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Grid Monitoring System and Power Theft Detection using Smart Grid – Smart Grid for Smart Cities

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ABSTRACT: IOT based Smart Grid is an evolution of the existing electricity grid. Advancement in high speed communication and lowcost sensor coupled with the increased deployment of the advanced provide utilities with better information to manage the grid. It comprises of a communication where electricity and information are exchanged by the consumer and utility to maximize efficiency. The control centre ensure the smart grid optimize circuit VAR flow there by power theft can be monitored with help of the current sensor and smart system. Introducing microcontroller and IOT interface in the electrical grid makes the grid as smart grid. The important information are sent to cloud, collected by current sensors and voltage sensor by using microcontroller. So, the Data Analytics is performed by the cloud, which gives the information of the electrical grid.

KEYWORDS: Smart Grid, IOT Cloud, sensors, microcontroller

I. INTRODUCTION

In today's world, everything is smart, hence the concept of Smart Grid. Present grid network is over strained and cannot fully support the integration of renewable energy. Low power reliability, fluctuation in the power supply, extensive power failures, heavy transmission losses, undetected power theft, difficulty in fault location etc. are some of the major drawbacks of the existing conventional power grid network. IOT based Smart Grid is an evolution of the existing electricity grid. Smart grid is basically an electrical grid with automation, communication and IT systems. And when we compare the smart grid and existing traditional grid, smart grid is more advanced, reliable, power theft can be easily detected and gives high efficiency.

Internet of Things (IOT) is widely used in smart energy monitoring, industrial automation, and a variety of applications. At various stages of Smart Grid, IOT devices are deployed to monitor and control gridstatistics for reliable and efficient delivery of power to the end users. In case if any fault such as under voltage, over voltage or overload is detected then the system will automatically shutdown hence avoiding further damage to the system. And also if in case any power theft tapping will get detected from source to destination, it will be detected by current sensor and user will able to see power theft from anywhere of world location using IOT and can also control or disconnect the theft load using phone, laptop etc., This can be done only by authorized person.

Although IOT integration in the Smart Grid domain provides manifold benefits, the challenges in IOT- Smart grid integration needs to be solved for the efficient operation of the grid. This project describes the IOT based power monitoring system that is capable to measure and analyse the electrical parameters and power theft. IOT based software application 'Thing Speak' is used to obtain the real-time electrical data of object. In case of any fault the system will automatically shut down and switches to another grid. Advancement in high speed communication sensor coupled with the increased deployment of the advanced provides utilities with better information to manage the grid.

II. PROPOSED SYSTEM

This project proposes Smart grid systems consistof digitally based sensing, communications, and control technologies and field devices that function to coordinate multiple electric grid processes. A more intelligent grid includes the

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application of information technology systems to handle new data and permits utilities to more effectively and dynamically manage grid operations. The information provided by smartgrid systems also enables customers to makeinformed choices about the way they manage energy use. Based on theft authorized person will get update with help of IOT app and display section.

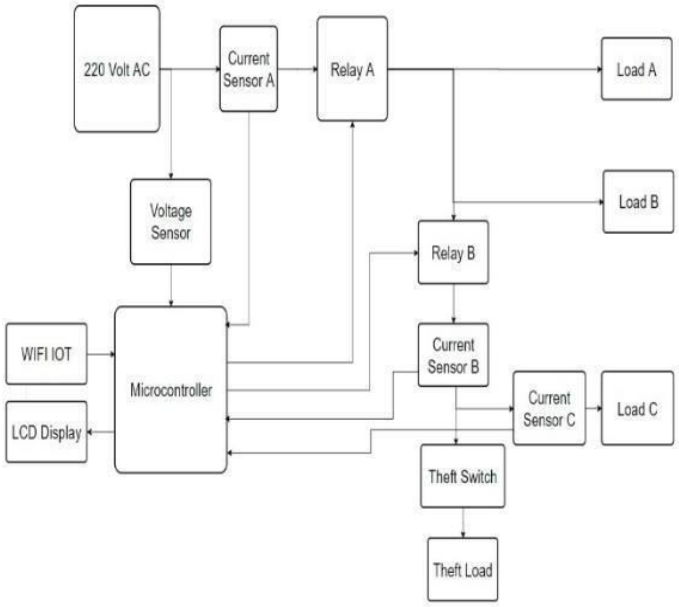

Figure 1: Block Diagram of Proposed System

Inourproject,asupplyof230VACisstepdownto 12Vusingstepdowntransformeranditisgivenasinput to the microcontroller. The sensing devices continuously monitor grid current and voltage and it will provide signals to the microcontroller. If any fault or theft detected microcontroller will trigger the relays, where relay A operates for fault conditions - over voltage, under voltage and over load and the relay B operates for the theft system. Here current sensor A is used for sensing the faults whereas current sensors B and C checks for theft condition. The information will be updated on IOT cloud and also displayed on LCD. Here, using blynk app the authorized persons will be able to control using smart devices from anywhere of theworld.

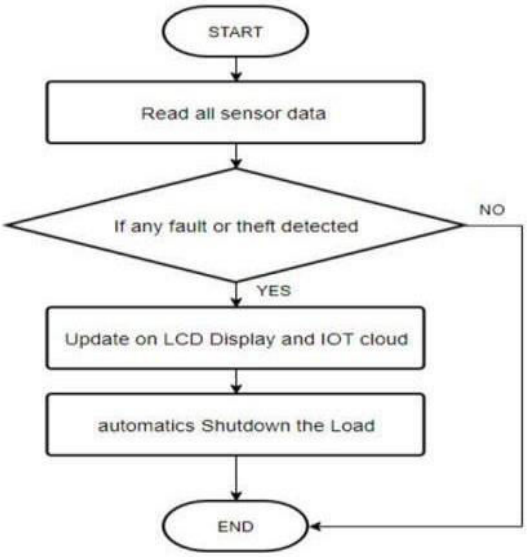

Figure 3: Flowchart of Proposed System

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To start with, the sensors will read all the data's. If any fault or theft detected, then it will be displayed on LCD and also it will be updated on IoT cloud. Hence the system or the load will shutdown automatically.
If there is no fault or theft detected, then the system will function in normal condition. And the loop endsthere.

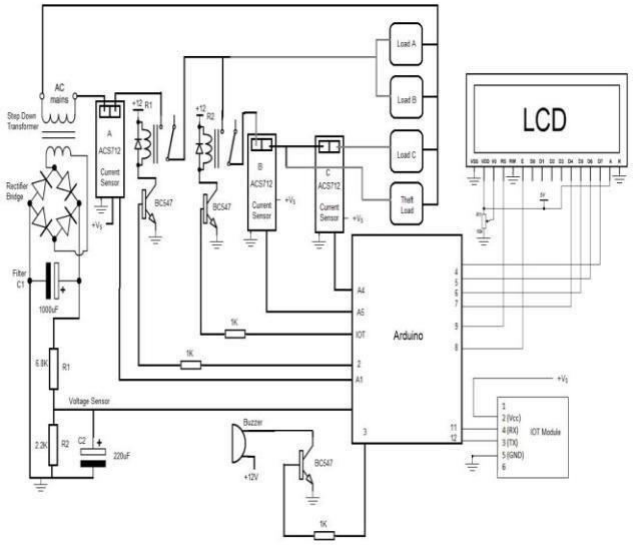

Figure 2: Circuit Diagram of the Proposed System

The figure above shows the circuit diagram of the proposed system. The step down transformer is used at the input to step down the mains voltage from 230v to 12v. The output of the transformer is fed to bridge rectifier. The bridge rectifier is an Alternating Current (AC) to Direct Current (DC) converter that rectifies mains AC input to DC output. Bridge Rectifiers are widely used in power supplies that provide necessary DC voltage for the electronic components or devices and hence it provides necessary voltage to the microcontroller. The current sensor ACS712 is placed at the input to measure the input current. And also the voltage sensor is placed at input to measure the input voltage.
The output of the current and voltage sensors are fed as an input to the Arduino UNO microcontroller. Wherein, the microcontroller checks for any theft or fault conditions. And the output of this microcontroller is given as an input to the relays. If any theft or fault detected then these relays will operate accordingly.
Also the microcontroller feeds the input for IoT module or wifi module and LCD display. The loads A, B, C are connected to the relays. Load A and B are normally operated loads. Also the current sensors are connected to load C and theft load. Any changes in the system can be detected by the IoT and the using the mobiles or Laptops we can control it. The whole process will happen without human intervention.

III. BLYNK IOTAPP

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

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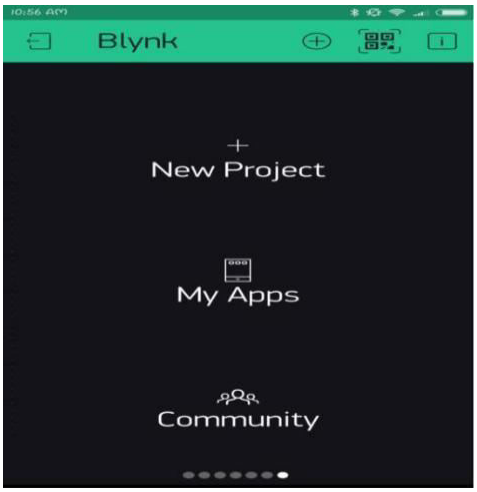

Figure 4: Home Screen of the Blynk App

This app can be downloaded in the electronic deviceslikelaptop,mobileetc.Hereinthisproject,this app is used to get the status of the proposed systemand the authorized persons can control if any faults or theft occurred.

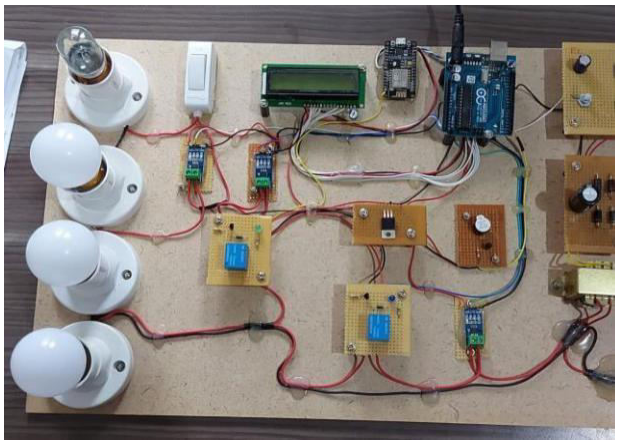

Figure 5: Complete Hardware Setup of the Proposed System

IV. FUTURE SCOPE

This project is full complete setup for required task, but in future we can add many other things in this projectforincreasefunctionandfeaturesofthisproject. We can interface many other sensors for monitor to grid with more advance level. We can implement a local servalalsoforstoreandanalysistheoldvalueofsensor. With minimum changes we can edit this project in future.

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V. RESULT

Condition	Threshold Values	Result
Power Theft	-	Theft Detected
Over Voltage	Above 240V	OV Detected
Under Voltage	Above 180 V	UV Detected
Over Load	-	System Shutdown Automatically

Table 1: Table of Result

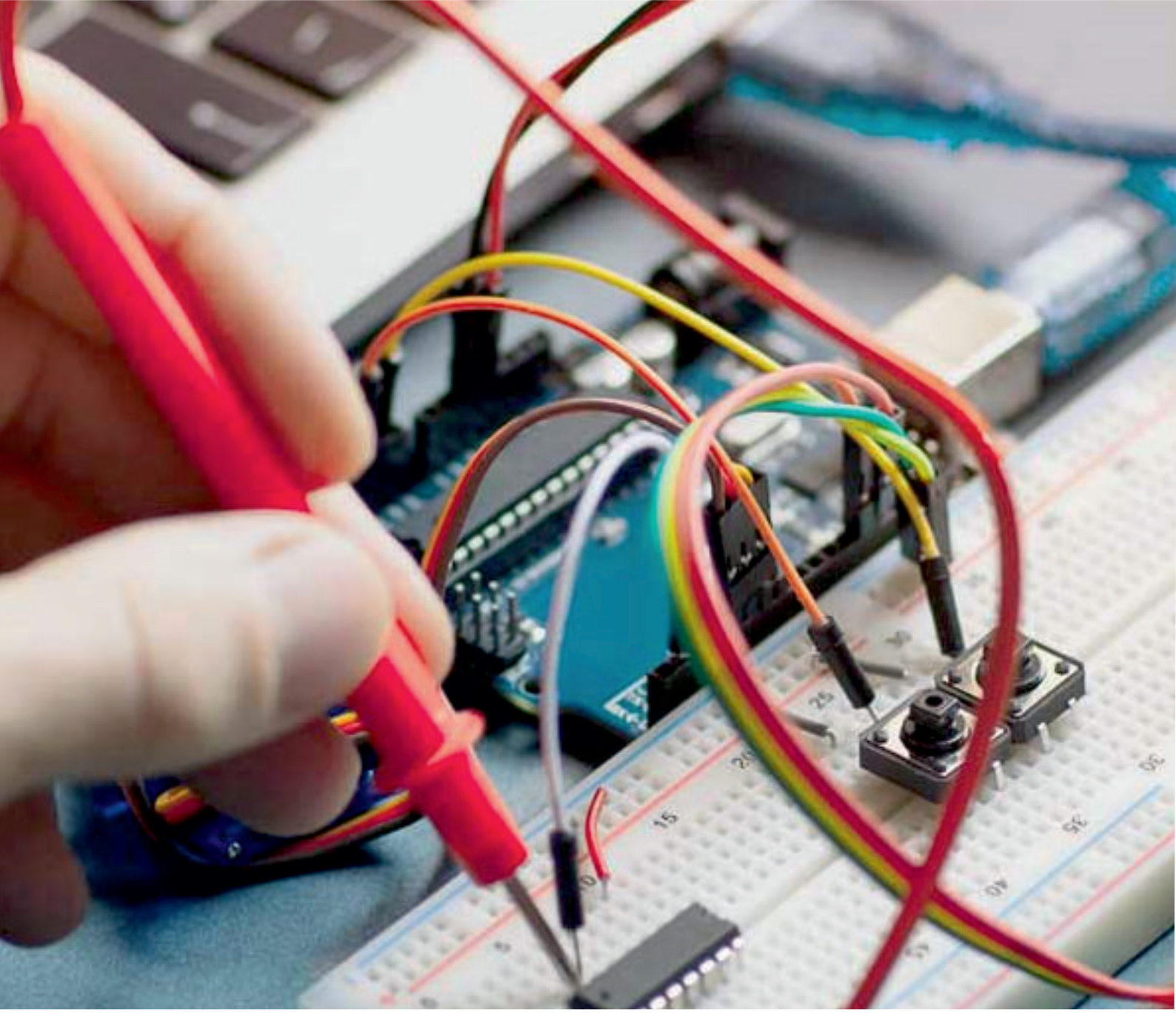
In our project, Grid is monitored and protected in a smart way using IOT and the identification of power theft is done. Alarm buzzer is activated as per required condition and load will be switched off using relay switches.
This system will provide good output as per requirement and implementation design.

VI. CONCLUSION

We implemented this project for grid monitoring with smart way and theft detection. We have used automatic system and cloud IOT server for remote monitoring. We are able to detect voltage and current related fault with this system and in case of theft we tested the hardware for theft detection for this section also we are able to create theft. The implemented system working successfully for required working. Alarm buzzer is getting activated as per required condition and load getting switch off using relay switches. The system is implemented with help of microcontroller and embedded c program code. This system will provide good output as per requirement and implementation design.

REFERENCES

1. Fahad Khan, Muhammad Abu Bakar Siddiqui, Ateeq Ur Rehman, Jawad Khan, Muhammad Tariq SadiqAdeelAsad and AdeelAsad., “IOT BASED MONITORING SYSTEM FOR SMART GRID APPLICATION”, 30 March 2020
2. Mr.P.Leninpugalhanthi, Janani.R, Nidheesh.s, Mamtha R.V, Keerthana I and MrR.Senthil Kumar., “POWER THEFT IDENTIFICATION SYSTEMUSING IOT” ,2019.
3. M J Jeffin, Madhu G M, Akshayata Rao, Gurpreet Singh and C. Vyjayanthi.,“INTERNET OF THINGS ENABLED POWER THEFT AND SMART METERMONITORINGSYSTEM”, July 28 - 30, 2020.
4. Rahul N. Gore, SurajSawai and HimashriKour., “GRID ON TAB: IOT BASED QUICK,MOBILE AND SMART GRID ANALYZER”, March 2019.
5. E. Spanò, L. Niccolini, S. D. Pascoli and G. Iannacconeluca., “LAST METER SMART GRID EMBEDDED IN AN INTERNET OF THINGS PLATFORM” IEEE TRANSACTIONSONSMARTGRID" in IEEE Transactions on Smart Grid, vol. 6, no. 1, Jan. 2015.



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