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# IOT based Diagnosing of Fault Detection in Power Line Distribution Using Arduino

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***Abstract***
*As everyone knows inside a transformer copper winding exists, copper is a costly material compare to that of aluminum. If any fault occurs then the transformer starts to burn and becomes a huge problem for power grid. When an issue happens in distribution line, it is risky for the territory. In this project a design which will distinguish the shortcoming in distribution line by looking at the Arduino, which is connected to a transformer. If power flows through this, then a subsequent signal will go to database, it depends on the number of transformer and its corresponding Arduino, if all signals go to database means power line is on ok condition. If the data signals are said to be not in specified limits so it will assume that Power line is not working properly and every Arduino has a unique area code id. The data with respect to issue event specifically stage will be sent to database through Arduino. Here there will be a microcontroller Arduino in this, IC writing computer programs is done which think about the voltage signal and will send yield through the IOT module. If any issues occur that message will be sent to the operator.*

***Keywords:*** *Fault, Detection, Arduino, Power Line ,Database, IOT, GSM Module, SMS.*

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## I. INTRODUCTION

It is realized that when a shortcoming happens in overhead distribution line framework then momentary changes in voltage and current at the purpose of deficiency produce high recurrence. Electromagnetic driving forces called voyaging wave which engender along the distribution line in the two headings from the flaw point. The electric power framework is profoundly end incensed against many types of normal and spiffy physical occasions. Which can incredulously influence the general execution and steadiness of the network. The deficiency impedance being low. The issue current is moderately high, during the issue. The power stream is redirected towards the blame and supply to the neighboring zone is influenced Voltage become unequal [1, 2, 3]. It is critical to identify the issue as right on time as conceivable that is the reason a pack is being made utilizing microcontroller to make its procedure quicker.

There is a drawing closer need to prepare the deep-rooted distribution line foundation with a superior information correspondence arrange, that supports future operational prerequisites like genuine in the time record and control vital for shrewd network mix Because of this procedure the continuous checking is fundamental. Numerous electric power distribution organizations have essentially relied upon circuit markers to identify the defective areas of their distribution lines [4].

In power distribution systems, the majority of voltage and current signal distortions are caused by faults. Faults that occur in power distribution lines can cause an interruption of power supply. The time required to locate a fault is drastically reduced, as the system automatically and accurately provides accurate fault location information. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. The system must be capable to move secret data, for example, current condition of the transmission line and control data to and from the transmission network [6, 7].

The electric power framework is increasingly helpless against numerous types of regular and pernicious physical occasions which is straightforwardly influence the security of matrix. There will be a few parameters which is influenced [8]. A smart GSM based fault detection and location system was used to adequately and accurately indicate and locate where fault had occurred. The system uses a Transformer, Microcontroller, and a GSM modem. The system automatically detects faults, analyses and classifies these faults and then informs the location of the fault.

Finally, the fault information is transmitted to the control room. The project presents design and implementation of a distributed monitoring and centralized control system. The master slave communication with the Mod bus protocol is implemented. Also using wireless technology GSM, SMS is sent to a responsible person on mobile. The GSM network provides reliable communication quality with nationwide coverage.

Short message service (SMS) has now become the most widely used service based upon GSM standard. At the same time the decreasing cost of GSM devices such as mobile phones and the GSM SMS provides a unique address (SIM card number) to the remote-control unit and commands can be transmitted in the wireless communication network. GSM networks provide reliable communication quality with nationwide coverage. The Short Message Service (SMS) has now become the most widely used service based on the GSM standard. At the same time, the reduced cost of GSM devices such as mobile phones and GSM SMS provides a unique address (SIM card number) for remote control and commands that can be transmitted in the wireless communication network.

The Fault Information is also sent to Cloud service or Database for later Analysis.

## II. PROPOSED SYSTEM

The power passes through the transformers in different areas. Different transformers are installed and a subsequent Arduino UNO is attached to each of the transformer. A program is already uploaded inside the Arduino UNO in which a unique area code and unique SIM card is placed inside. When power is not sufficient to reach on the transformer than corresponding transformer attached Arduino UNO will not work during that time that Arduino UNO will not be capable to transmit the signal. In this project each on Arduino UNO has connected with an DHT sensor, MQ7 Sensor.

DHT sensor measure the temperature and humidity level of the transformer, MQ7 sensor measures the CO level in surrounding area. When sensor values fall in the fault occurrence range it will send SMS through GSM module that a Fault is going to occur in specific area and also send data to cloud. If everything is normal then just data is sent to cloud through Arduino UNO with help of GSM module. The Arduino UNO will continuously monitor the power line and if a fault is about to occur, will notify the operator so that protective measures can be taken.

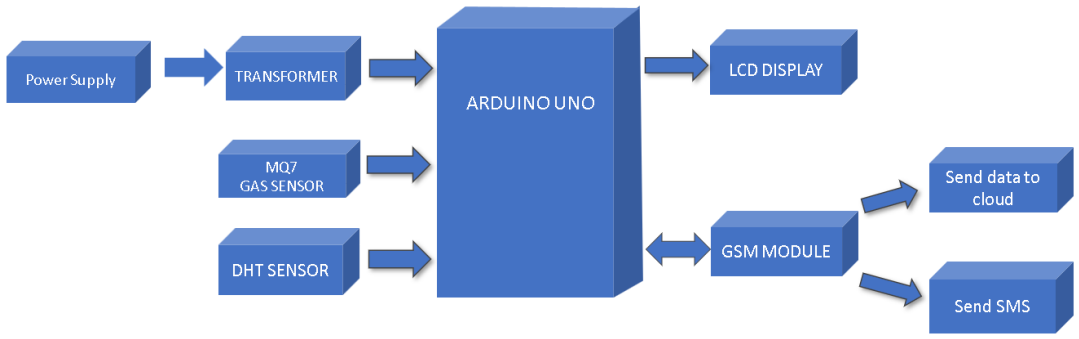


**Figure 1: Block Diagram of IOT based Diagnosing of Fault Detection System**

### 2.1 Components

**Transformer**: -

It is a coil binding machine which is used for step down and step up of the voltage, it has two numbers of turns as they are primary and secondary coil. From the power station to particular area mainly step-down transformer is used [5].

**Arduino:** -

This is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

**DHT SENSOR:** -

This sensor created by Adafruit company, the main motive of this sensor to detect the temperature and humidity level to any nearest area.

**MQ7 GAS SENSOR: -**

The use of carbon mono oxide gas sensor is to detect the flame arising during the time of burning of transformer it will warn the power station operator for avoiding the major transformer fault. Transformer is very costly because inside the transformer winding occurred in a large proportion and mostly winding is done with copper winding and copper is costly material compares to aluminum.

**GSM Module: -**

It is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. They use SIMs to identify their device to the network.

| Component | Specifications |
|---|---|
| **Transformer** | **Turns Ratio= 20:1** |
| **DHT Sensor** | **Input Voltage: 3 to 5 Volts**<br>**Temperature Measuring Range: 0 – 200° C**<br>**Humidity Measuring Range: 20% - 90% RH** |
| **MQ7 Sensor** | **Input Voltage: 9 to 12 Volts**<br>**Operating Temperature: -40° to 90° C** |
| **Microcontroller** | **Arduino Uno** |
| **GSM Module** | **SIM 800A**<br>**Data transfer link Download: 85.6 kbps**<br>**Upload: 42.8 kbps**<br>**SMS: MT, MO, PDU Modes** |
| **LCD display** | |

**Table 1: Listing of Fundamental Components Used**

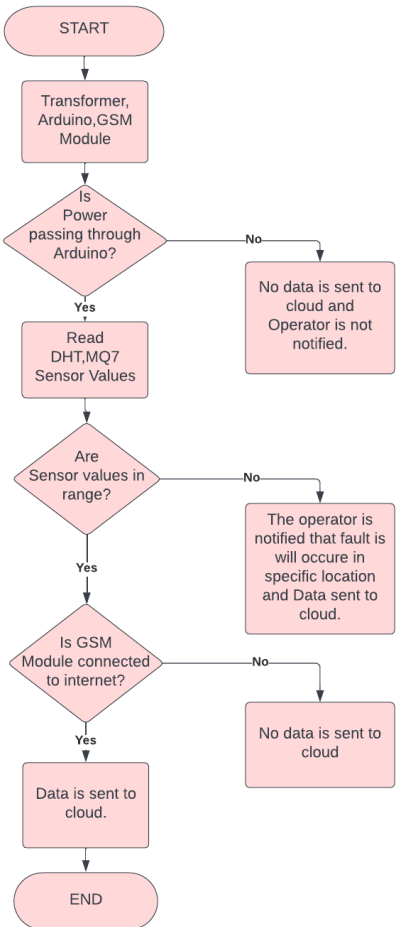


**Figure 2: Flow Chart**

## III. RESULTS

**Case 1:**

During Power off condition i.e. the power supply is in off. So, there will be no power flowing through the transformer. Hence the entire circuit will be in off condition. So, there will be no monitoring of power line and no data will be sent to cloud database.

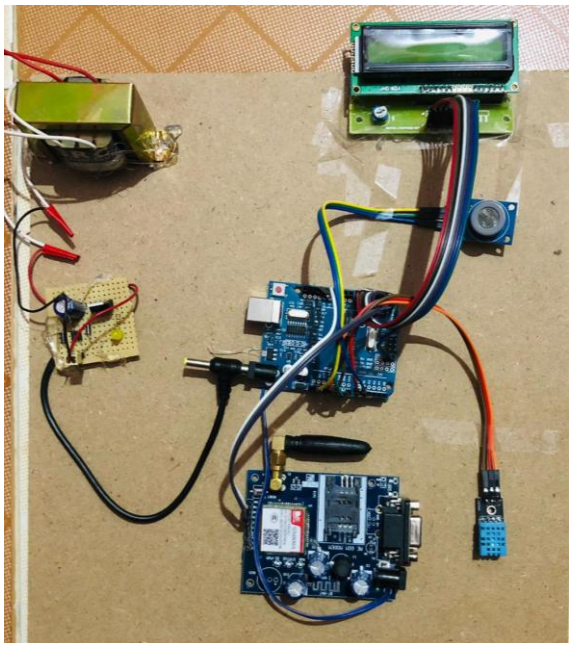

**Figure 3: Circuit connection during Power Off condition**

**Case 2:**

During Power on condition i.e., the power supply is available. So, there will be power flowing through the transformer. Now the starts Monitoring the Power Line for detecting the faults. When the sensor values are out of range, a fault will occur and then Operator is notified that fault will Occur at that location and Values are sent to cloud database.

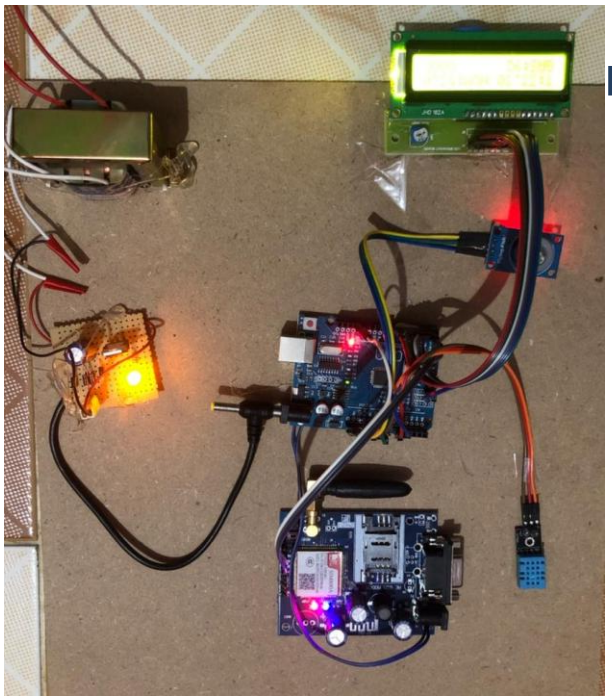


**Figure 5: LCD Display during on condition**

**Figure 4: Circuit connection during Power On condition**

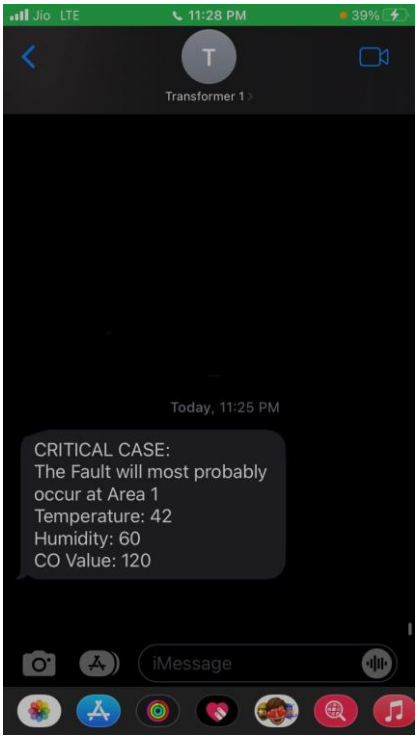


**Figure 6: SMS Received by Operator**


**Figure 7: Remote Monitoring through website**

| MQ7 GAS SENSOR | TEMPERATURE | HUMIDI TY | CONDITION |
|---|---|---|---|
| 90 | 30 | 95 | GOOD |
| 100 | 32 | 85 | GOOD |
| 130 | 40 | 65 | CRITICAL |
| 150 | 42 | 55 | CRITICAL |
| 160 | 50 | 45 | WORST |

**Table 2: For Different Condition Sensor Values**

## IV. CONCLUSION

The design and development of a low-cost IOT based Diagnosing of Fault Detection in Power Line Distribution Using Arduino. In this project, we are able to predict the fault at multiple locations and we are able to monitor the transformer through cloud-based website. We are able to send SMS to operator about fault occurrence.

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