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Gyroscopic Supportive System for Partially Paralyzed Patient with IOT

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ABSTRACT: Paralysis is the complete or partial loss of muscle function. It's caused as a result of damage in nervous system due to various reasons like Parkinson's disease, spinal cord injuries, brain injury, stroke etc., We know that these people can't be able to convey their messages or requirements. There's monitoring system and controller for paralyzed patient, but it makes a loss of communication problem. To avoid this type of issue we introduced a new system. The IoT based paralysis supportive system is a system designed a hand glove to help patient convey their requirements by simple hand gestures in room itself. The movement is detected by Accelerometer (multiple axis gyro) and also transmit information by HC12 transmitter. The receiver system processes the command and display on the LCD screen as well as transmit the data online over IoT. It also consists of a buzzer to warn the attendant in case of emergency.

KEYWORDS: Paralysis, Hand gestures, Hand glove, IoT, Arduino, Gyro, Esp-32 cam..

I. INTRODUCTION

In many sectors, including health care services, Internet of Things (IoT) systems are growing rapidly, providing promising technological, economical, and social potential. Health care services can be improved with IoT capabilities, including remote patient monitoring, diagnosis of medical issues in real time, and more, all of which improve both the quality and the satisfaction of human users. The Internet of Medical Things (IoMT) is gaining momentum as wearable devices, and their numerous health monitoring applications increase popularity. The IoMT plays a significant role in reducing death rates by detecting diseases early. Prediction of heart disease is an essential challenge in clinical data set analysis. The proposed research aim is to employ machine learning (ML) classification algorithm to predict heart disease. The IoMT-based cloud-fog diagnostics for heart disease have been proposed. Fog layer is used to quickly analyze patient data using ML classification techniques.

II. METHODOLOGY

In this project, we have used Arduino Uno micro-controller which acts as brain of our system. Two kinds of devices are proposing, one is for patient i.e., transmitter and another one is receiver for the caretaker. The multiple axis accelerometer (gyroscope) which will sense the analog signal through the movement gesture of the patient and encode to the transmitter. The receiver receives the encoded signal and coded with Arduino IDE. DHT 11 temp sensor used to detect the patient body temperature. IOT feed the data in cloud. ESP-32 CAM used to monitor the patient. The GSM module SIM900A which will send the message to the caretaker's device and also the LCD. The buzzer attached for the alarm which will sound the device if the caretaker far away from the patient.

The gyroscope measures the angular acceleration on one axis and to sense angular rotational velocity and acceleration. With the help of Gyro patient will intimate the problem to care taker through GSM. IOT will feed the data in cloud. There is no possible for full time monitoring manually. The monitored data are feed in the cloud. With the help of ESP32 CAM it will store the video locally. Push button used for in this project means that's if any emergency happened to patient that push button very helpful to patient for save from the emergency if the patient click the push button.

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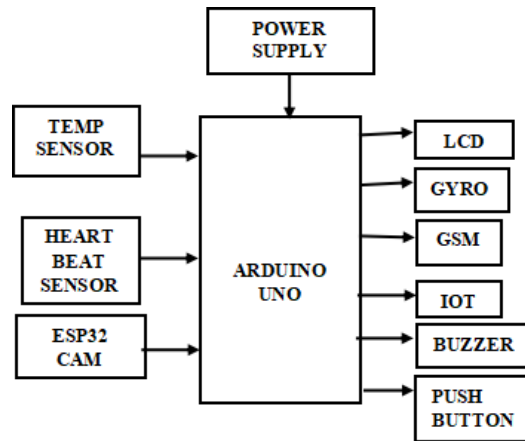


Fig 1. Block diagram

III. MATERIALS HARDWARE REQUIREMENTS

A. ARDUINO UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz quartz crystal, 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 an AC-to-DC adapter or battery to get started.

B. 9v BATTERY

The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in smoke detectors, gas detectors, clocks, walkie-talkies, electric guitars and effects units. ESP-12E pin diagram shown in fig.6. The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content.

C. LCD (Liquid Crystal Display)

LCD screen is an electronic display module and find a wider range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven-segment and thermultisegment LEDs. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

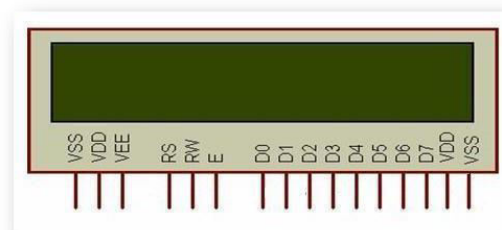


Fig 2. LCD DISPLAY

D. ESP32-CAM

The ESP32-CAM is a full-featured microcontroller that also has an integrated video camera and microSD card socket. It's inexpensive and easy to use, and is perfect for IoT devices requiring a camera with advanced functions like image tracking and recognition. The ESP32-CAM board has no USB port, so you can't just connect it up to your computer and start loading programs. Instead, you will need to add an external FTDI adapter.



Fig 3. Esp32-cam

E. GYROSCOPE SENSOR

Gyroscope technologies commercially available, such as Mechanical Gyroscopes, silicon MEMS Gyroscopes, Ring Laser Gyroscopes (RLGs) and Fiber-Optic Gyroscopes (FOGs), are discussed. The main features of these gyroscopes and their technologies are linked to their performance. Micro-Electro-Mechanical System (MEMS) gyroscopes are motion sensors that detect and measure the angular motion of an object. They measure the rate of rotation of an object around a particular axis. The increased demand for mobile devices is also responsible for the growth of the MEMS gyroscopes market. The cost of MEMS gyroscopes is expected to reduce drastically in the next years, leading to an increment in the use of these devices.

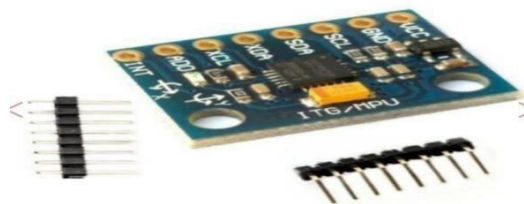


Fig4. Gyroscope sensor

F. DHT11 SENSOR

The DHT11 sensors are used to measure temperature and relative humidity. These are very popular among makers and electronic hobbyists. These sensors contain a chip that does analog to digital conversion and spit out a digital signal with the temperature and humidity. This makes them very easy to use with any microcontroller. The DHT11 has a smaller range and it's less accurate. However, you can request sensor readings every second. It's also a bit cheaper.

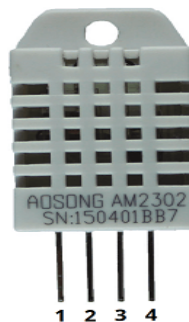


Fig 5. DHT11 sensor

A. HEARTBEATSENSOR

Heartbeatsensoraredesignedtogivedigitaloutputheartbeatawhena fingerisplacedonit. when the heart beat detectsthe startsworking,the lightemitting detectorblinks simultaneouslyforeveryheartbeat. When the blood is pumped by the blood, there is more amount of blood in the blood vessels of thefingerwhichmakes itopaquer.Whenthe bloodretreats, there is less amount of blood in the bloodvessels,thefingerbecomeslessopaque.Bymeasuring the opaqueness of the finger,wecanplotitscurvewhich varieswiththeamountofblood init. Fortaking this measurement, we use theIRemitterandReceiver.

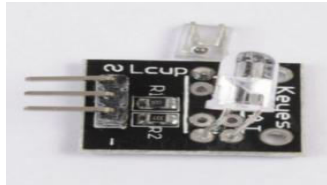


Fig 6. Heartbeatsensor

B. ESP-12EBASEDNODEMCU

The ESP8266 is the name of a micro controller designed by Expressive Systems. The ESP8266 itself is a self-contained Wi-Fi networking solution offering a bridge from existing microcontroller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built-in USB connector and a rich assortment of pin-outs. With a micro-USB cable, you can connect NodeMCU dev kit to your laptop and flash it without any trouble, just like Arduino.

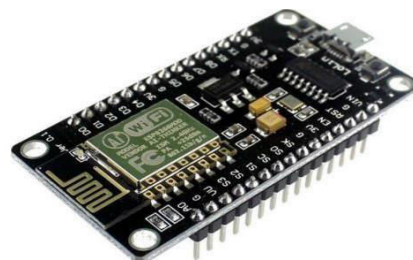


Fig7.ESP-12ENODEMCU

ESP-12E Wi-Fi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Ten silica L106 integrates industry-leading ultra-low power 32-bit MCU micro, with the 16-bit short mode, Clock speeds support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE 802.11b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers.

SOFTWARE REQUIREMENTS:

A. EMBEDDED C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronics system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. Embedded system is a system composed of hardware, application software and real-time operating system. It can be small independent system or large combinational system. These all-device working is based on microcontroller that are programmed by embedded C.

B. ARDUINO IDE

The Arduino Integrated Development Environment or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino

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and Genuine hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

C. ADAFRUIT IoT CLOUD

Adafruit IoT cloud is used for the purpose of storing and displaying of the messages conveyed by the patients over the internet. This enables to create a new account for free to get messages. This free account is capable of storing messages received for the past 30 days. The cloud consists of various options like dashboards, devices, triggers and services. The first step is to register our device on the IoT cloud. By doing so our device is connected to the IoT cloud and all the data produced by our device is automatically uploaded to the cloud when connected to the internet. The four different messages are assigned to four different directional tilt and the message “Normal” is displayed when no directional tilt is made.

IV. RESULTS

IoT enabled Paralysis patient healthcare helps to know, the health status and needs of the patients by being at a remote place. This system model plays a vital role by being an assistive aid for people who are affected by paralysis. The IoT cloud stores the messages gives an overview of the health status of the patient over a period of time. Further and the development can be made by using additionally gyrosensor and flex sensors which bring in more applications to be included to our proposed system. Gyrosensor can be used for the purpose of measuring the rotational movement of the hand flex sensor can be used to detect the motion made by individual fingers.

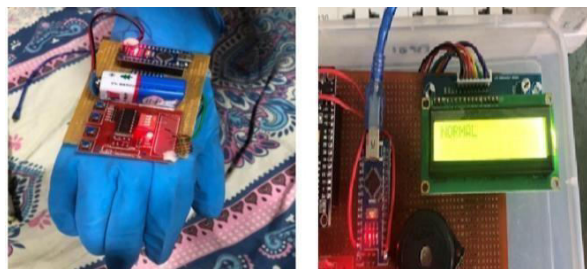


Fig 8. Hardware glove and LCD output



Fig 9. IoT output for no motion

V. CONCLUSION

This research study proposed an IoMT-based healthcare monitoring system for heart disease prediction. The proposed health care model is evaluated with accuracy, recall, precision, specificity, F1-measure, and G-mean. The proposed model achieved accuracy (97.32%), recall (97.58%), precision (97.37%), specificity (96.87%), F1-measure (97.16%), and G-mean (97.22%).

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