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Smart MSEB Fault Detection and Analysis

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Abstract -*Here we have a proposed model for the line fault detection method using raspberry pi 3B+ which will replace the traditional manual fault detection method. They can monitor the whole area from the substation office and whenever the electricity cut off is there, they will send help to the specific area as soon as possible. The location provided by the system is precise as the system will provide the coordinates (longitude and latitude) where the cut off takes place. The system would prevent the misuse of electricity which can be referred as power theft as well as it can also detect the line fault location quickly and precisely without the assistance of any human control.*

SCADA is referred as supervisory control and data acquisition system as well as it can be referred as the combination of control and data acquisition. SCADA encompasses the collecting of the information via controller having sensor interfaced, transferring it back to the central site, carrying out any necessary analysis and control, and then displaying that information on an operator's screen or display. It gathers the required information or data from the instruments and sensors residing at the remote sides. Then, it transmits data at a central site for the controller monitoring process. In this project, we are going to use this system to monitor and control MSEB's power distribution system.

Key Words: Raspberry pi, fault detection, electricity, Relays, User Interface, etc

1. INTRODUCTION

Electricity is an essential source necessary in our day to day life. Most industries are running with electricity. In commercial areas also electricity plays a very vital role and hence electricity is the backbone of any developing nation. This system will find out the line fault location without any human control quickly and accurately. The global energy crisis is increasing every moment. There is a never-ending desire for the energy production by many. A lot of new technology has been introduced to satisfy user demands. Automation in the energy distribution is also necessary to enhance people's living standard. The power theft is additionally increasing which can affect the economy of our country. The development of advanced cut off detection with a theft detection scheme can be used to prevent electricity stealing by the household. The customer needs power without any interruption, hence a reliable system should be established to ensure the continuity of power supply. This system proposes an effective fault detection method that periodically updates the energy consumption details of the households and sends it to the authority side by using an LCD. The fault detection part monitors the type of fault and sends the details about the type and location of the fault to the authority. Human lives are saved from this electrical danger as it provides detection of any fault prior and prevents the electricity supply to the damaged line as well as it sends a message to the board of electricity to solve the developed fault. A design based on embedded hardware has been developed which acquires data from a system that has electrical sensing. A powerful sensing as well as detecting system has been designed to send data from a network to other networks. If there is any transmission parameter being changed it is then detected/sensed in order to save the entire transmission and distribution.

1.1 Aims and Objectives

Before the main objective of the project is to develop a smart cut/off fault detection system that implements the following functionalities

i. The exact location where the cut off has taken place.
ii. Using longitude and latitude of the distribution panel in a supply system.
iii. To provide a display at the main center.

1.2 Prior Work

The Global energy crisis is increasing every moment. A lot of new technology has been introduced to satisfy user demands. Automation in the energy distribution is also necessary to enhance people's living standard. The traditional method of electricity fault detection involves the residents or people to call at the MSEB office and inform them that electricity cut off is there. There are many issues related to this method such as giving wrong information, lack of information on the cause, and exact location of the distribution panel, etc. One of the advanced and convenient methods is automatic fault detection. In this method, the sensors send the details about the electricity cut off along with the exact distribution panel (DP) location by longitude and latitude points. There is a rise in the theft of the power which has been causing an economical damage. The development of advanced electronic meter with a theft detection scheme can also be added further in the system used to prevent the electricity stealing by the household. The customer needs power without any interruption, hence a reliable system should be established to ensure the continuity of power supply. Thus, fault identification and

elimination must be accomplished as soon as possible. This paper proposes an effective fault detection method that periodically updates the signals send by the sensors to the raspberry pi. The fault detection part monitors the type of fault and sends the details about the type and location of the fault to the authority. The Raspberry pi technique enhances the speed of communication with distance independency. Human life is preserved with the help of this technology. During the transmission if any parameters are changed then it is detected to protect the entire transmission and distribution.

2. Components of Process and Working

In case of fault detection, nowadays we use impedance relay or reactance relays to locate the fault. But this requires a long time to calculate the distance of the faulty part and repair the faulty phase, the system will be in OFF state and the supply to the consumers is unreliable. This paper concludes that the raspberry pi technology used for the fault detection of the three-phase line through calls and messages is provided to the person in charge of that particular location, with the help of protection schemes of communication. A notification such as a message of the detected fault location will be sent to all the respective people in charge as well as at the same moment by the internal programming of the microcontroller which would be connected to a GSM module. In order to detect the faulty phase condition has taken place, the RYB indicators would be also provided for the indication purpose of the faulty phase.

2.1 Raspberry pi 3B+

Table -1: Raspberry pi 3B+ Specifications

Processor	Broadcom BCM2837B0
Memory	1GB LPDDR2 SDRAM
Connectivity	2.4Ghz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE, Gigabit Ethernet over USB 2.0, 4 x USB 2.0 ports
Access	Extended 40-pin GPIO Header
Support	System and Data Storage.
SD Card	Micro SD format for loading Operating

It has been developed in the U.K by Raspberry Pi foundation in 2009. Project was initiated by Eben Upton. It is based on Broadcom Chips. Supported by UCCL and Broadcom. It runs LINUX OS. Microsoft is developing windows 10 for newer boards. It consumes less than 5W of power in total. It also supports full HD video output (1080p), Multiple USB ports.

Fig -1: Credit Card Sized Computer

2.2 Relay

A relay is an electrically operated switch. Relays are used to control a circuit that has a low power signal (Complete isolation between controlled circuits and control) or where one signal is controlled by several circuits. It is calibrated with operating characteristics and for protection from overloads or faults multiple operating coils are used.

2.3 Analysis

In this section, we have analyzed various activities played by a different layer of the network to reach our goal of development. We have made the following analysis on how the data will flow through various processes and how the user will interact with the system.

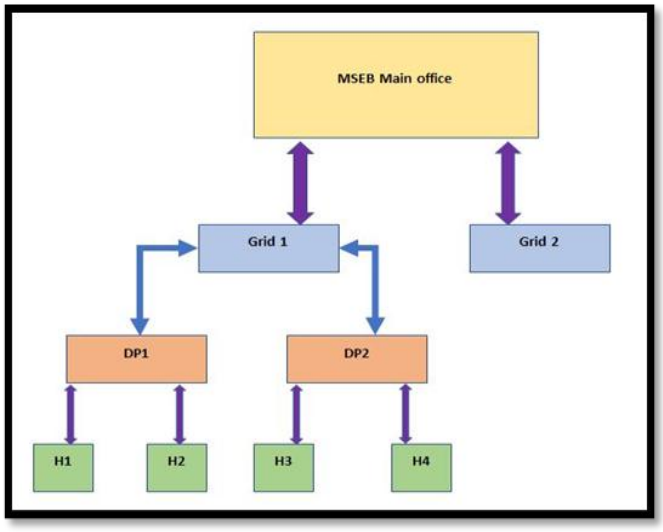


Fig –2: Electricity Distribution

2.4 Algorithm

Step 1: At the system start-up scan value of all sensors.
Step 2: If the status is green indicate as high.
Step 3: If the status is red indicate as low.
Step 4: Check whether the button is clicked.
Step 5: If the button is clicked toggle the status of relay.
Step 6: Repeat from step 1.

2.5 Working of relays in the system

Current successful implementation done of a relay circuit that will receive signal from raspberry pi and will perform switching for the grid, distribution panel and home.

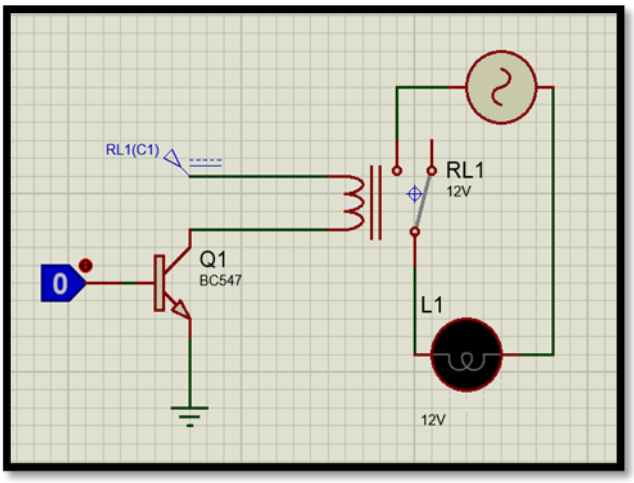


Fig -3: Signal is low/off

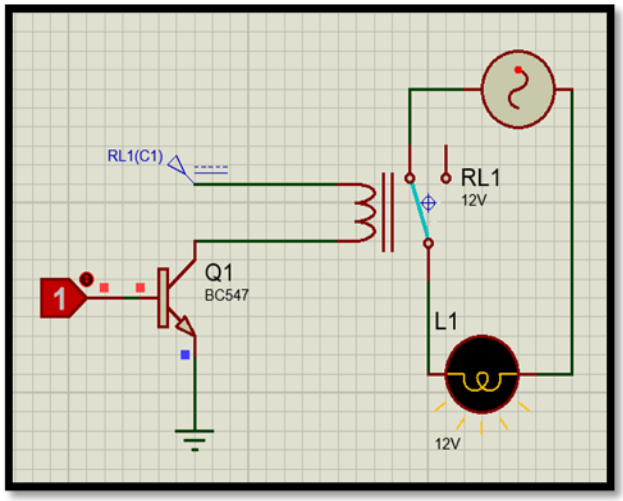
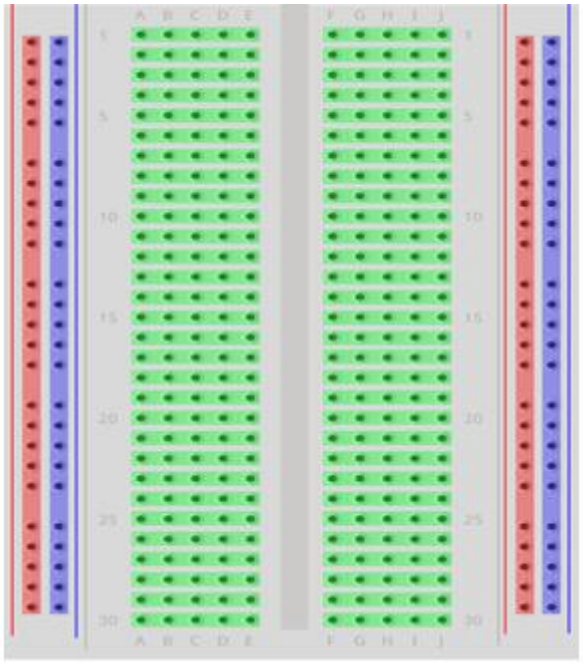


Fig -4: Signal is high/on

2.6 Bread Board

A breadboard is used for prototyping electronics, it allows you to create circuits without soldering. It is viewed as a board made out of plastic that contains several holes which can be referred as tie points. There are connecting points between the metal strips inside the board and the holes in various ways. In the illustration below we have highlighted some of the sections with different colours. This is to show you how the grid is connected.



2.7 State Diagram

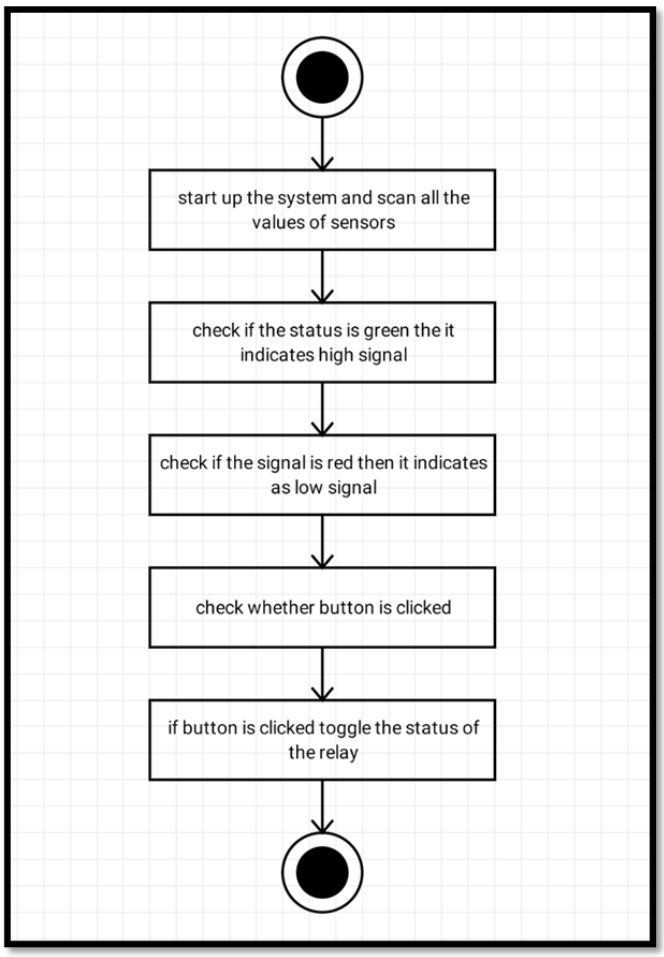
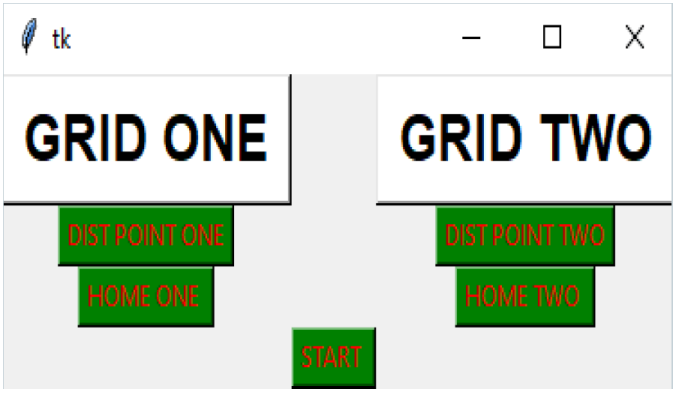
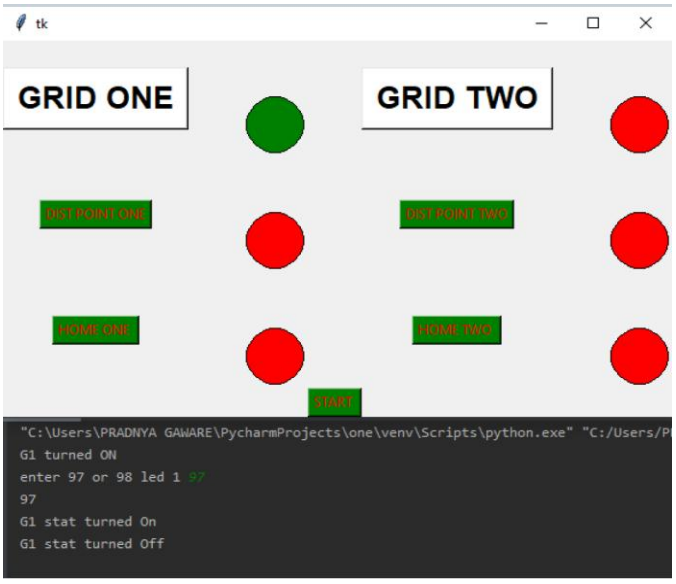


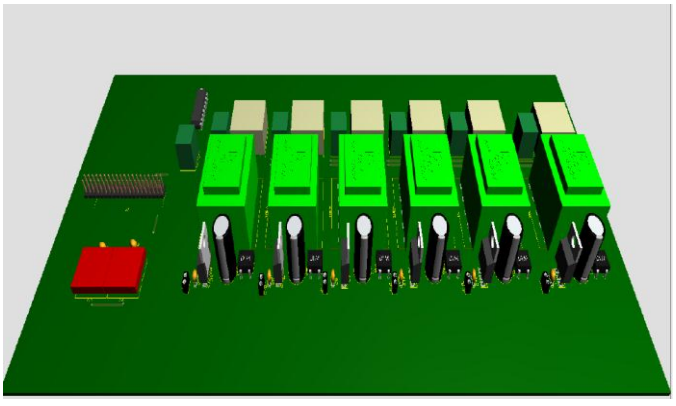
Fig -4: State diagram of system

3. User Interface Implementation





4. Virtual Circuit Implementation



5. CONCLUSION

According to work and survey so far, we have done, it shows that this system will help to provide precise control, will avoid accidents on-site and will help for fast problem solving during natural disasters. Human interaction is minimized by the present system, so it has high accuracy at the end of a specific time the cost of energy consumed. The main purpose of implementing this idea is to reduce manpower. The implemented system design mainly concentrates on the distribution system. It provides a way to detect faults such as wastage of energy and power theft. The system continuously monitors various parameters of the system. It helps the misuse of electricity and has better fault detection with a perfect timing. Automatic monitoring, analyzing and recording are done on the PC LCD screen.

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