



Design and Development of a Device to Detect Break Down Electric line

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I.ABSTRACT

Electric lines may lead to damage in severe climatic conditions. Due to much heat in summer if a small break done occurs, the whole line is going to shut down and it is hard to find out the approximate location. Linemen need to check every pole and line to find the fault and it takes a lot of effort and time to fix the problem. With the help of the Internet of Things - IoT we can modernize the traditional methods of searching every pole and line. The main aim of this paper is to develop a device that has the capability of sending Email directly to the substation, whether the power is available or not at that pole. Then linemen can directly visit a particular pole to search fault line. This not only saves a lot of time but also it is possible to fix the problem quickly with the help of NodeMUC and IFTTT service.

II.KEYWORDS

NodeMCU, IFTTT, IoT, Gmail, Webhooks, Arduino IDE.

III.INTRODUCTION

A city can be made into a smart city by monitoring and integrating functionality to infrastructures like roadways, railways, and power supply to making living more convenient and sustainable [6]. So for making a system or city to be smart IoT (internet of things) is necessary for digital communication. With the help of IoT, anyone can collect data from sensors for example city council can get the information regarding climate, air quality, or any other parameters continuously. Also controlling and monitoring any electrical appliances is easy and efficient. Smart city demands for automation as well as efficient usage of any resource [7], for example, usage of electricity can be reduced by sending remainder about consumption and smart fault detection method.

This report mainly focuses on fault detection of electric lines. By this method finding fault in a point in a power supply system would be easy than the traditional method and can fix the problem fast. For the past few years, many advancements had made in the IoT field like Patient Health Monitoring System[8] and smart home[10]. In the same way, IoT can be implemented in the electrical system like in power distribution and fault detection. The main purpose of this project is to make the electrical system smart in detecting faults to fix the problem fast.

IV.LITERAURE REVIEW

Yogendra Singh Parihar He made a review of usage of Nodemcu ESP8266 in IoT products in June 2019 In his paper he completely explained Nodemcu, software environment and its features and how it is useful in IoT [5]

SujataJoshi, SakshamSaxena, TanviGodbole, Shreya wrote a paper on **Developing Smart Cities: An Integrated Framework**. They had discussed how a city can be smart and how infrastructure can be interconnected on 6th International Conference on Advances on Computing & Communications, ICACC 2016, 6-8 September 2016 not explained details about power system with IoT

Rui Santos developed various project with NodeMCU and IFTTT cloud server, he made an IOT based system to monitor the system remotely, Rui Santos has his website <https://randomnerdtutorials.com/> where a lot of information is provided in IoT

V.METHODOLOGY:

The idea of making this project combines one of the problems and one solution. The problem is the difficulty of finding a fault point and the solution is IoT(Internet of things). By analyzing both things a compatible design was made that is informing fault point to substation or anyone in the world. Firstly, to build an efficient method of transferring information wirelessly, many websites and related research papers from the last few years were reviewed. From this many designs and views came into the picture, but many of them are complex and not compatible with designs as they require many components to an interface. Moreover, the overall complete cost of the system is increasing. Then the NodeMCU came into a picture efficient, small, cost effective[9], and the overall speed of communication increases. Next, the methods for sending mail have been assessed. This gave many views on how the system can be designed. The study resources were from 16 research papers as well as websites like IEEE, research gate, and google scholar. This paper includes a cost-effective and efficient system for finding approximate fault a point so that the hardness and time in finding it will be reduced. Here are some methods we analyzed for successful design.

IFTTT: This is one of the main components of our research it is very popular in doing IoT things like uploading an image to a dropbox when some photo is liked on Instagram or getting mail or text message when the phone is charged these are called applets. So these all types of smart work can be done through IFTTT. Every day new applets are created by members to make things smart. Here webhooks and Gmail services are used to send mail when NodeMCU is powered. And this is a very power-efficient method.

Designing circuit prototype: After finding an efficient method for sending mail, the next process is to place NodeMCU in the circuit. If the NodeMCU is directly placed on the line then there is no use when a fault occurs as NodeMCU also shuts down. But the other method is to place NodeMCU in a separate line and grounded as shown in Fig 6 it is going to complete the circuit and it will be in an active state when the mainline gives fault.

VI.EXPERIMENTATION

A. NodeMCU: NodeMCU, is the main component of the project, When the power supply is connected, it starts running the code. The process starts by connecting to the WiFi. The NodeMCU is an open-source Lua-based firmware and **development board** specially targeted for IoT-based Applications. NodeMCU is a low-cost open-source IoT platform. It initially included [firmware](#) that runs on the [ESP8266 Wi-Fi](#) SoC (System-on-chip) from Espressif Systems and hardware which was based on the ESP-12 module. Later, support for the [ESP32](#) 32-bit MCU was added [1]. NodeMCU can be powered through USB. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for the ESP8266 port.

NodeMUC used here incorporates a Tensilica 32-bit RISC CPU Xtensa LX106. Peripheral connectors on this board include 17 GPIO pins on the board, 1 UARTs, 1 SPIs, 1 I2Cs, SRAM 64 KB, 2.4GHz Antenna, Pin D0 to Pin D10 Digital Pins, 12 PWM Pins, A0 Analog Pin. It has 5 Ground Pins, 3 number of 3.3 V Pins, 1 Vin Pin. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. USB-TTL based on CP2102 is included onboard, Enabling Plug n Play PCB Antenna. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. The ESP8266 Integrates an **802.11b/g/n HT40 Wi-Fi transceiver**, so it can not only connect to a WiFi network and interact with the Internet and Deep Sleep Operating features make it ideal for IoT projects. The ESP8266 requires a 3.3V power supply and 3.3V logic levels for communication. [2]

Micro USB cable is used to make a connection with NodeMUC and Computer to upload code which is written in C language into the board. NodeMCU has enough computational power to connect with WiFi and send Emails.

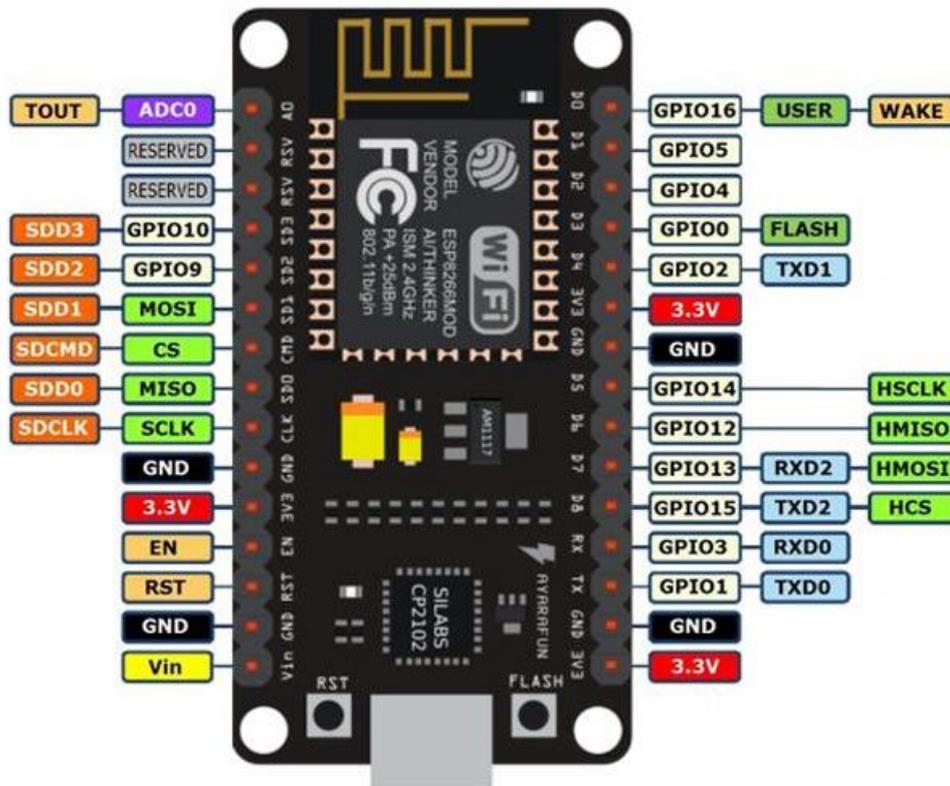


Fig .1 NodeMUC ESP8266

B IFTTT: It is a software platform that connects apps, devices, and services from different developers to trigger one or more automation [4]. “**If This Then That**” is the full form of IFTTT. **This** part of a Recipe is a Trigger. **That** part of a Recipe is an Action. IFTTT takes the APIs associated with web-based services and lets those act as a trigger to make something else happen. Here the web-based service is **Webhooks** which is a trigger and the action takes place by sending an **Email**.

Moreover, IFTTT has partnerships with hundreds of service providers that supply event notifications to IFTTT and execute commands that implement the responses, but some event and command interfaces are just public APIs[11].



Fig .2 IFTTT [3]

C. WebHooks: Receive a web request. This trigger fires every time the Maker service receives a web request to notify it of an event. For information on triggering events. Here there will be a special key that is combined with event name and URL in the documentation of Webhooks service https://maker.ifttt.com/trigger/Power_Available/with/key/m3-biniHxZUe2C1KhE7ubjolOaSQ-fEtf5GJIR****)

Power_Available is the event name that is linked with a unique key. When the NodeMCU is powered this event will be triggered and an email will be sent to the receiver mail ID (Here the sender mail will be the one with which the IFTTT account is created)



Fig .3 Webhooks service connected with Email

D. Gmail: Gmail is the main source of communication to send and receive information about the power availability at the device point. When the NodeMCU is powered it will connect to the internet and thereby triggering webhooks to send mail. Subject, a body of the mail can be set previously in IFTTT website along with receiver mail Id. Every time the same subject and body message will be delivered but the time will be changed accordingly.

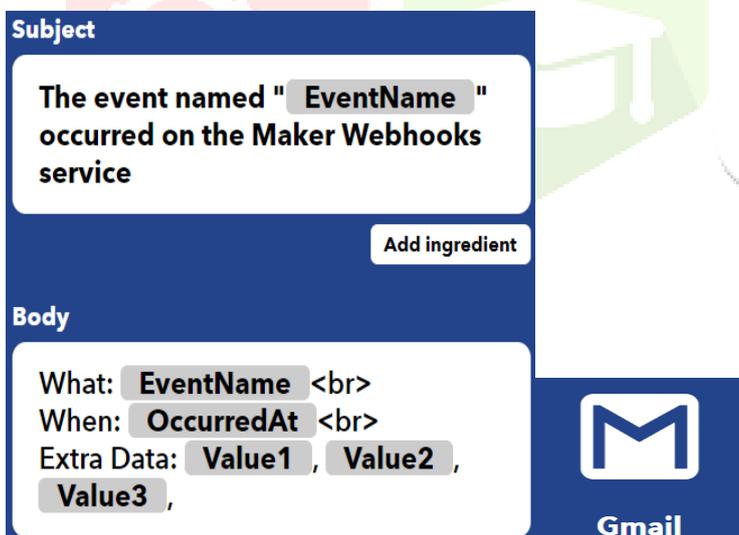


Fig .4 Gmail

E. Arduino IDE: ESP8266 add-on for Arduino

The Arduino IDE is a cross-platform application that is used to write and upload programs to Arduino compatible boards, The ESP8266 community created an add-on for the Arduino IDE that can be used to program the ESP8266 using the Arduino IDE and its programming language. There are many other platforms suitable for programming ESP8266 NodeMCU [5]. For NodeMCU to code, there is a need to download the ESP8266 library by the ESP8266 community from the board manager. Before that there is a need to paste this link http://arduino.esp8266.com/stable/package_esp8266com_index.json in

(Files>>preference) additional board manager URLs. It also enhances the creative process by making it easier to go from concept to execution.[12]

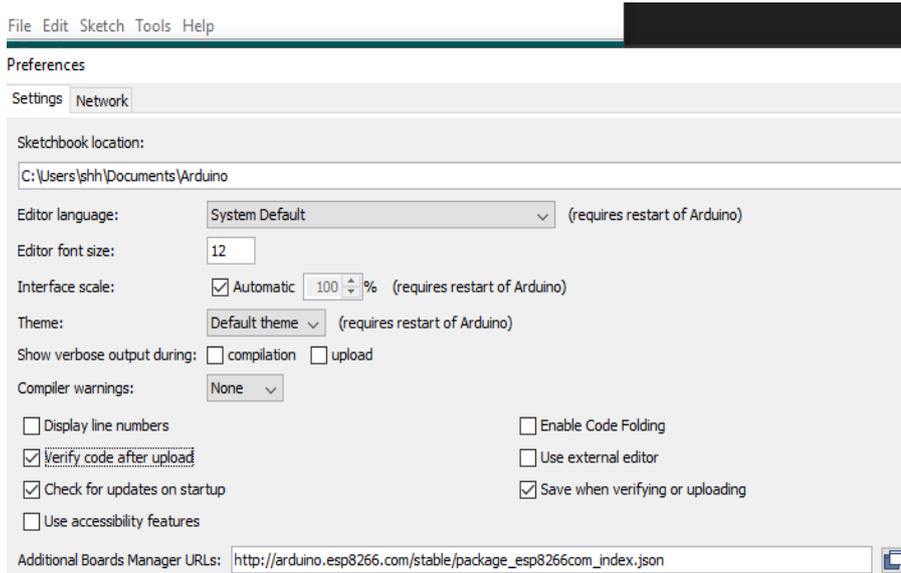


Fig .5 Arduino IDE

H. Circuit Diagram:

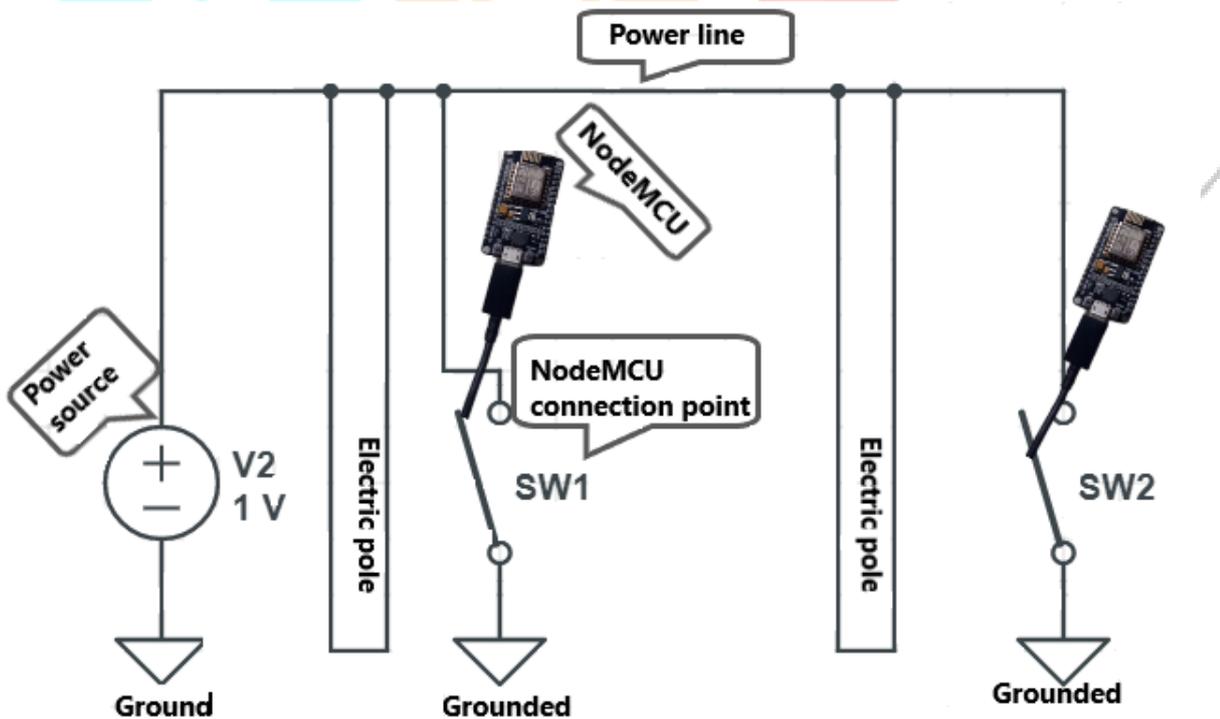


Fig . 6 Circuit diagram

I. Flow Chart:

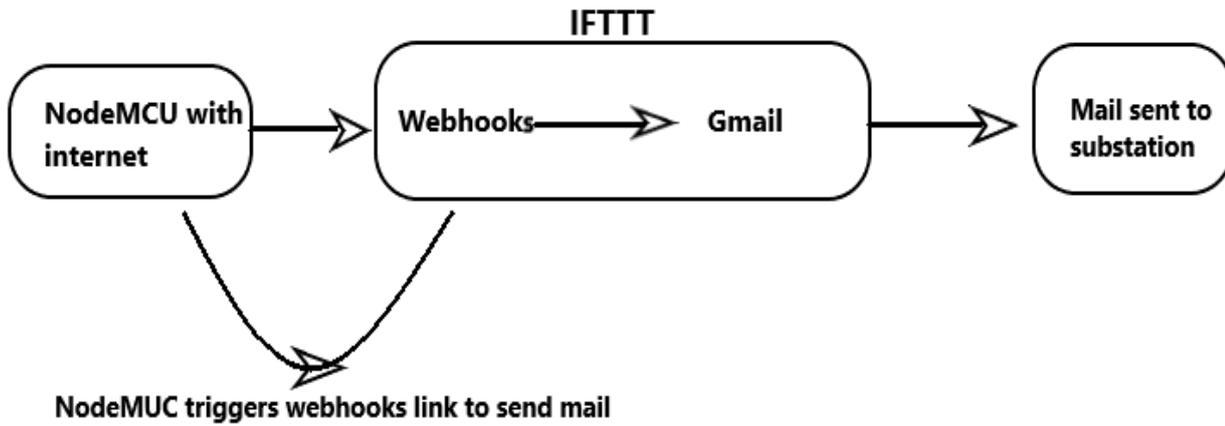


Fig .7 Flow chart

VII. RESULTS AND DISCUSSIONS

This section represents the working and performance of the project made using NodeMCU

The figure mentioned below shows the mail being received by a user when NodeMCU is powered, and Fig .8 shows the successful transmission of mail using IFTTT services. It displays the data from NodeMCU to show that the power is available



Fig 8. Email received when the event triggered by NodeMCU



Fig 9. NodeMUC when powered

VIII.CONCLUSION

The current methods used to find fault lines are not robust, and linemen have to see and verify every pole and line work too hard to find fault point location if the breakage is small. In this method NodeMCU is placed at poles and when the breakage happened before that breakage NodeMCU sends mails as every NodeMCU is grounded whereas NodeMCU after the breakage shuts down and therefore mail will not be sent. This project helps the linemen to find approximate fault points efficiently and can fix the problem in less time with less stress. This paper helps the linemen or substation workers to monitor power availability at poles from anywhere. In the future, this project should come into reality and help electric workers. The improved design can be readymade and more compatible to use directly.

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