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Paralysis Patients Monitoring System using GSM

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Abstract: *Healthcare systems are a critical component of each country's economy and public health. In today's fast-paced world, it's difficult for people to be continually available for their loved ones who may require assistance while they are going through a difficult time. Physiological parameters are measured constantly or at regular intervals by patient monitoring systems. According to a recent World Health Organization survey, over 5.6 million people are paralysed, accounting for 1.9 percent of the population, or roughly 1 in every 50 people. Paraplegic health surveillance in hospitals indicates that a variety of exercises, stimulation, and medications are available to safeguard the paralysed. However, there isno specialised monitoring system in place to follow the health of paralysed persons. To deal with these problems, a monitoring system is put in place, which is used to keep track on the patients' health. Bio sensors, such as pulse rate, blood pressure, and airflow sensor, are used in this monitoring system to sense the vital framework of patients, and these parameters are continually monitored and relayed to the caretaker through GSM. This is something that a microcontroller can help with (MSP430).*

Keywords: GSM , Patient Monitoring System, Health Surveillance, SafeGuard

I. Introduction

This method is provided by electronic innovation, which reduces human needs and, as a result, improves people's well-being. As a result, a patient's condition should be monitored on a regular basis. However, it is a difficult task. This can be made easier by deploying GSM technology, which sends a message to the doctor or guardian regarding the patient's condition if any changes in health parameters occur. This innovation also makes use of a GPS module to keep track of the patient's whereabouts. As a result, the patient is not required to remain in the doctor's presence at all times. When the patient is at home or in another location, his condition will be continuously recorded. Consistent monitoring of the patient's vital signs, such as temperature, heart rate, and voltage. This structure is intended for usage by family members of patients who do not appear to be in critical condition but should be examined for health on a regular basis. In any emergency, an SMS is sent to a professional or a family member. The tilt direction of the user part is read by our proposed system. Mounting the accelerometer on the glove demonstrates how the device works. To send a message, the user now only needs to tilt the smartphone at a specific angle. Different messages are conveyed by tilting the gadget in different directions. We're going to use an accelerometer to measure motion statistics. It then sends the information to the microcontroller. The data is processed by the microcontroller, which then displays the appropriate message based on the input. The associated message is now shown on the LCD screen by the microcontroller. When it receives a motion signal from the accelerometer, it also sounds a buzzer and displays a message. If no one is available to respond to the message displayed on the LCD, the patient can opt to tilt the device, which will send an SMS to the patient's registered caretaker with the message that the patient wishes to express using a GSM modem.

II. Literature Survey

The main goal of this massive connectivity is to make it possible to access information about any object from anywhere. IoT, the objects are integrated with some intelligent sensors, these sensors, sense the environment in order toget the meaningful information, after receiving this data they examined and processed further for the necessary action . The Internet of Things is also used in health-care systems. Sensors keep an eye on the patient whether he or she is in thehospital, at home, or elsewhere. There is a persistent need for continuous interaction with the technologies, it is not possible for every paralysed patient to connect and interact with these gadgets. To solve this difficulty, the scientists developed "Eye-com," a

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retina-controlled gadget. This device is made out of low-cost IoT components such as an Arduino microcontroller, an accelerometer, an X-bee wireless sensor, and IR diodes. This apparatus climbs the glasses with ease. With this technology, paraplegic patients can readily interact with equipment by moving their heads and blinking their eyes. The proposed prototype includes three health sensors: Galvanic Skin Response Sensor, Heart Pulse Sensor, and Body Temperature Sensor. These sensors are combined into a system with Arduino UNO to sense the patient's health parameters, and Raspberry Pi collects the data and then sends it to the cloud server.

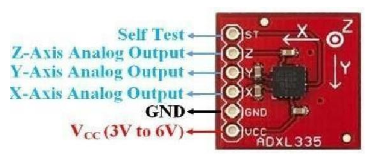
III. HARDWARE DESCRIPTION

3.1 Arduino Nano

The Arduino Nano is a tiny, comprehensive, adaptable, and breadboard-friendly microcontroller board based on the ATmega328p microprocessor. The Arduino Nano has 14 digital pins, 8 analogue pins, 2 reset pins, and 6 power pins. It operates at 5 volts, although the input voltage may be anywhere between 7 and 12 volts. The Arduino Nano has a 1KB EEPROM memory. There is a choice of 16KB or 32KB of flash memory.

3.2 Accelerometer

Accelerometers are instruments that measure a structure's vibration or acceleration of motion. They have a transducer that converts mechanical force induced by vibration or movement into electrical energy. Changes in the locations of these devices are detected using micro- electromechanical systems (MEMS). Accelerometers offer a wide range of applications in industry and science.



3.3 SIM900A GSM Module

It runs on a 240MHz clock frequency. The GSM Module can send text and PDN messages (Public Data Network) SIM900A is a wireless module that is both small and dependable. CSD, USSD, SMS, and FAX are all supported. Allows for a single SIM card to be used.

pp

3.4 LCD

Alphanumeric LCD display module with a 4.7 V to 5.3 V operating voltage that can display alphabets and numbers Alphanumeric LCD display module with a 4.7 V to 5.3 V operating voltage that can display alphabets and numbers.There are two rows, each of which can print 16 characters. A 588pixel box is used to create each character. Both 8-bit and 4-bit modes are supported. It can also show any characters that have been made by user.

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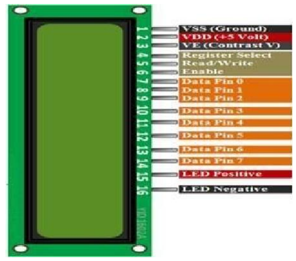
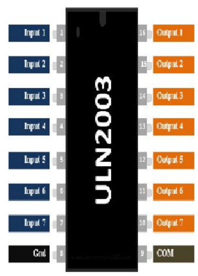


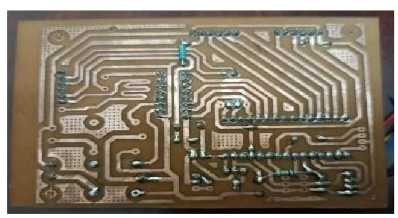
3.5 Driver IC

It has seven Darlington pairs with high voltage and current. Each pair is rated at 50 volts and 500 milliamps. +5V can be used to trigger input pins. To drive loads up to (7500mA) 3.5A, all seven output pins can be linked to gather. It can be controlled directly by logic devices such as Digital Gates, DRIVERS, PIC, and so on. It comes in a 16-pin DIP, TSSOP,and SOIC packaging.



3.6 Printed Circuit Board (PCB)

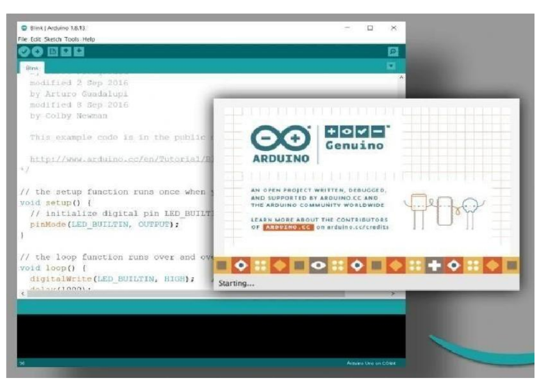
A Printed Circuit Board (PCB) is a bonded sandwich architecture consisting of conducting and insulating layers. PCBs are used for two different reasons. It's a printed circuit board with only one layer. This was made with Deep Trace software. The components on the PCB were connected using soldering..



IV. Software Description

4.1 Arduino IDE

The Arduino IDE is an open-source programme for writing and uploading code to Arduino boards. C and C++ aresupported programming languages. IDE stands for Integrated Development Environment in this case. Sketchesare programmes created with the Arduino Software (IDE).



V. Working of Monitoring System

The circuit is powered by an 11-volt source. However, the circuit just requires 5 volts to operate. As a result, the regulator IC receives 11 volts via a diode. The 5v output from the Regulator IC is used to power the other components. The output of the Regulator IC may be loaded, resulting in less than 5V, causing the microcontroller to reset due to insufficient power, and the circuit also requires over 5V power for only a few Microseconds. We used an electrolytic capacitor at the output of the Regulator IC for this purpose, which should be able to handle the circumstance. As an IDE, we're using Arduino Nano, and the controller is an ATmega328P with a clock frequency of 16MHz.When power is first applied, the Arduino board's resistance and capacitance are used to reset the board. Clock pulses are necessary for various controller board executions, and these clock pulses are created by the Crystal Oscillator (Crystal Oscillator generates continuous clock pulses). Now turn on the controller and check for data from the accelerometer.

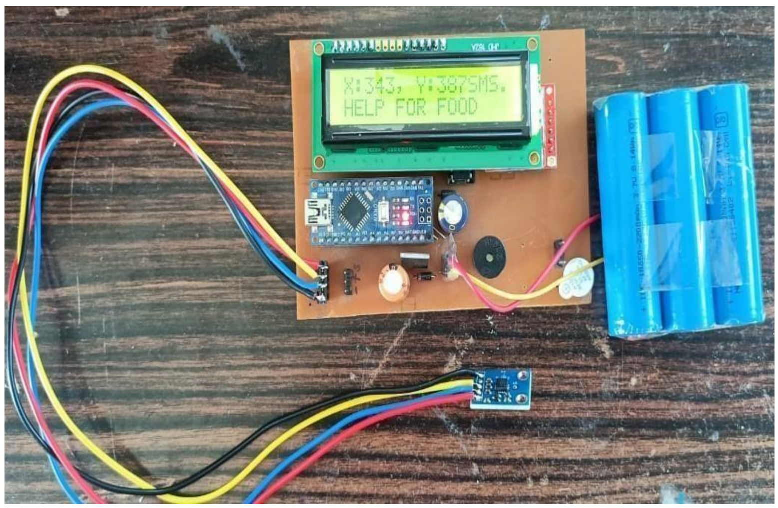


Figure 5.1: Model of Monitoring System

We used Accelerometer MEMS in this circuit (Micro ElectroMechanical sensor). For dynamic applications, this Digital MEMS Accelerometer is small in size and works in close loop with good bias stability and scale factor repeatability. This MEMS Accelerometer has a voltage range of 2.7V to 3.8V. The x, y, and z axes are all used by this accelerometer. We are only using the x and y axes because we are creating this circuit for paralysed people. The measured acceleration data is sent to the controller by this accelerometer. The data will be checked and compared with the controller's threshold values. If the values are equivalent, the controller will proceed to the next step. Because the Accelerometer MEMS in this circuit runs on 3.3V only, the 5 V supply is regulated back to3.3V for usage by the Accelerometer. The 10 bit ADC utilised here has a count of 280-440, while the typical ADC count is 400-404. We've set the ADC count of 430 in both the positive and negative x and y axes in our application to measure acceleration. When the controller receives data, it will display the command on the LCD display, and we want the buzzer to beep as well. A buzzer requires 5V and 60 mA of electricity to operate. However, because the controller only has a 30mA source current, Arduino is unable to operatethe buzzer. As a result, we used a Driver IC that amplifies current in accordance with the buzzer's requirements. So we've displayed theinstructions on the LCD, and now we'd like to send them as a text message to the caretaker's phone number. We utilised the GSM module to accomplish this. Text and PDN messages can be sent using the GSM module. The GSM module we're utilising here has a 240MHz clock frequency. Using USART, the GSM module communicates with the Arduino. It's a serial method of communication. Incomparison to Arduino, the GSM module operates at a greater frequency. As a result, both devices communicate at a 9600 baud rate. In the form of AT commands, Arduino sends data to the GSM module. Because this is a full-duplex transmission, the GSM module's acknowledgement is required. Once the acknowledgement has been completed, the controller will configure the text message bit and send the text message to the saved cellphone numbers. Once an Arduino command is issued, GSM will only take 3 microseconds to reverse the command. As a result, we've included a 100 millisecond delay. If GSM acknowledges within a reasonable amount of time,an OK message will be delivered. Otherwise, Arduino will send all three commands and resume its normal operations.

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VI. Simulation Result

Fig 6.1: Input 1

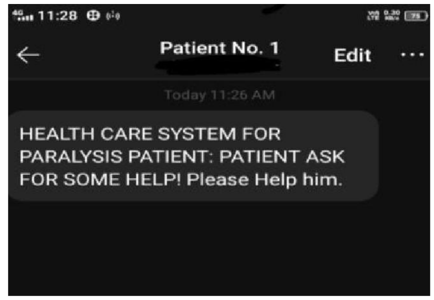

Fig 6.2: Output 2

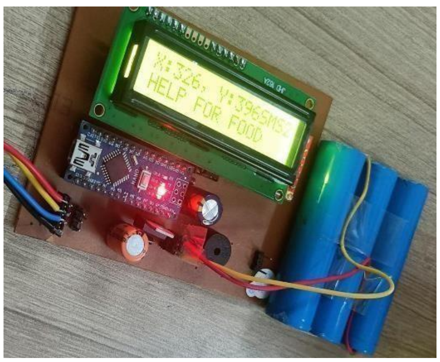

Fig 6.3: Input 2

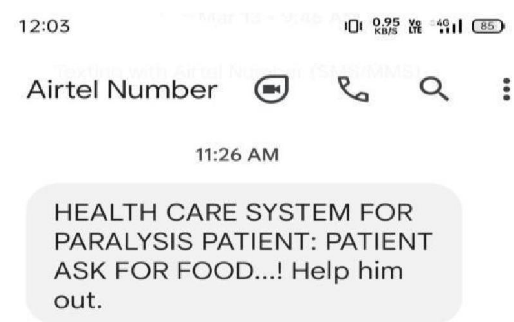

Fig 6.4: Output 2

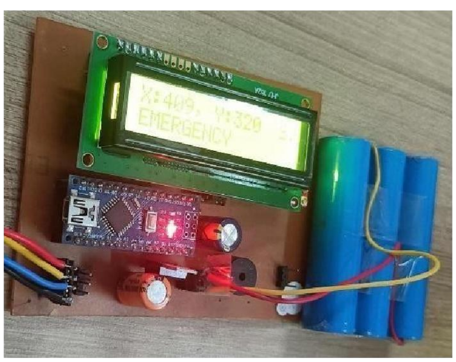

Fig 6.5: Input 3

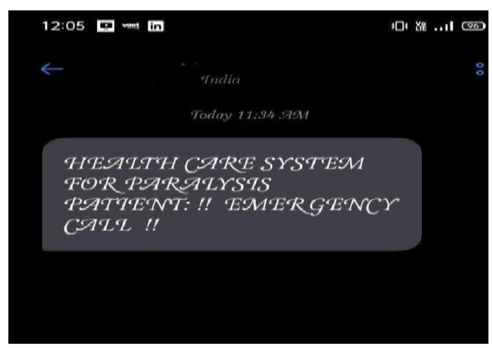

Fig 6.6: Output 3

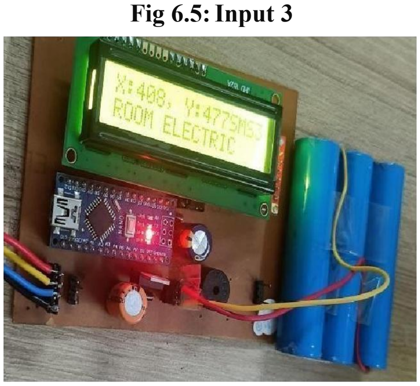

Fig 6.7: Input 4

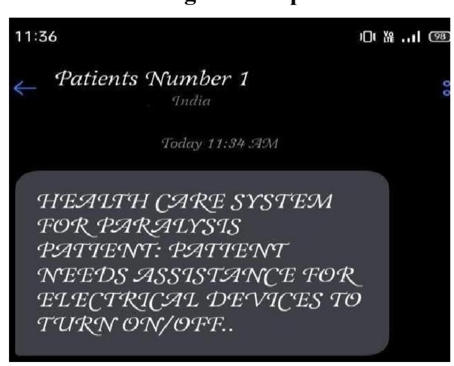

Fig 6.8: Output 4

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VII. Conclusion

Paralyzed individuals have trouble interacting with caregivers to satisfy their requirements since they are unable to properly express their concerns and needs. We developed a GSM-based paralysis patient healthcare system to assist paralysed people in overcoming this obstacle. In this recommended approach, the paralysed patient transmits signals to the caregiver using a glove. The GSM module transmits a message to the pre-programmed caregiver phone numbers when the patient's hand is tilted.. We want to integrate this method into desktop screens and an Android app for remote monitoring in the future. The proposed approach allows for the evaluation of hospital doctors' performance, as well as the true treatment of patients and the saving of their lives. The love fit of making the patient aware of a healthy lifestyle is also initiated by this proposed system.

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