blynk.begin(auth, ssid,
pass); if (!accel.begin())

{

Serial.println("No valid sensor found"); while (1);

}

sensors.begin();

}

void loop() { Blynk.run(); sensors_event_t event;
accel.getEvent(&event);

x = (event.acceleration.x); y = (event.acceleration.y); z =
(event.acceleration.z);


delay(200); Serial.print(" X: "); Serial.print(x);

Blynk.virtualWrite(V0,x); Serial.print(" Y: "); Serial.
println(y); Blynk. virtualWrite(V1,y); Serial. Print(" Z: ");
Serial.println(z); Blynk.virtualWrite(V2,z);
sensors.requesttemperatures();

Serial.println(sensors.getTempCByIndex(0));
Blynk.virtualWrite(V3,sensors.getTempByIndex(0));

}
```

RESULTS:

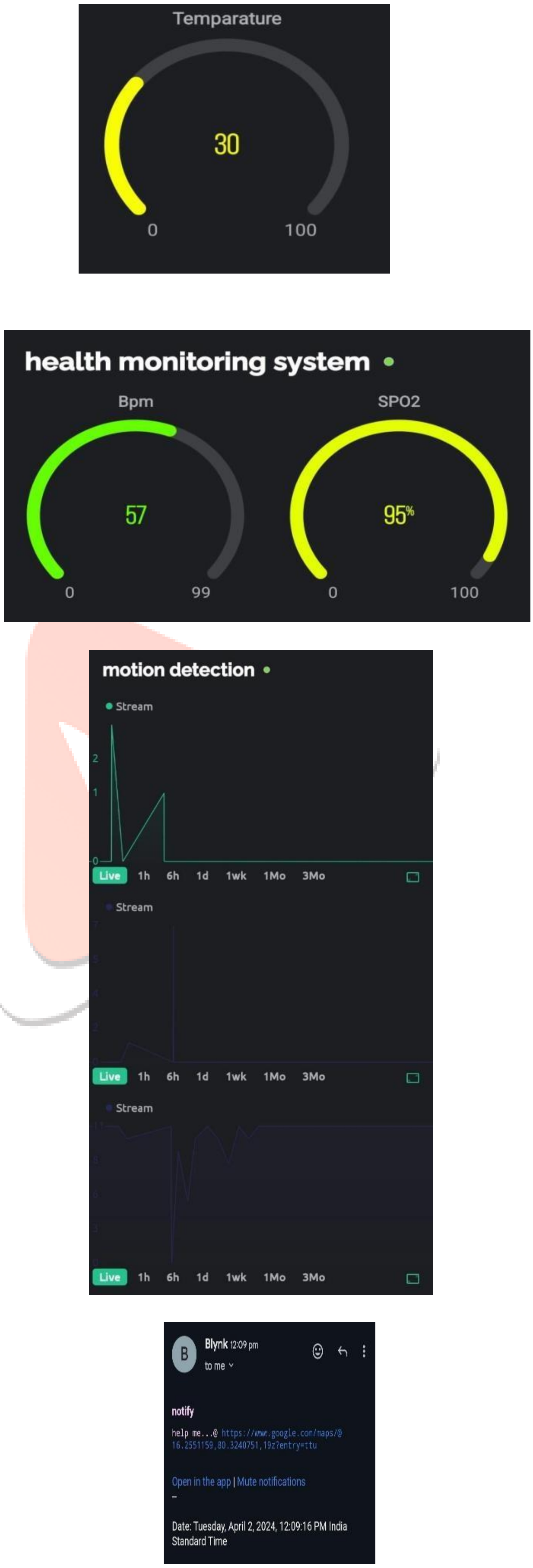

Fig: Results Of project

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