A Mini Project Report on

SMART GLASS MULTIMETER

Dissertation submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF ENGINEERING

in

ELECTRICAL AND ELECTRONICS ENGINEERING

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BONAFIDE CERTIFICATE

Certified that the mini project work entitled "Smart glass multimeter" carried out by **R Varun (1NH19EE090), Ritika Kapoor (1NH19EE093), Tejas V(1NH19EE116)** are Bonafide students of New Horizon College of Engineering submitted the report in completion of project at Department of Electrical and Electronics Engineering, New Horizon College of Engineering during the Academic Year 2020-2021.

It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for said Degree.

Project Guide   **HOD-EEE**

Dr. Joshua Daniel Raj   **Dr. Mahesh M**

Semester End Examination held on _____

……………………..   ……………………..

(Internal Examiner)   (External Examiner)

ACKNOWLEDGEMENT

Date:
Place: Bengaluru

DECLARATION

We **R Varun 1NH19EE090, Ritika Kapoor 1NH19EE093 and Tejas V 1NH19EE116,** students of New Horizon College of Engineering hereby declare that, this project phase-I work entitled "**Smart glass multimeter**" is an original and bonafide work carried out at New Horizon College of Engineering in partial fulfillment of Bachelor of Engineering in Electrical and Electronics Engineering of Visvesvaraya Technological University, Belgaum.

We also declare that, to the best of our knowledge and belief, the work reported here in does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion by any student.

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ABSTRACT

This project represents the design the voltmeter with Arduino and the display the value with the help of wireless technology. This project safeguards and makes the life of workers simpler who work on voltage systems. Arduino is used as voltmeter to store the analog data and transmit via Bluetooth device to the smart glass where another Bluetooth module is also implemented to collect the data. When we display data on the screen of a smart glass, we use lights telescopic property of reflection. It is a comfortable device for the workers.

The technology is increasing rapidly in every field, so it's always necessary to improve in every field. This project gives an idea to initialize smart technology in the voltage systems.

We have tried to build the wireless communication between two Bluetooth modules, where the data is transferred serially. There are a lot of benefits for the wireless communication. Wireless system is cost efficient and easier to maintain. The data gets transferred fast at a high speed. The wireless networks can be accessed anywhere anytime.

In the display the voltmeter reading is present and the readings are accurate compared to the analog meters. It is stable are more reliable.

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INTRODUCTION

Voltmeter is an instrument used for measuring electric powered capacity distinction among points in an electric powered circuit.

In this project we are trying to safeguard and make the life simpler for the workers, who work on voltage systems with the help of smart technology. We are building the voltmeter circuit with the help of Arduino.

When we measure the electrical potential between two points the value of the voltage is transferred to Bluetooth module hc05 with the help of another Bluetooth module hc05.

The receiver circuit on receiving the voltage value, will display the value on a OLED screen. The value on the OLED screen would be reflected to the plane mirror with the help of convex lens. The glass can be used as specs to help the workers from high voltage in the work area. This project gives us an idea to initialize the smart technology in the field of safety in engineering/Technology.

The main objective of this project is to provide:

1. To measure electrical parameters accurately.

2. To increase mobility of multimeter.

3. To enhance observer convenience while measuring electrical parameters.

4. To initialize the smart technology in the field of safety in engineering/Technology.

The data is being transmitted wirelessly with the help of Bluetooth module hc05. Benefits of wireless communication is that data is transmitted faster and at a high velocity. Reduced renovation and installation price compared to other form of networks, it can be accessed from everywhere, every time.

LITERATURE SURVEY

PAPER DETAILS:	YEAR PUBLISHED:	OBJECTIVE:
International Research Journal of Engineering and Technology (IRJET) Suraj Khamkar, Ashish Bhosale, Vaibhav Damame.	03	Mar 2019	1. To measure electrical parameters accurately. 2. To increase mobility of multimeter. 3. To enhance observer convenience while measuring electrical parameters.
HBRP Publication. Design of a Smart Measuring Glass/Frame to Display the Analog Voltage *Darakhshan Zafar Faez Ahmed Khan, Debasis Roy*		This project will give us an idea to initialize the smart technology in the field of safety in engineering/Technology.

2.1. Existing system:

Voltmeter are used for voltage measurements in the industries and various laboratories .

Smart glass multimeter technology is a system where the voltage of a device is directly displayed on the glass when measured .

The existing system works of the ARM module , we have tried to implement with Bluetooth module hc05 and Arduino uno as it is cost efficient as simpler to use.

Problem statement:

Current voltage measuring instruments may not be as convenient as the smart glass multimeter as the value gets display in front of the plane mirror. The voltage readings are accurate compared to the analog devices.

OBJECTIVE:

The main objective is to measure the voltage accurately and also introduce technology in the field of voltage measurements and safety.

COMPONENTS REQUIRED

Arduino uno(2)
Resistors 1kohm and 10kohm
Bluetooth module hc05 (2)
Breadboard
OLED display
Jumper wires
Convex lens , plane mirror
Battery or power supply.

3.0

Arduino uno:

Arduino uno is a microcontroller board. It can be integrated to various projects. In our project we are using 2 Arduino uno . One Arduino for transmitting purpose and another Arduino for receiving purpose.

Fig 3.1 Arduino Uno

Resistors (1Kohm and 10kohm):

Resistor is an electrical component that limits the flow of electric current to a electric circuit . We are using the resistors to convert the Arduino as voltmeter . The resitors are connected in parallel and short circuited on the breadboard.

Vout = (Val * 5.0) / 1024.00;

Val is the value read by Arduino as the analog input.

Vin = Vout / (R2/R1+R2)

Fig 3.2 Resistors

Bluetooth module hc05:

It is an communication module designed for transparent wireless serial communication setup. In our project we have used the Bluetooth module hc05 to transmit and receive values of the voltage measured up to 30V.
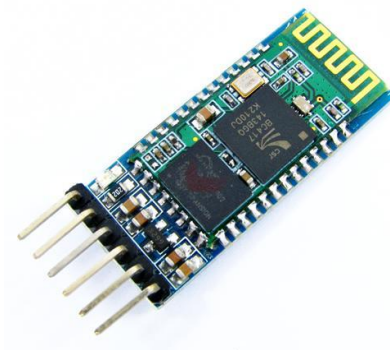

Fig 3.3 Bluetooth HC05

Breadboard:

Breadboard is an rectangular plastic board where we can build the electronic circuit. We have built the voltmeter circuit on the breadboard. It is simpler and easy to use.

Fig 3.4 Breadboard

OLED display:

OLED stands for organic light emitting diode . It uses leds in which light is produced by organic molecules. In our circuit we have used to display the voltage value measured.

Fig 3.5 OLED display

Jumper wires:

Electrical wire that are used to connect different electronic components of a breadboard or any other prototype. It is smaller , expandable and compatible.
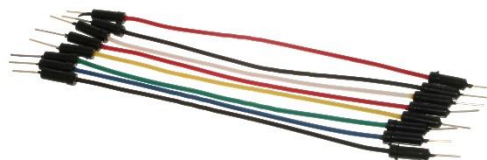

Fig 3.6 jumper wires

Convex lens and plane mirror :

Convex lens converges the ray of light. It is used to reflect the voltage value on the OLED display to the plane mirror.

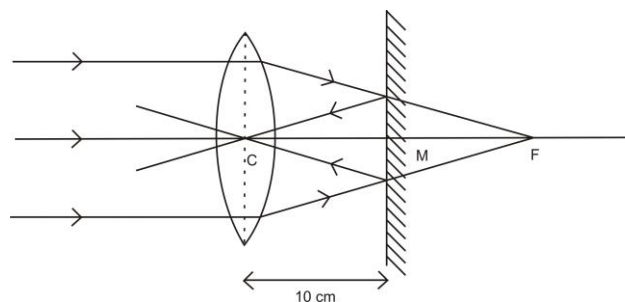10 cm

Fig 3.7 convex lens diagram

Battery or power supply:

A battery is a source of electrical power that consist of one or more electrochemical cells. In our project we are using to give the power to the circuit .

Fig 3.8 batteries
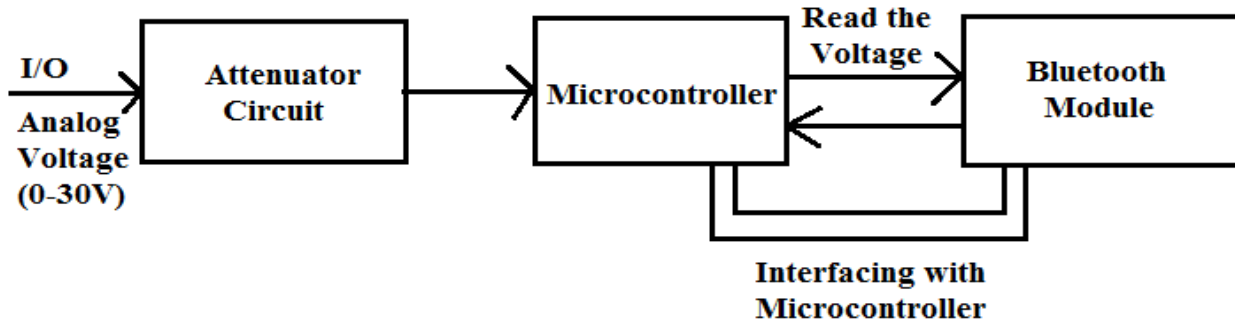
BLOCK DIAGRAM

Transmitter circuit:

Fig 4.1 shows the transmitter circuit block diagram

Attenuator circuit is the circuit of the voltmeter using voltage divider method. The circuit can measure the voltage from 0 to 30V . The circuit is interfaced with the Arduino uno where a bluetooth module is present to transmit the data of the voltage serially. The master Bluetooth module is paired with slave's Bluetooth module address. This is a transmitter circuit .
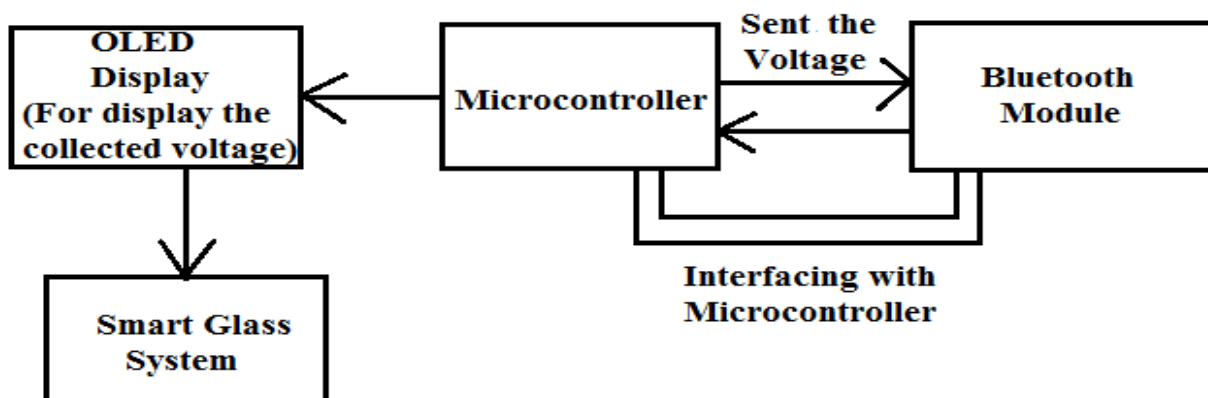
Receiver circuit:

Fig 4.2 shows the receiver circuit block diagram

The receiver circuit receives the voltage data from the master Bluetooth module and displays it on the OLED display. The slave Bluetooth module is interfaced with an another Arduino uno to receive the data from the master Bluetooth module. This is a receiver circuit .
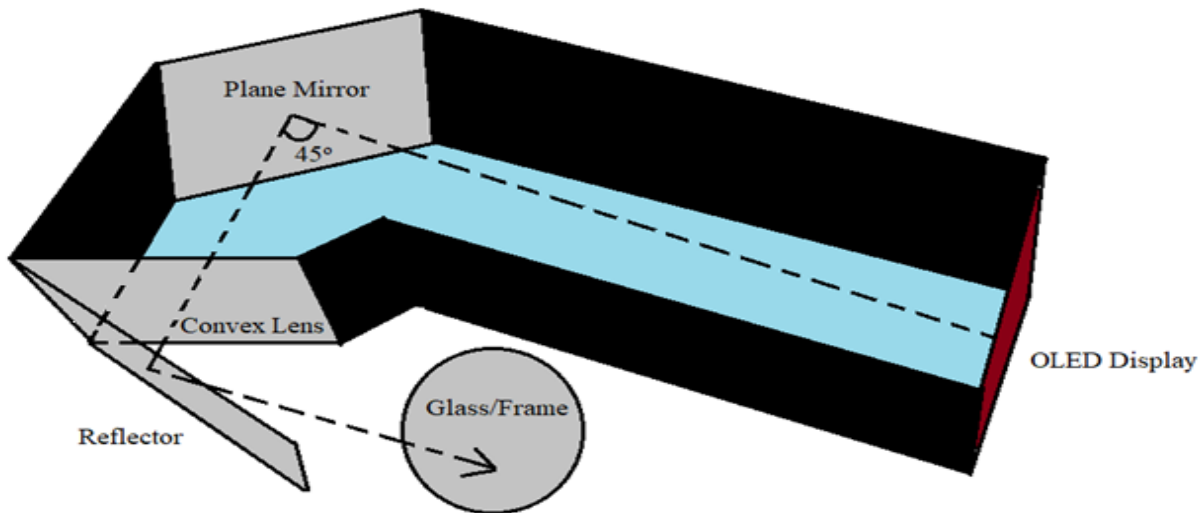
Fig 4.3 The spectacle diagram reflection and refraction

This is a replica of the model we have been trying to develop. The voltage value displayed on the OLED display is reflected to the glass frame with the help of converging nature of convex lens.
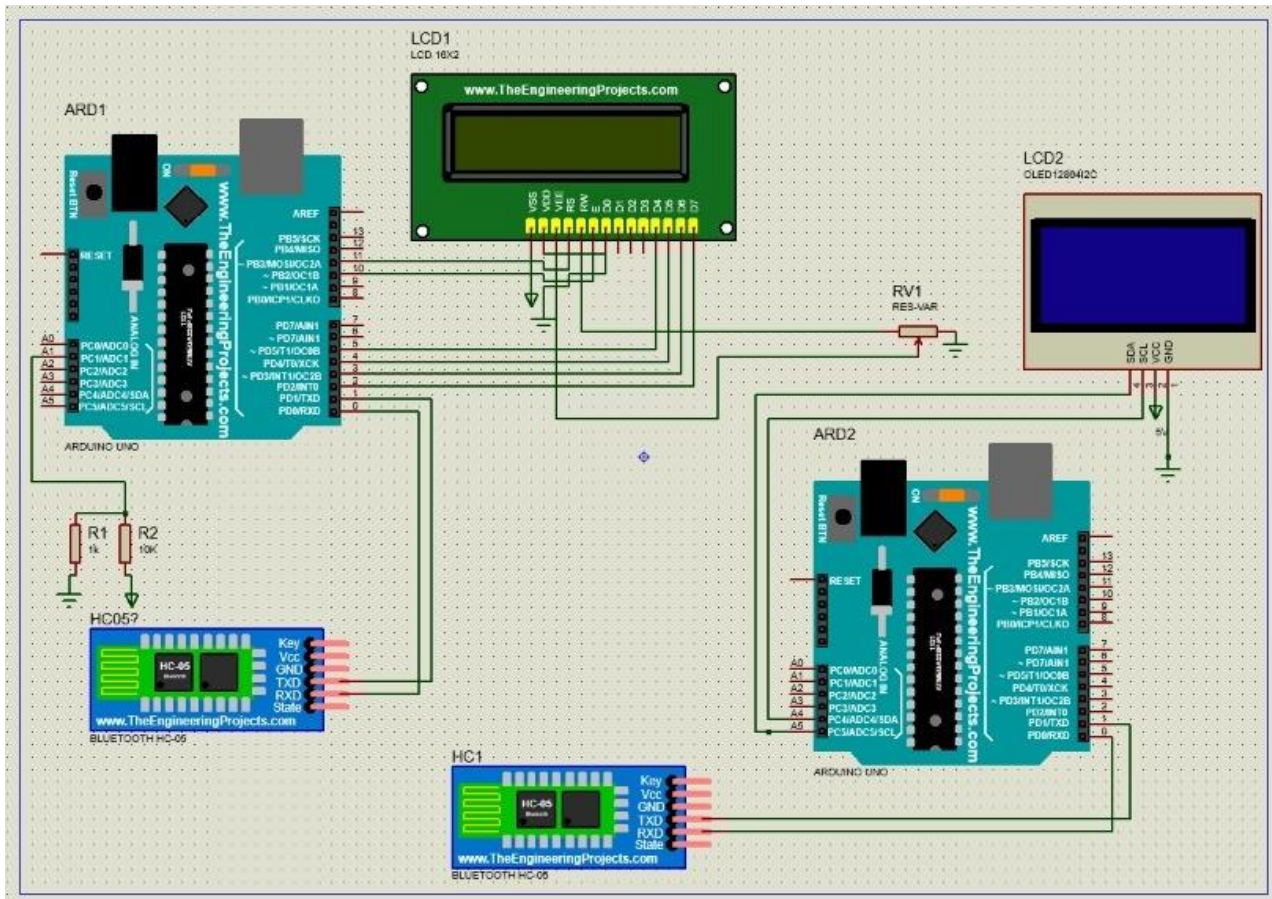
CIRCUIT DIAGRAM

Fig 5.1 There are two sections in the circuit . The transmitting and receiving circuit.

Transmitter circuit:

1. Resistors R1(1kohm) and R2(10kohm) and connected in parallel on the breadboard.
2. Analog input A1 of the Arduino is given to the R2. Resistors R1 and R2 are short circuited.
3. GND of the Arduino is given to the R1.
4. Place two wire's around R1 and R2 to measure the electric potential .
5. Connect the master Bluetooth module pin RX to the Rx of Arduino , TX to TX of Arduino , EN to 3.3V of the Arduino and V to 5V of the Arduino.

Receiver circuit:

1. Connect the slave Bluetooth module pin RX to the Rx of Arduino , TX to TX of Arduino , EN to 3.3V of the Arduino and V to 5V of the Arduino.
2. Connect the SDA of the OLED to the analog input A4 of the Arduino ,SCL to A5 of the Arduino, V to 5V and GND to GND of the arduino.

WORKING

Voltmeter circuit:

The Arduino is used to create a voltmeter circuit. In digital voltmeter, the voltages to be measured ,which are in analog form are converted to digital form . It is a voltage divider based voltmeter .

Transmitter circuit:

Bluetooth module hc05 is used for transmitting. We have to initialize the Bluetooth module as the master Bluetooth module and bind it with the slave's Bluetooth module address, with the help of AT commands.

After interfacing, when the voltage value is being measured the master Bluetooth module hc05 transmits the value of the voltage to the slave Bluetooth module.

Receiver circuit:

When the slave Bluetooth module gets paired with the master Bluetooth module ,it receives the voltage value from the transmitter circuit and displays it on the OLED display.

The value displayed in the OLED display is reflected to the plane mirror with the help of convex lens. Hence we are trying to implement smart technology in the field of safety and engineering.

ADVANTAGES

1. A digital voltmeter provides better stability.
2. It has a better resolution.
3. It is bipolar.
4. Low cost Device.
5. Monitoring can be done from a distance.
6. Portable.
7. Safe to use.
8. Data is transmitted fast at high speed.
9. Wireless networks can be accessed anywhere and at anytime.
10. Increases efficiency and there is a lot of flexibility.
11. Wider reach.

APPLICATION

1. Used for voltage measurements.
2. Used in laboratories.
3. Used in industries.
4. Used in Circuit building Applications.

CONCLUSION

We have tried to figure out the working methodology of the system. The usage of this device will help to reduce the difficulties on voltagemeasurements. The technology is smart and portable. The cost is also low and is one of the safest devices

This project will give us an idea to initialize the smart technology in the field of safety in engineering/Technology.

FUTURE SCOPE

In future we can modify this project by including ammeter. We can also modify to display different types of mathematical calculations. We can include a mini projector to display the data on the projector. If this comes into the industrial practices, this project can be further developed by changing the Bluetooth modules for longer ranges and can be used accordingly. This will definitely ease the overall difficulty industrialists face while measuring high voltages. Hoping this project will help in doing the same.

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3. Albanesius, Chloe (4 April 2012). "Google 'Project Glass' Replaces the Smartphone With Glasses". PC Magazine. Retrieved 4 April 2012.

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6. http://nevonprojects.com/smart-e-glasses-forvoltage-measurement/

7. https://www.instructables.com/id/Arduino-DataGlasses-for-My-Multimeter/

CODE

```
int analogInput = 1;

float Vout = 0.00;

float R1 = 10000.00;

float R2 = 1000.00;

int val = 0;

void setup(){

  pinMode(analogInput, INPUT); //assigning the input port

    Serial.begin(38400);

  }

void loop(){

   val = analogRead(analogInput);

  Vout = (val * 5.00) / 1024.00;

  float Vin = Vout / (R2/(R1+R2));

  if (Vin<0.09)

 {

   Vin=0.00;

 }

 if(Vin>0)

 { Serial.print(Vin);

 delay(200);

 }

 if(Serial.available()>0){
```

```
  int state=Serial.read();

  Serial.write(state);

  Serial.println(Vin);

  }

  Serial.print("\t Voltage of the given source = ");

Serial.println(Vin);

delay(1000); //for maintaining the speed of the output in serial moniter

}

#include <Wire.h>

#include <Adafruit_GFX.h>

#include <Adafruit_SSD1306.h>

#include<SoftwareSerial.h>

SoftwareSerial BTSerial(0,1);

int state;

int a;

#define SCREEN_WIDTH 128

#define SCREEN_HEIGHT 64

Adafruit_SSD1306 oled(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);

void setup() {

  Serial.begin(38400);

  if (!oled.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {

    Serial.println(F("SSD1306 allocation failed"));

    while (true);

  }
```

```
   delay(2000);

    oled.clearDisplay();

   oled.setTextSize(1);

    oled.setTextColor(WHITE);

    oled.setCursor(0, 10);

    oled.println("");

    oled.display();

}

void loop() {

   if(Serial.available()>0){

    state=BTSerial.read();

     a = Serial.read();

    delay(10);

    Serial.println(state);

  }

  Serial.println(state);

  oled.clearDisplay();

 oled.setTextSize(1);

  oled.setTextColor(WHITE);

  oled.setCursor(0, 10);

  oled.println(state);

  oled.display();

 }
```