SUPPLY LINE FAULT DETECTOR

PROJECT REPORT

Submitted by

EDWIN SIBY(Reg No:VJC19EC037)

in partial fulfilment for the award of degree of

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMMUNICATION ENGINEERING

(Affiliated to APJ Abdul Kalam Technological University, Trivandrum)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISWAJYOTHI COLLEGE OF ENGINEERING AND TECHNOLOGY

VAZHAKULAM

2019 - 2023 BATCH
SEPTEMBER 2022

VISWAJYOTHI COLLEGE OF ENGINEERING AND TECHNOLOGY

VAZHAKULAM

Department of Electronics and Communication Engineering

Vision

Moulding Electronics Engineers with Professional Competence and Global Outlook

Mission

- To create a vibrant academic ambience conducive for progressive learning.
- Build up excellent infrastructure and lab facilities to train the students in the current & emerging technology.
- Maintain well qualified faculty who are willing to upgrade their knowledge continuously.
- Groom students towards successful careers by facilitating industry-institute relationships and value addition through regular skill-development programmes.

Program Educational Objectives

Our Graduates shall be,

- Suitably employed in allied industries/services with professional competency and knowledge of modern tools.
- Capable of developing economically viable, technically, feasible eco-friendly electronic systems.
- Capable to pursue higher studies/research in the field of engineering and management.

Programme Outcomes

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solutions of complex engineering problems.

Program analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communication effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply this to one’s own work as a member and leader in a team, to manage projects and multidisciplinary environments.

Life-long learning: Recognize the need for and have the preparations and ability to engage in independent and life-long learning in the broadcast context of technological change.

Program Specific Outcomes

Our students shall be able to,

- Analyse and modify electronic products which will find applications in the field of communication and automation.
- Apply the concepts of signal processing and develop algorithms to solve real-world electronics and communication engineering problems.
- Design and manage cost effective low power electronic systems to address global challenges with a strong social commitment and ethical values.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

- **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

- **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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VISWAJYOTHI COLLEGE OF ENGINEERING AND TECHNOLOGY, VAZHAKULAM

Department of Electronics and Communications Engineering

BONAFIDE CERTIFICATE

This is to certify that the project report entitled **" Supply Line Fault Detector"** is a bonafide record of the work done by **EDWIN SIBY(Reg.No.VJC19EC037)** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Electronics and Communications Engineering** of **APJ Abdul Kalam Technological University, Trivandrum.**

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ACKNOWLEDGEMENT

First and foremost, we thank God Almighty for His divine grace and blessings in making all this possible. May he continue to lead us in the years to come. It is our privilege to render our heartfelt thanks and gratitude to our most beloved manager, **Rev Msgr. Dr. Cherian Kanjirakombil** and our Principal, **Dr. K K Rajan** for providing us the opportunity to do this mini project during the fourth year of our B-Tech degree course. We are deeply thankful to our Head of the Department, **Dr.Naveen Jacob** for his support and encouragement. We would like to express our sincere thanks to the project guide **Mr Jibby Peter Dcruz**, Asst. Professor, Department of Electronics and Communication Engineering for her motivation, assistance, and help for the project. . We also thank all the staff members of Electronics and Communication Engineering for providing their assistance and support. Last, but not least, we thank all our friends and family for their valuable feedback from time to time as their help and encouragement.

ABSTRACT

In this project, a new power supply line fault detecting system is proposed. Using this we can monitor a three phase system, with the help of sensors. The sensors will be installed on the transformers. Those will help in continuously monitoring the voltage and current of the supply line.Variations in the values of current voltage and frequency, from those values that are preset, will be notified as a fault.

Method 1: We use Arduino Uno as the heart of the project .It will process the data from the sensors and then send the information about the current status of the supply grid line to the supply office through a GSM module. Depending on the values obtained the cause for the fault can also be concluded and the same will be informed to the office.We can even break the connection if required. A monitoring system will be provided for the updating and visualisation of the status. This helps the technician and administrators to monitor and know about the supply line status from their office itself. So the technicians can take immediate actions when an emergency situation arises

Method 2: We use this method in low network in which GSM doesn't work properly .We use NodeMCU as the heart of the project.It will process the data from the sensors and then send the information about the current status of the supply grid line to mobile app.Depending on the values obtained the cause for the fault can also be concluded.

CONTENTS

LIST OF ABBREVIATIONS

1. **GSM:** **Global System for Mobile Communication**
2. **I2C:** **Inter-Integrated Circuit, eye-squared-C**
3. **IDE:** **Integrated Development Environment**

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Replacement of other forms of energy, like fossil fuel with electrical energy, had a tremendous impact on society. Since the time of invention electricity is at the heart of many technologies. That is because electricity is the most versatile and easily controlled form of energy. At the point of use it is practically loss free and essentially non polluting. At the same time distribution and handling of this energy must be done in a much careful way. Also, a considerable amount of effort is necessary to maintain an electric power supply within the requirements of various types of consumers. Some of the requirements of a good distribution system include proper voltage, availability of power on demand and reliability

Changes in voltages are generally caused due to the variation of load on the system. Low voltages cause loss of revenue, inefficient lighting and possible burning out of motors. High voltage can cause lamps to burn out permanently and may cause failure of other appliances. Furthermore power must be available to the consumers in any amount that they may require from time to time. This necessitates that operating staff must continuously study load patterns to predict in advance those major load changes that follow the known schedules.

This project proposes a system that continuously monitors the supply line. When ever a fault is detected, the cause will be identified and the information about the same will be notified in their concern.

OBJECTIVES

1. To continuously monitor the power supply line so that at the moment a fault occurs it can be identified.
2. To successfully inform the supply line office at the very right time the fault has occurred.
3. To have the idea about how the fault has occurred so that necessary solution could be found.
4. To take necessary action based on the cause of the fault.

CHAPTER 2

LITERATURE REVIEW

The extraordinary versatility of electricity allows it to be put to a limitless set of applications and has become the backbone of modern industrial society.1880s marked the beginning of electricity transmission. Even since then the problems due to this have begun.

Fig2.1:Newspaper Clippings

Newspaper clippings about the same provoked us to have the idea of SUPPLY LINE FAULT DETECTOR.The proposed project idea was formulated from the insight of accidents that are being caused due to the supply line fault like breaking of the line and the high variation in the power delivered. Also, ensuring an efficient power distribution system which has properties like proper voltage, availability of power on demand and reliability, is being considered. With the continuous surveillance and updating the supply officers will be able to take necessary actions at the right moment of fault occurrence.

This section discusses the system which has been designed and compares it with some related work. The necessary information for doing this project was formulated by referring to a paper that was about a Smart Voltage and Current Monitoring System for Three-Phase Inverters Using an Android Smartphone Application. In the reference paper, a new smart voltage and current monitoring system (SVCMS) technique was proposed. It monitors a three-phase electrical system using an Arduino platform as a microcontroller to read the voltage and current from sensors and then wirelessly send the measured data to monitor the results using a new Android application. We obtained the ideas from this paper.

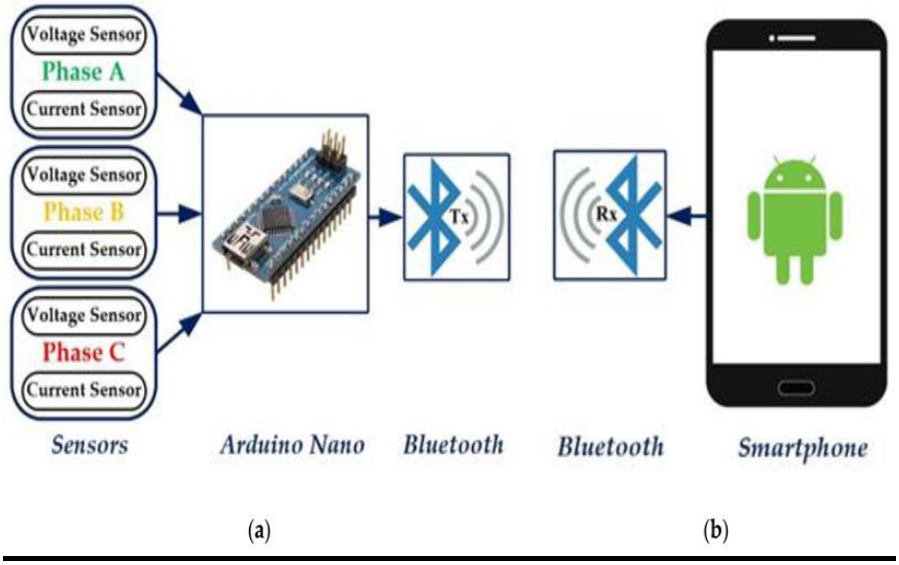


Fig2.2: Block Diagram of SVCMS

CHAPTER 3

PROJECT OVERVIEW

This section deals with the block diagram and working of the project, followed by the various hardware components used in this project.

3.1 BLOCK DIAGRAM

This sub-chapter discusses the block diagram of the supply line fault detector.

3.1.1 METHOD 1:USING Arduino UNO & GSM

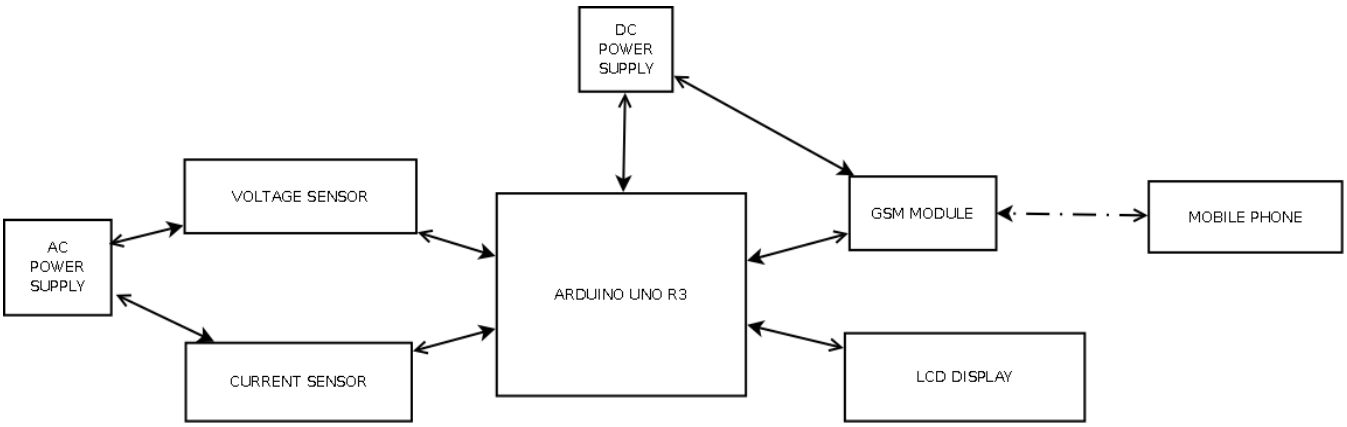


Fig3.1.1:Method 1 Block Diagram

3.1.2 METHOD2:Using NodeMCU

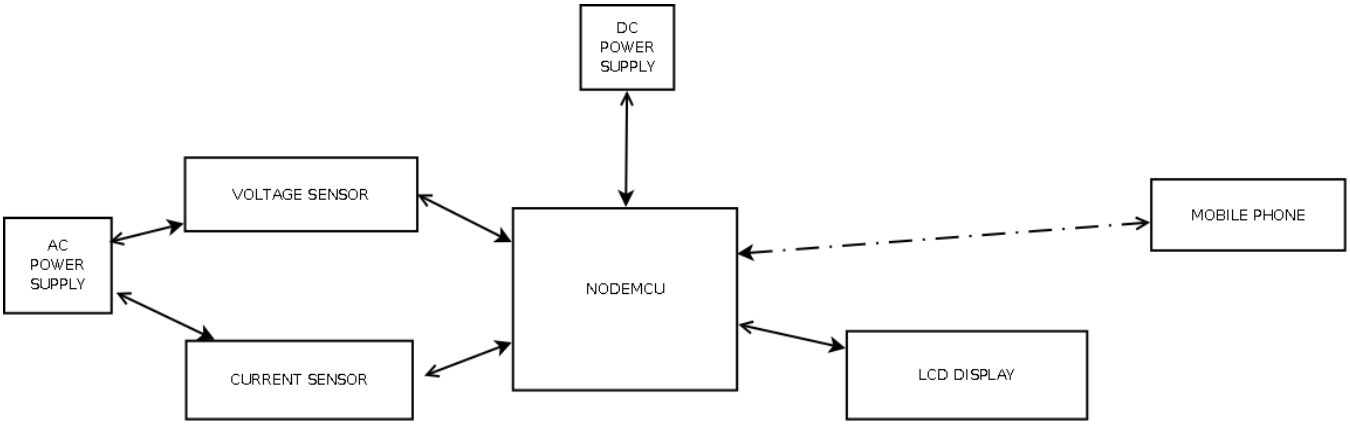


Fig3.1.2:Method 2 Block Diagram

3.2 Working

3.2.1 Method 1:Using Arduino & GSM

The main sections of the project include the Arduino, Voltage sensor (ZMPT101B), current sensor(ACS712), GSM (SIM 900A), and LCD display. The system will be placed between the power supply side and the consumer side. The officials get information about the supply line from the GSM module.

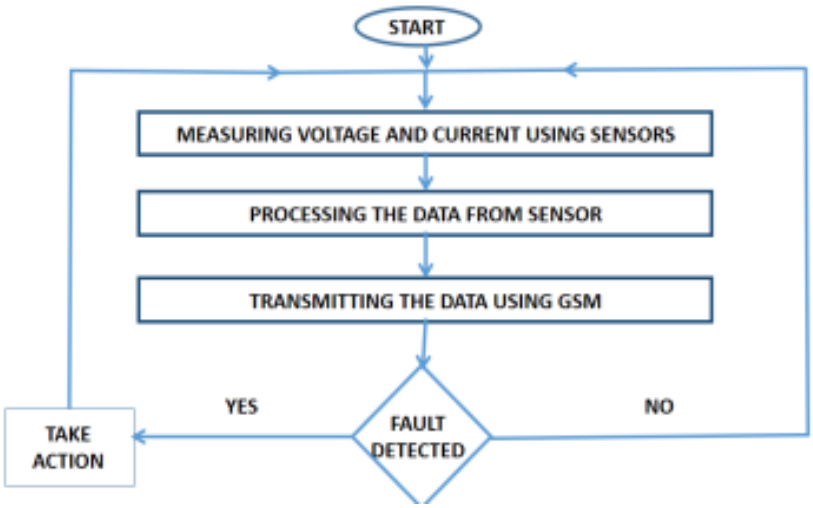


Fig 3.2.1:Methodology

For finding the fault we have to continuously monitor the voltage and current across the line. For that, we use voltage and current sensors which are capable of measuring high values. We use a voltage sensor for continuously monitoring voltage and a current sensor for monitoring the current across the supply line and the values will be displayed on the LCD module.

When the voltage or current goes above the threshold value(the value that is already set) in that case there occurred a fault. Arduino processes the data from both voltage and current sensors, with the help of the GSM Module(SIM900A) the information about the fault is transmitted to t near supply office.

Method 2:Using NodeMCU

This method is used in the cases where the project is used in places without a strong network for the smooth working of the GSM Module.

The main sections of the project include the NodeMCU Voltage sensor (ZMPT101B), current sensor(ACS712), and LCD display. The system will be placed in between the power supply side and the consumer side. The people within the WiFi range will get the information about the supply line through the Mobile application so that they can inform the supply office.

For finding the fault we have to continuously monitor the voltage and current across the line. For that, we use voltage and current sensors which are capable of measuring high values. We use a voltage sensor for continuously monitoring voltage and a current sensor for monitoring the current across the supply line and the values will be displayed on the LCD module.

When the voltage or current goes above the threshold value(the value that is already set) in that case there occured a fault.NodeMCU processes the data from the both voltage and current sensors using WiFi.Then the information about the fault is conveyed to nearby people within WiFi range through Mobile Application

3.3 Components Required
(For Method 1 & Method 2)

This sub-chapter discusses the different hardware components used in the project.

3.3.1 Arduino UNO

The Arduino UNO is an open source-microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. cc and initially released in 2010.The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

Fig 3.3.1:Arduino UNO

3.3.2 Voltage Sensor (ZMPT101B)

The voltage sensor we are using is ZMPT101B. It is basically a voltage transformer which can be used to measure accurate AC voltages. It can measure up to 1000v AC

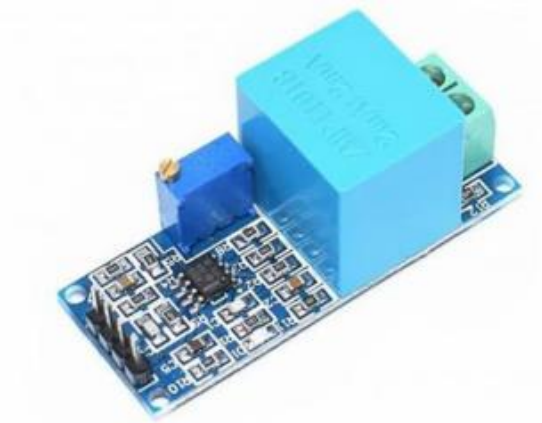


Fig 3.3.2:ZMPT101B

3.3.3 Current Sensor (ACS712)

ACS712 is a current sensor that can operate on both AC and DC. This sensor operates at 5V and produces an analog voltage output proportional to the measured current.

Fig3.3.3:ACS712

3.3.4:LCD Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is a very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Fig3.3.4:LCD Display

3.3.5 GSM Module-SIM900A

IM900A Modem is built with Dual Band GSM/GPRS based SIM900A modem from SIMCOM. It works on frequencies 900/ 1800 MHz. SIM900A can search these two bands automatically. The frequency bands can also be set by AT Commands. The baud rate is configurable from 1200-115200 through AT command**.**

Fig 3.3.5:GSM Module

3.3.6 Node MCU

NodeMCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol.

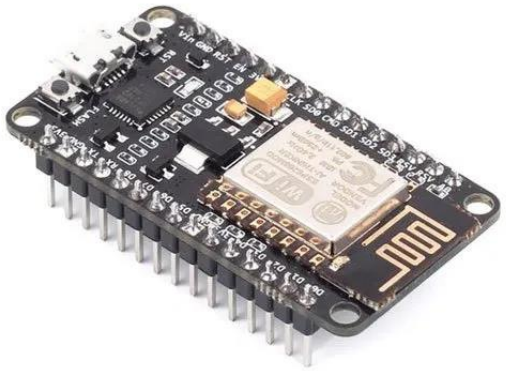


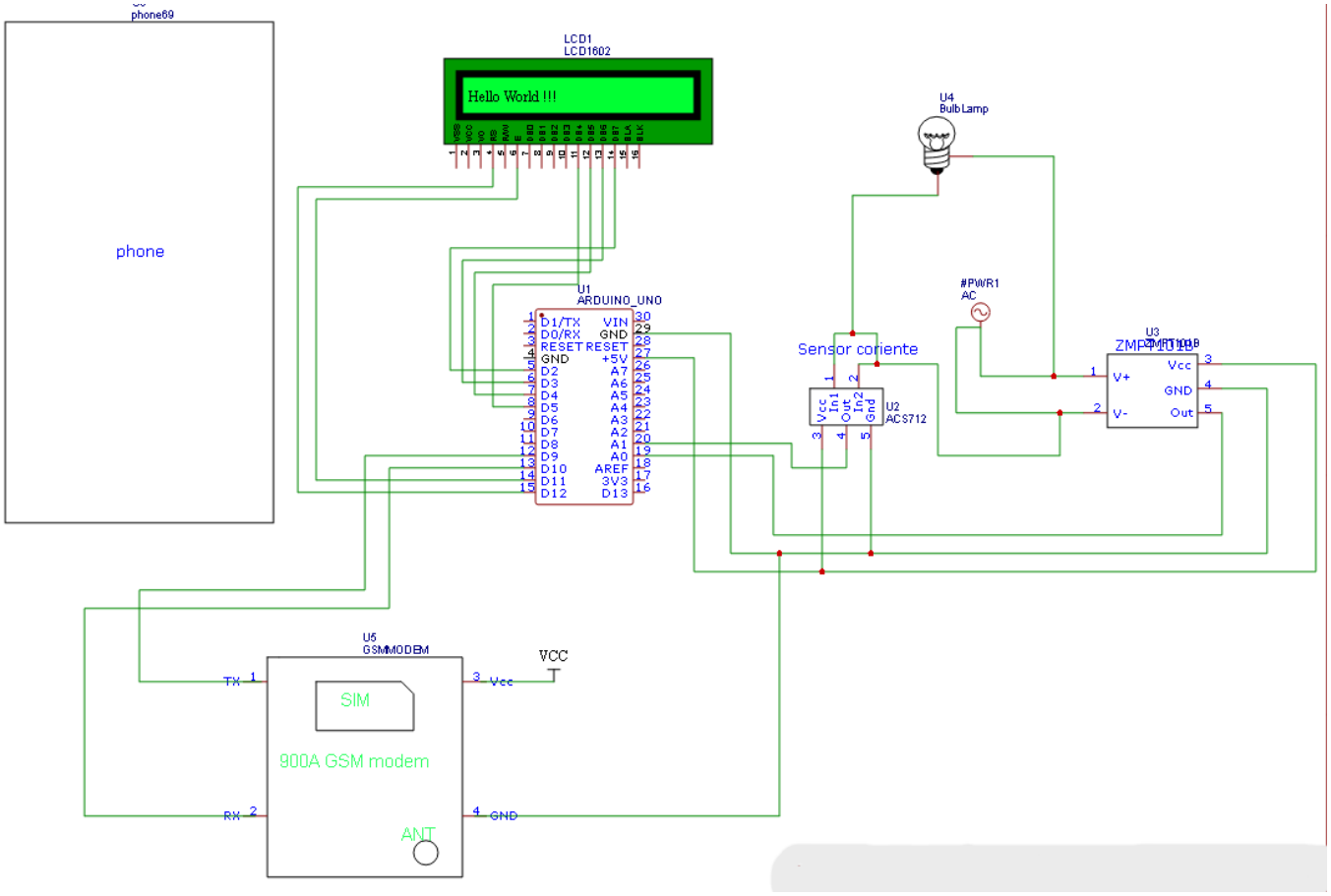
Fig 3.3.6:NodeMCU

3.3.7 I2C Module

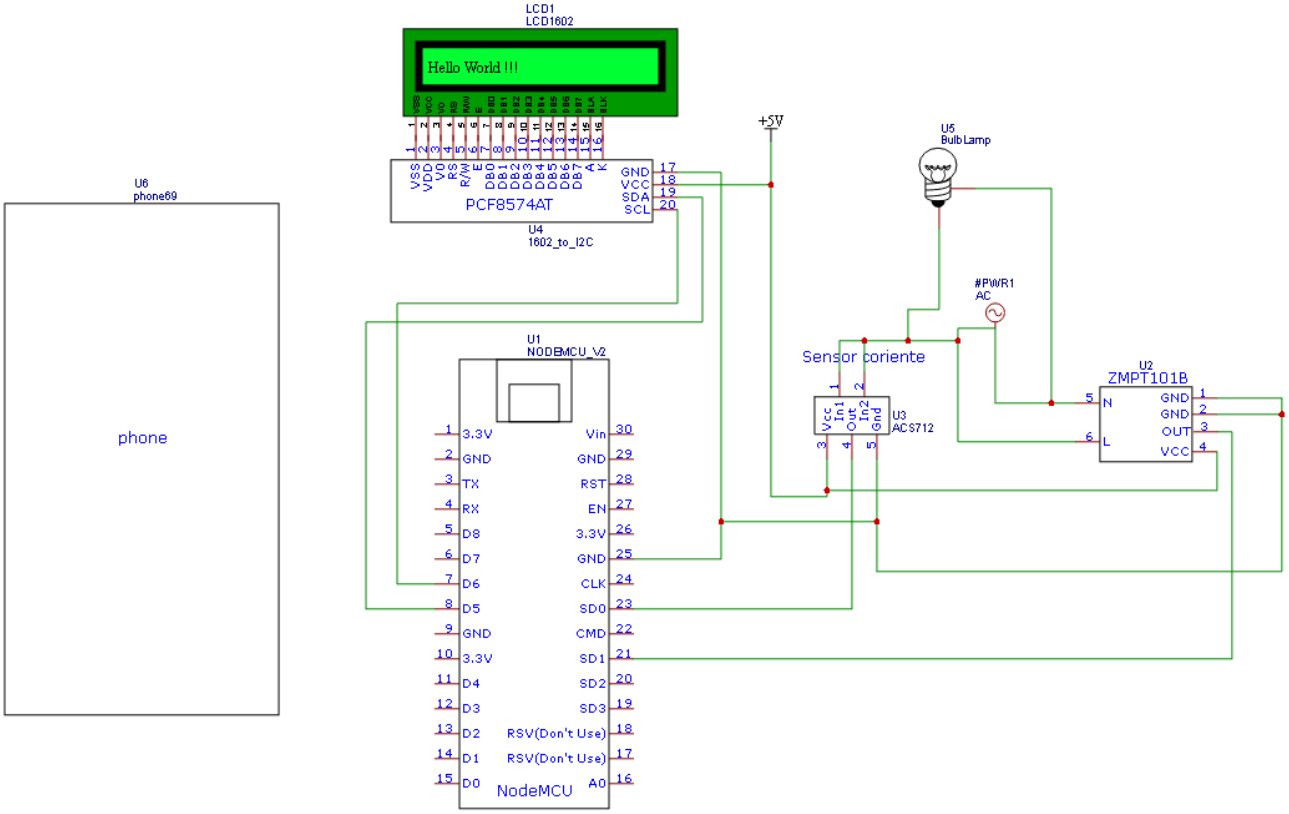
I2C is a synchronous, multi slave, multi master packet switched, single-ended serial bus. ie. multiple chips can be connected to the same bus. I2C uses only two bidirectional open collector or open drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL), pulled up with resistors.

Fig3.3.7:I2C Module

3.4 Circuit Diagram



3.4.1 Method 1 Circuit Diagram



3.4.2 Method 2 Circuit Diagram

3.5 Software Used

3.5.1.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 hardware to upload programs and communicate with them.

Fig 3.5.1:Arduino IDE

2.Firebase

Firebase is a platform developed by Google for creating mobile and web applications.Firebase helps you develop high-quality apps, grow your user base. Each feature works independently, and they work even better together.

Fig3.5.2:Firebase

CHAPTER 4

RESULTS

FINAL HARDWARE PRODUCT

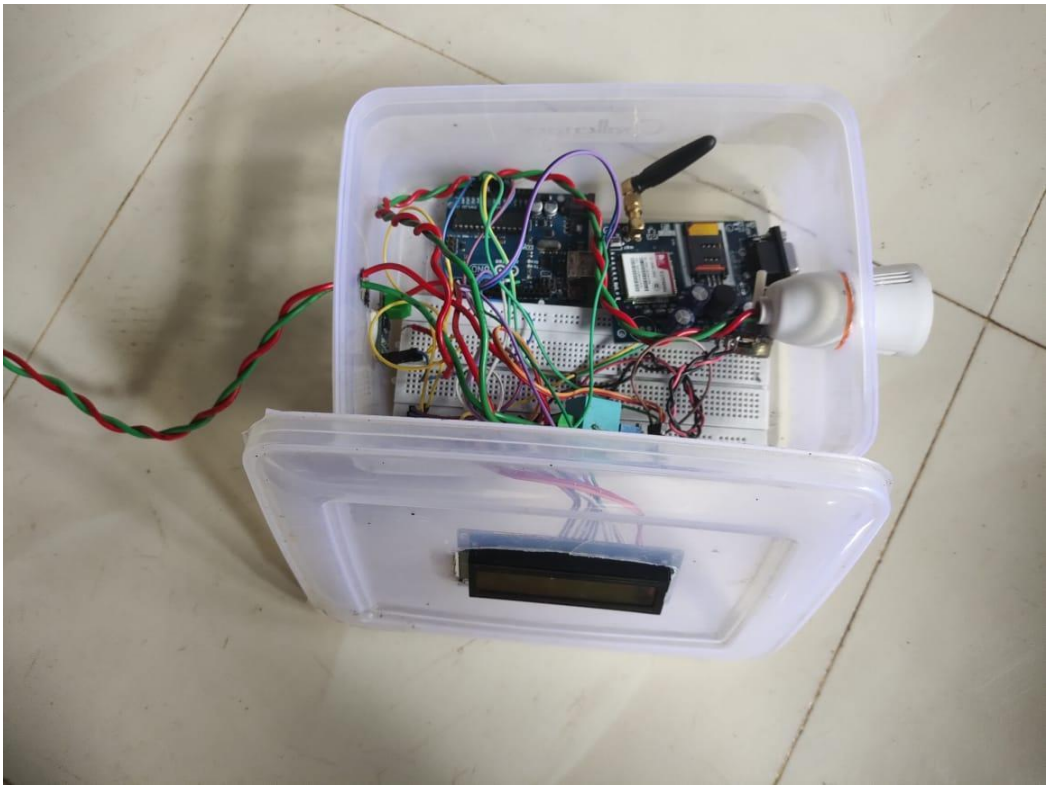


Fig4.1:Using Arduino UNO & GSM Module

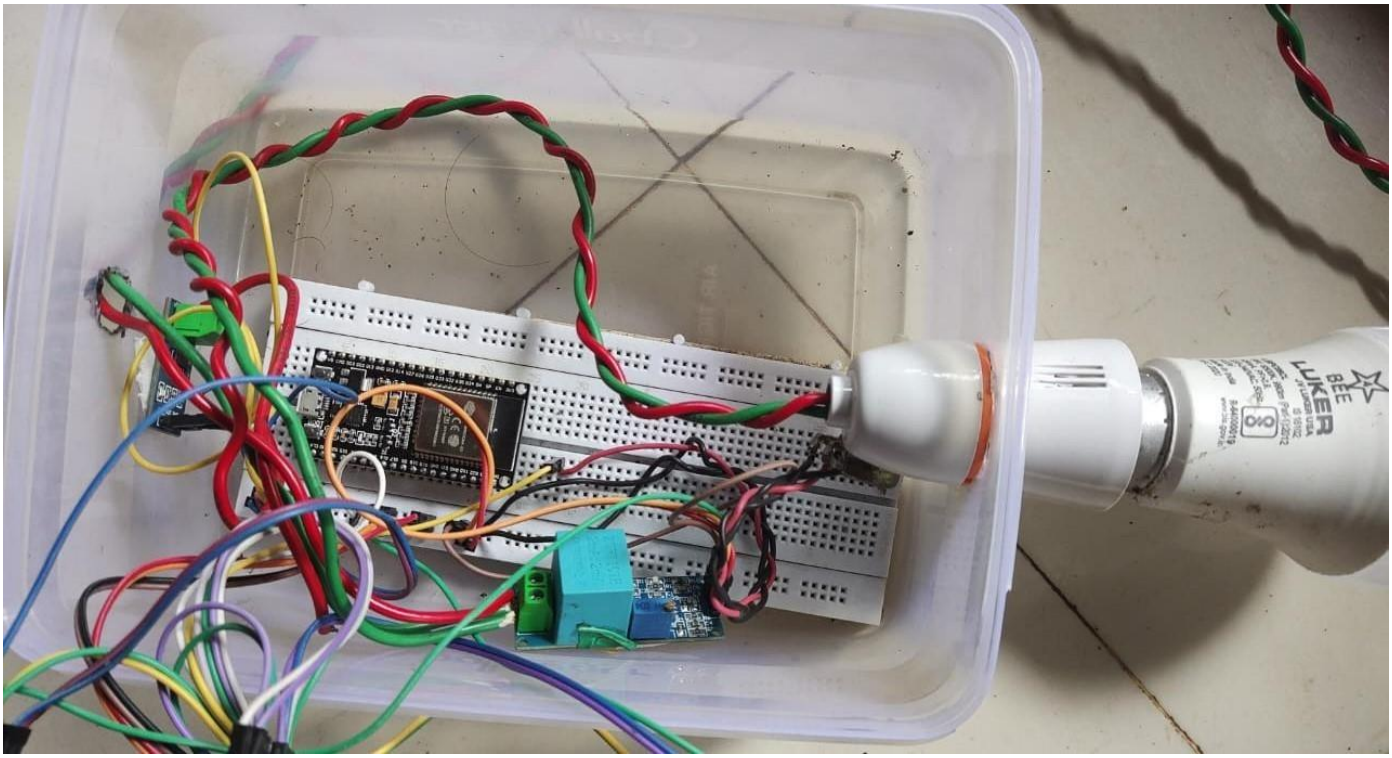


Fig4.1:Using NodeMCU

CHAPTER 5

CONCLUSION

We all live in a world were life has to be smooth and sound. Electricity has become one among the necessities people need to live at an ease. Faults in the power grid system can affect this lot. The proposed system will help in laying down a stone to the recurring power supply line failures and accidents. Our project will help in the early detection of faults in the power supply grid which can cause accidents at the right moment the fault has occured.It not only notifies the fault but also helps in identifying the cause for the same.The supply office officials can monitor the gird every second.They can also can the grid connection by turning on and off the relay module provided ,which is being controlled by the microcontroller program,through the web page.We have implemented successfully ,the system , for a single phase down converted supply.The implementation of the same on the supply grid will be done with the help of the supply line officials.

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