CHAPTER 1: INTRODUCTION

1.1 Background Study

Our project is based on wireless communication which is the transfer of information or power between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio waves.

Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. As wireless frequency penetrates the walls, wireless networks are easy to install anywhere based on choice. This flexibility is one of the great benefits of wireless network where wired cable cannot be installed.
Wireless networks are easy to install and easy to maintain compare to messy wired counterparts. This will help when network grows and will have hundreds to thousands of customers.

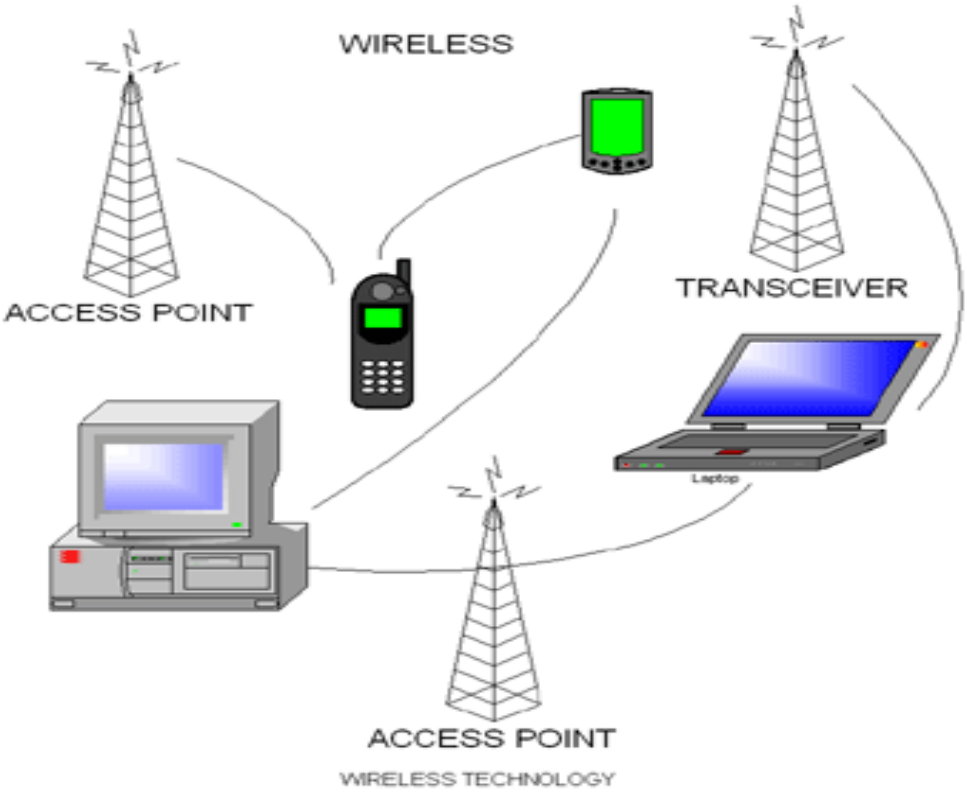


Fig 1.1 Wireless Communication

1.2 Motivation

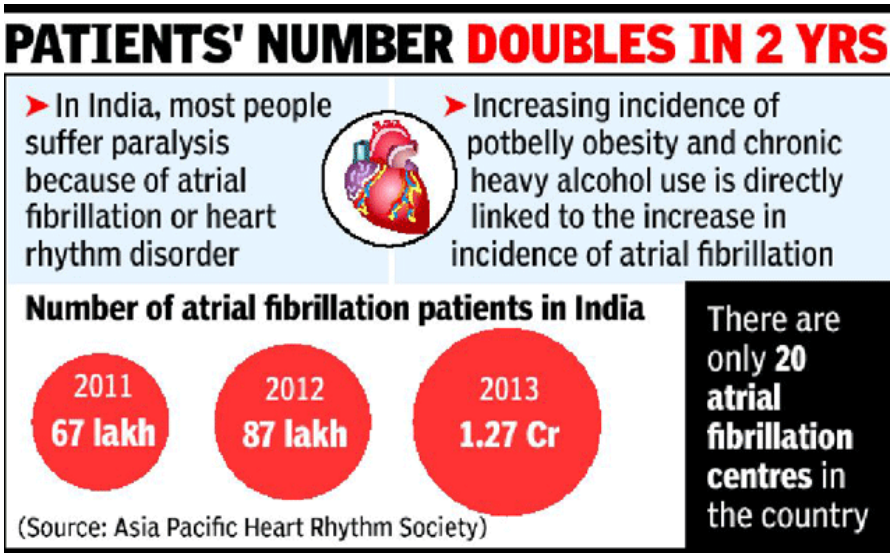


Fig 1.2 Report for paralysed patients [#]

Paralytic patients can't move on their own. At times they can't even speak or tell with actions about their needs and difficulties. They need a full time care taker for them which is not possible in many of the cases. Patients' basic needs and requirements needs to be taken care for which we need a system.

1.3 Project Goal

Among the large number of advancements done in the medical sector, very few actually focus on helping patients with disabilities to communicate. Although monitoring systems make it easier for doctors to collect and observe a patient's vitals, there aren't many options for actual verbal communication for disabled patients.

So here we propose a simple yet effective way to solve this age old problem. The main purpose is to replace the conventional approach of patient-nurse communication with modern technologies that provide a much faster and reliable way to do so. In the current scenario, the patient has to be dependent on a family member or mostly a ward boy both of which have to attend to the patient constantly.

Our objective is to make such patients independent to communicate with the nurse by the simple task of tilting a device located on his any part of the body that is capable of movement. This will not only help

the patient but also ease out the nurse's job. As a single nurse is responsible for a number of patients, the time required for each nurse to visit every patient to meet his needs will be saved. After the patient sends the message the nurse can remotely monitor their requests and provide assistance without any further delay. All these ideas together thus focus on building a smart system to make patients self-sufficient, and assist the nurses at the same time.

Our project consists of a movement sensing device i.e an accelerometer plus gyrometer (MPU6050) that detects change in angle and tilt which is connected with Arduino UNO to store these changes with the help of programming done on arduino IDE and further transmits to NRF module which is connected to Arduino too. This would be the whole set up at the transmitter end which is embedded on bread board.The communication will take place wirelessly between NRF transmitter and receiver modules in the form of EM waves called radio waves.At the receiving end, we will be having NRF receiver module with is then interfaced with Arduino to store the information retrieved from transmitter to display on 16X2 LCD in the form of appropriate message according to the angles detected. All the components are embedded on the bread board.The programming is done to detect angles from patient and then transmit information corresponding to some particular angles. This information received is encoded again by programming that information into required message.This whole process is continous and spontaneous. As the patient moves his/her hand in the some particular direction, simultaneosly message is received.

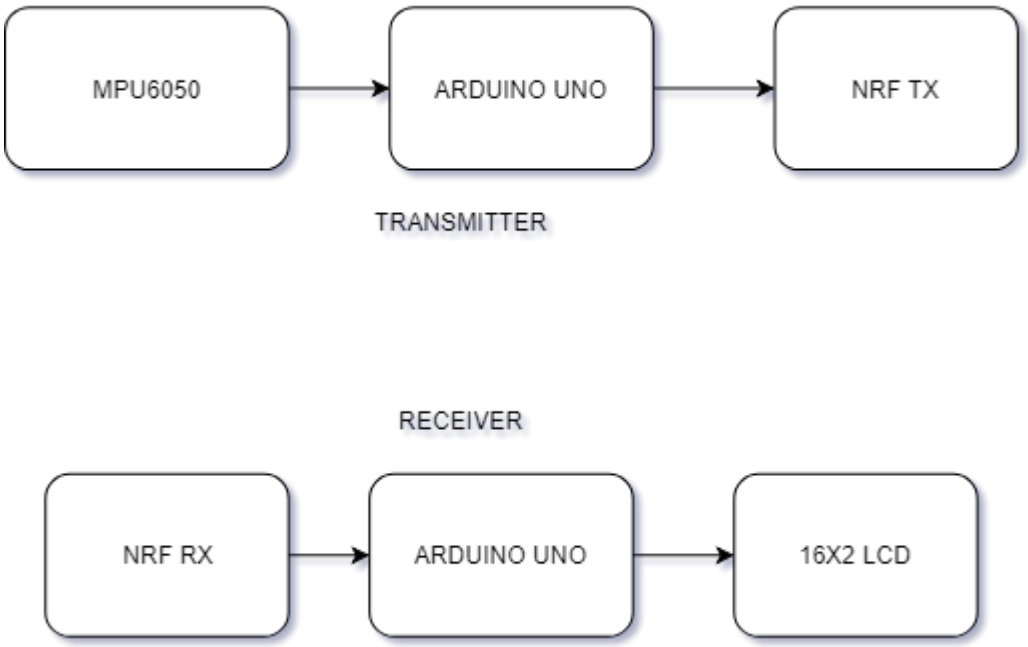


Fig 1.3 Block diagram

CHAPTER 2: LITERATURE SURVEY

2.1 Heart attack detection monitoring system

This proposed system uses sensor that allows detecting heart rate of a person using heart beat sensoreven if person is at home. After setting high and low level of heart beat limit, system starts monitoring and if limit exceeds it sends alert to controller which then transmits over internet and displays message at IOT gecko.

2.2 IOT based wheelchair fall detection system

This proposed system is developed to prevent patient falling from wheelchair by adding sensor technology to it. The communication between chair alarm and the person monitoring is done through WI-FI network. Patients gestures like leaning back or forth is evaluated by capacitor and pressure sensorsand transmits this information via ZigBee and USB.

2.3 Application based Health Monitoring System using GSM

Ongoing patient health checking framework with remote sensor system using delicate registering is an innovative concept that has been already introduced in developed country in recent years. Body Area network is implemented by using compact sensors that gather and assess body parameter and development.Transmission of these patients' records over web is done by GSM module to web server where database is stored. Moreover, it will produce a prediction on patient's wellbeing condition based on summation of all records of patient. Generated report will be shown on web application. With the assistance of web application both doctor and patient can have real time communication.

2.4 Microcontroller based anesthesia machine

This system provides syringe infusion pump along with the microcontroller. The anesthetist can set the level of anesthesia in terms of milliliters per hour to administer anesthesia to the patient. After receiving the signal from the temperature sensor heart beat sensor and respiration sensor, the microcontroller controls the signal to the desire level and fed into the stepper motor to drive the infusion pump in proper manner. The anesthesia is administered to the patient according to the stepper motor rotation.

CHAPTER 3: HARDWARE COMPONENTS

3.1 Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

ATMEGA328P is a high performance, low power controller from microchip. ATMEGA328P is an 8-bit MC based on RISC structure.

Operating voltage: 5V, DC current per I/O pin: 20 mA, Flash memory: 32kb (0.5 kb used by bootloader)

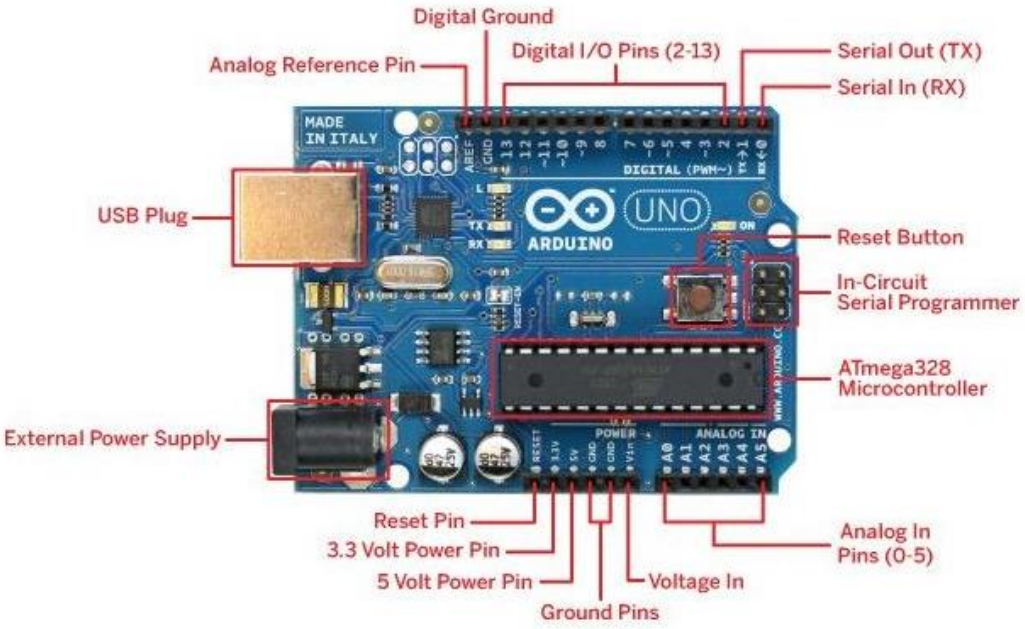


Fig 3.1 Pin Diagram of Arduino UNO

3.2 MPU6050

MPU6050 sensor module is complete 6-axis motion tracking device. It has 8 pins namely INT, AD0, XCL, XDA, SCL, SDA, GND, VCC. It combines 3-axis gyroscope, 3 axis accelerometer and digital motion processor all in small package. It has I2C bus interface to communication with the microcontrollers.

3-axis gyroscope is used to detect rotational velocity along the X, Y and Z axes.

3-axis accelerometer is used to detect angle of tilt or inclination along X, Y and Z axes.

Digital motion processor is used as a sensor such as magnetometer and processes the data. It provides motion data like roll, pitch, yaw angles.

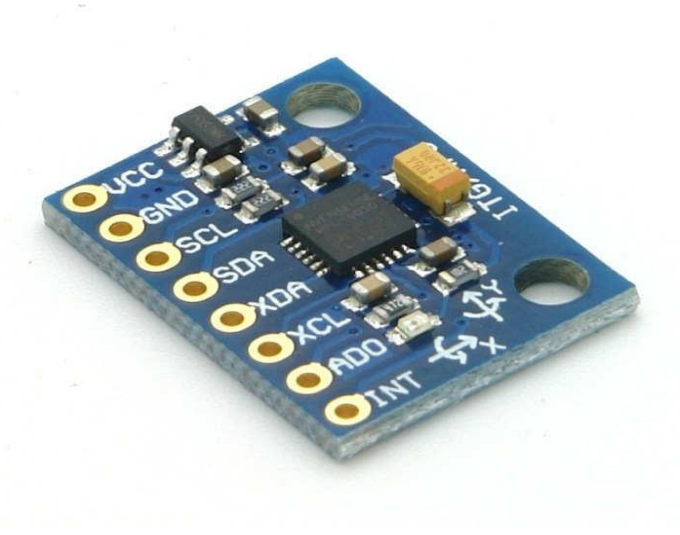


Fig 3.2 Pin diagram of accelerometer + gyroscope

3.3 NRF TX RX

These RF modules are very popular among the Arduino tinkerers. The nRF24L01 is used on a wide variety of applications that require wireless control. They are transceivers which this means that each module can transmit and receive data.

These modules are very cheap and you can use them with any microcontroller (MCU).

SPECIFICATIONS: NRF 24L01-2.4GHZ NRF TRANSCEIVER:

- Low cost single-chip 2.4GHz GFSK RF transceiver IC
- Range with Antenna: 250Kb rate (Open area) >1000 meter
- Power: Ultra low power consumption
- Input Voltage: 3.3V
- Pins: 5V tolerant

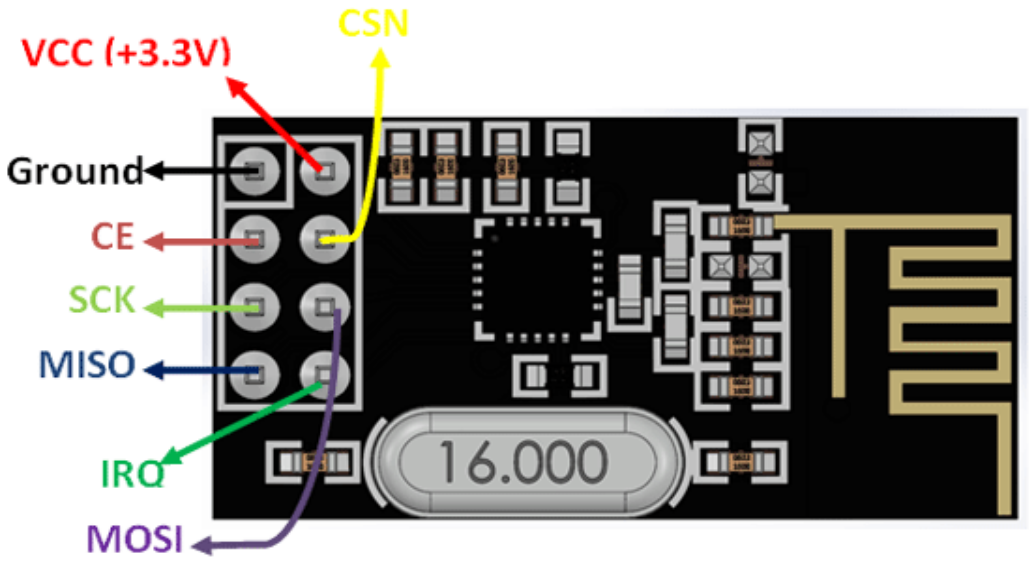


Fig 3.3 Pin Diagram of NRF Module

3.4 LCD

LCD is interfaced with the microcontroller which displays the message received by it.

Fig 3.4 Pin Diagram of LCD

CHAPTER 4: DETAILED DESIGN

4.1 TRANSMITTER MODULE

4.1.1 Assembling Arduino UNO and MPU6050

The MPU 6050 communicates with the Arduino through the I2C protocol. MPU 6050 module has a 5V pin which you can connect it to your Arduino's 5V pin. Next, the GND of the Arduino is connected to the GND of the MPU 6050.Connect your Arduino's digital pin 2 (interrupt pin 0) to the pin labeled as INT on the MPU 6050. Next, we need to set up the I2C lines. To do this, connect the pin labeled SDA on the MPU 6050 to the Arduino'sanalog pin 4 (SDA), and the pin labeled as SCL on the MPU 6050 to the Arduino'sanalog pin 5 (SCL).

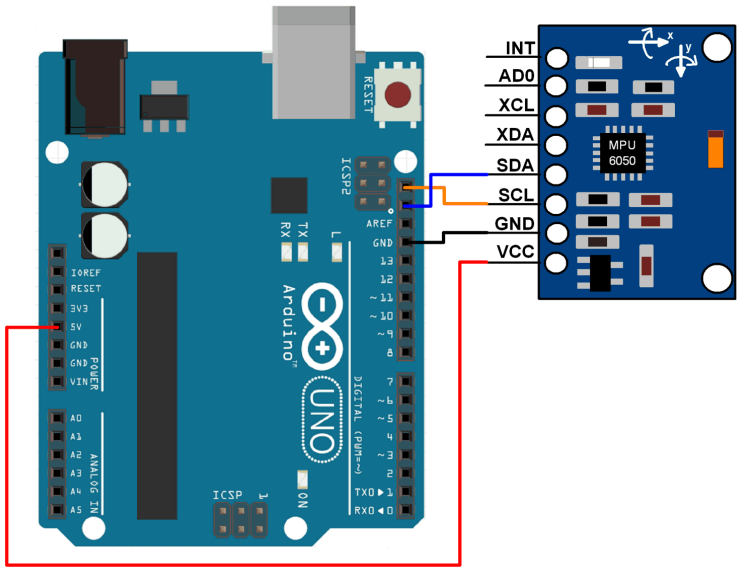


Fig 4.1 Arduino& MPU6050 interfacing diagram

4.1.2 Assembling Arduino UNO and NRF module transmitter

Following nRF24l01 Connections to Arduino UNO are needed:

nRF24L01	Arduino UNO
VCC	3.3V
GND	GND
SCK	D13
MISO	D12
MOSI	D11
CSN	D7
CE	D8

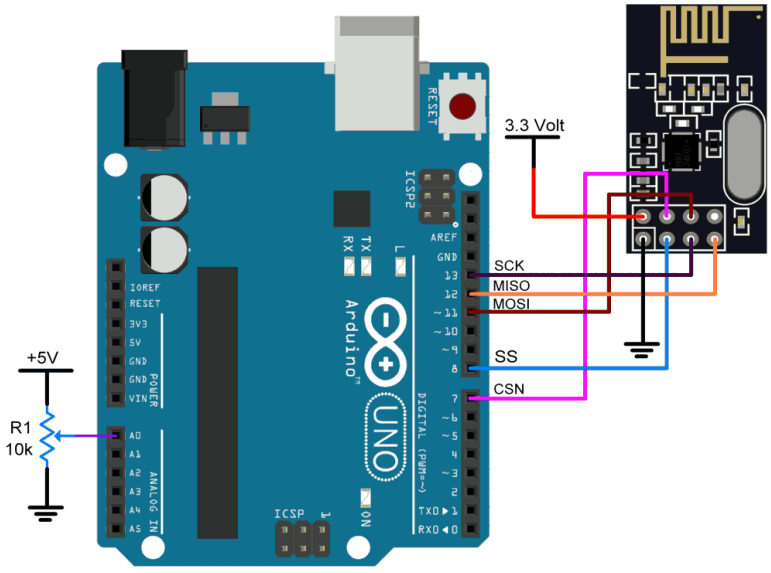


Fig 4.2 interfacing diagram of NRF module and arduino UNO

4.2 RECEIVER MODULE

4.2.1 Assembling Arduino UNO and NRF module receiver

Following nRF24l01 Connection to the Arduino UNO are needed:

nRF24L01	**Arduino UNO**
VCC	3.3V
GND	GND
SCK	D13
MISO	D12
MOSI	D11
CSN	D7
CE	D8

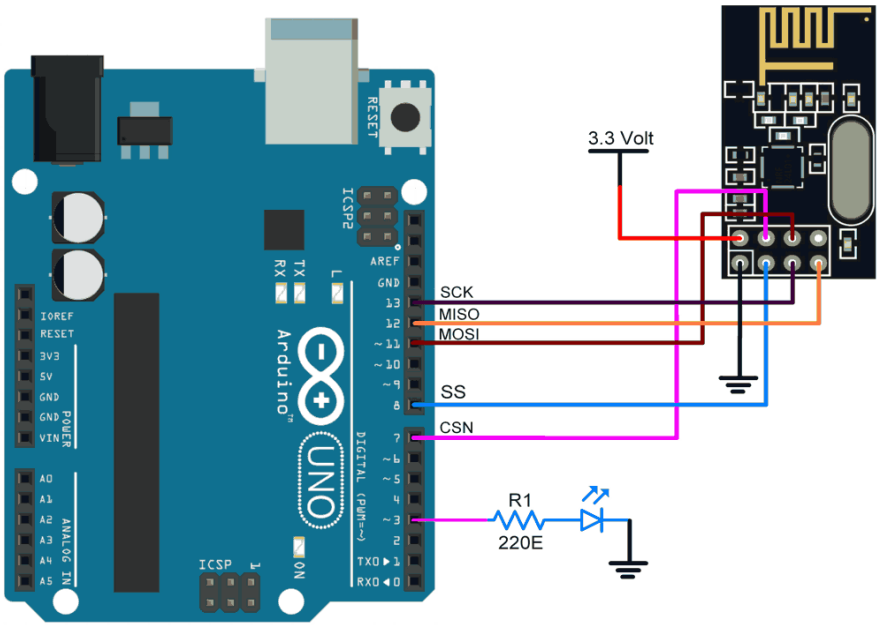


Fig 4.4 interfacing arduino UNO and NRF receiver

4.2.3 Assembling Arduino UNO and LCD

The connections which are done for LCD are given below:

PIN1 or VSS to ground, PIN2 or VDD or VCC to +5v power, PIN3 or VEE to ground (gives maximum contrast best for a beginner), PIN4 or RS (Register Selection) to PIN0 of ARDUINO UNO, PIN5 or RW (Read/Write) to ground (puts LCD in read mode eases the communication for user), PIN6 or E (Enable) to PIN1 of ARDUINO UNO, PIN11 or D4 to PIN8 of ARDUINO UNO, PIN12 or D5 to PIN9 of ARDUINO UNO, PIN13 or D6 to PIN10 of ARDUINO UNO, PIN14 or D7 to PIN11 of ARDUINO UNO

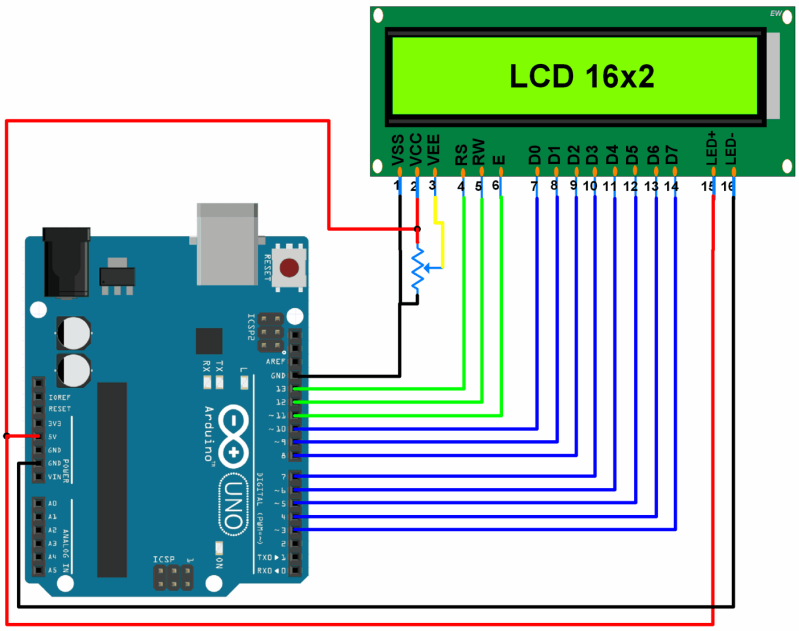


Fig 4.3 Arduino UNO & LCD interfacing diagram

CHAPTER 5: IMPLEMENTATION

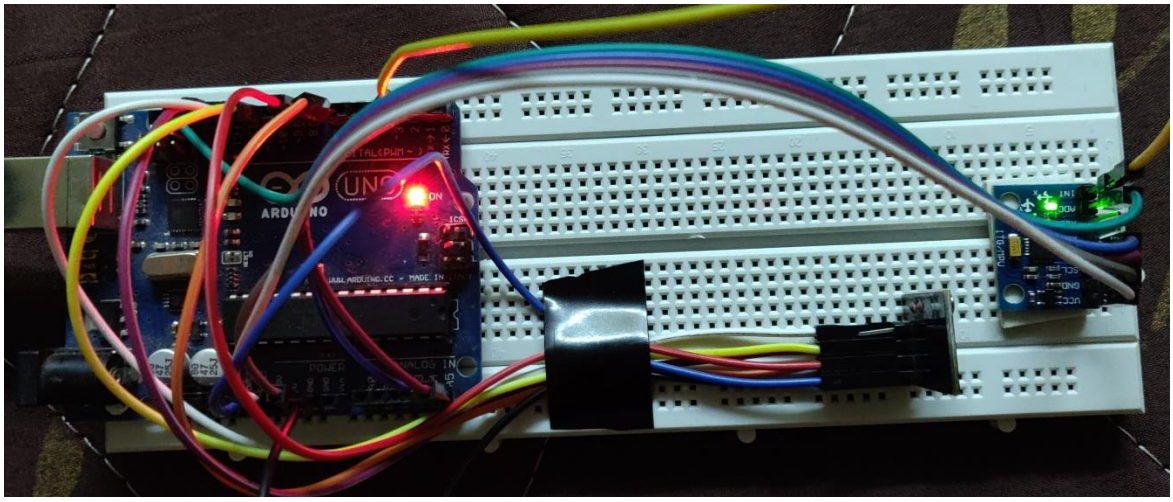
5.1 WORKING:

To overcome all the above drawbacks and meet the requirements of the system, we propose a system which mainly consists of a transmitter and a receiver section. In the transmitter section (at the patient side), a two axis accelerometer will be placed on the finger of the patient. This accelerometer is capable of measuring the static acceleration due to gravity and thus finding the angle at which the device is tilted with respect to the earth. Whenever patient needs any help he tilts the accelerometer in different directions. This acts as an input to the accelerometer while output of it is in volts that is connected to the controller board which acts as the processing unit. The output of the accelerometer depends on the tilt angles and is read by the controller.

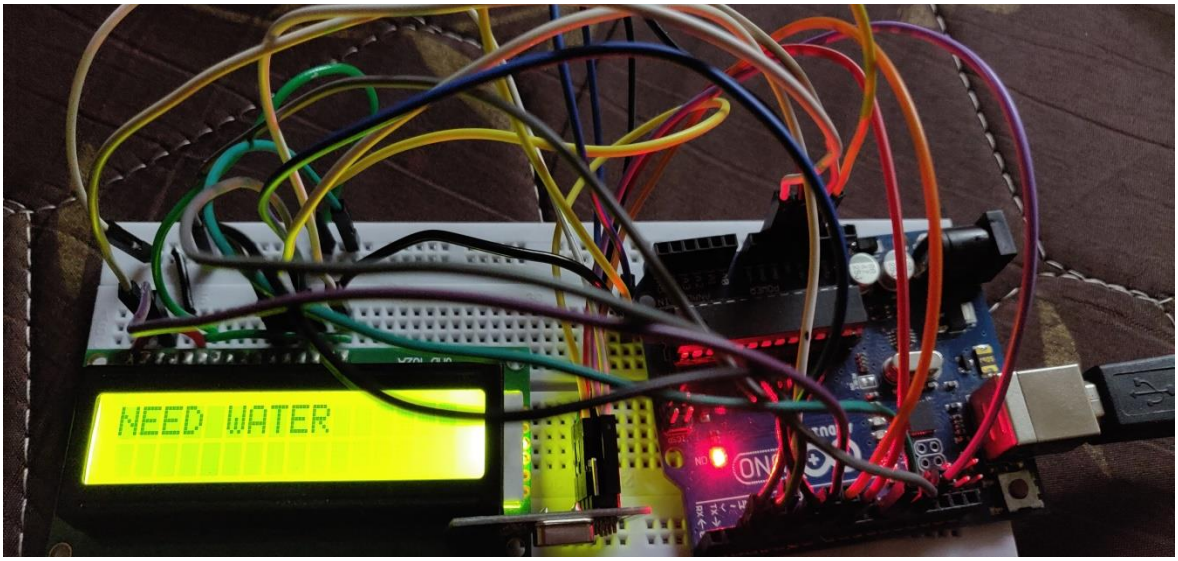
A predefined message catering to the basic needs of the patients and those required for emergency will be stored in the ranges assigned to a particular direction as mentioned above. For example: food/water is the message displayed when the patient moves his finger to the right. So on tilting the accelerometer to the right, it will send its value to the controller. If this value lies between the range assigned to the right direction the predefined message that is food/water in this case will be sent to the next module that is the NRF transmitter module. The accelerometer will be connected to each patient and each patient will have a controller board and transmitter for sending his messages. For identification of different patients their name or number is sent to the nurse. All these transmitters can be connected centrally to one NRF receiver which works on the same frequency as the transmitter. Thus the proposed system will provide a many to one communication.

At the receiver side, NRF receiver will receive the message and send it to the controller board on the receiver side which will then display the message on the LCD. On reception of the message, nurse will remotely take the required action to cater to the needs of the message.

5.2 TRANSMITTER MODULE REALIZATION:



5.3 RECEIVER MODULE REALIZATION:



5.4 ADVANTAGES:

- This helps to build a communication between patient and nurse easy.
- They don’t need a caretaker always with them.
- This system helps tofulfill their basic needs like eating and drinking easily.
- They cannot move from one place to another on their own. So, this is an effective system to make their life easy.

CHAPTER 6: CONCLUSION & FUTURE SCOPE

This device has made conveyance of message possible only by the motion of a body part. The ease of message conveyance is the main advantage of this system. By implementing this system a simple device for paralyzed people can be achieved without the use of complex form of inputs. The prototype we have made is fully functional but restricted to a small area of operation. For a large area and transmission distance the type of communication used have to be more effective and faster. Our system successfully proves that this system is an excellent approach to be implemented at hospitals for patient-nurse communication. The project can be further developed into an automatic wheel chair wherein the wheelchair will be moved just by hand gesture. Also, along with only message transmission other data like body temperature, pulse rate etc. can also be transmitted to the nurse so that a real time record of all the patients is maintained.

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