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Shielding of Transmission Line in Power System

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Abstract: ***Shielding of transmission line is a vital role in the power system because most of the power outage is occurred due to non-scientific shielding, machine problem, manual error and environmental conditions. Hence, these issues cause disturbance in electrical flow which in turn effects the living beings, transformer, machine etc. thus it is important to analyze the fault present in transmission line which helps out to remove electrical problem within short period and to re-establish the system on minimum interference. This interruption of power system can be brought up to an end by detecting and classifying the different electrical faults on transmission line with the help of sensors and then intimates the electricity board about fault and its location through a microcontroller, GSM module and serial communication device.***
Keywords: Transmission line, shielding, GSM Module, Fault.

I. INTRODUCTION

Electricity is the main source in the human day-to-day life to carry out their work and also plays a vital role in industries. Hence, it is important to maintain the shielding of transmission line because it transfers the electric charges from one station to another load centers, for example from transformer to household service device. During this distribution process the transmission line has to be shielded properly or else it transmits the abnormal flow of charges where it creates leakage and cause short circuit, grounding which in turns shutdowns the whole power system leads to equipment damage, and also threatens the living beings. Protection of transformer and transmission line is much important in power system to predict the fault present in the power system to maintain the work continuity of the system.



Figure 1: Transmission line



Figure 2: Transmission fault

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In early days technical team members or power system engineers were detecting the fault present in transmission line by traditional methods which took more time to solve the problem but in recent era the artificial or smart monitoring methods are used to detect the faults with the help of sensors, microcontroller, software tool, etc. which helps out the engineer to solve the problem as early as possible to restart the power system. Based on recent era this paper deals with smart monitoring; when transmission fault occurs it is unseen and even minutes faults like inner current leakage, grounding leads to transformer damage, and also initiates the fire which damages the corresponding equipment. Hence, the continuous monitoring of power system is necessary to check the condition of transmission line and transformer, this can be achieved by smart detection system where microcontroller sends the alert message to the board when the sensor values exceeds the preset value and GSM modules share information about the fault location. The real time detection is important because 60Kv transformer cost around 80000 rupees.

II. LITERATURE REVIEW

This section discuss about existing system. Concurrent neuro fuzzy technique was applied to power transmission line to find the fault, and it's location by comparing the value obtained from two different power transmission line but at a time only two values can be measured [1]. Four popular machine learning methods are bagging, boosting, radial basis function and naive Bayesian techniques were used to find four different faults present in transmission line but location information is not much accurate [2]. The incoming voltage and current values are fed to MATLAB based on program and Arduino hardware detects the fault present in power system and manages the electricity as per requirements [3]. Easier, cheaper and highly comfortable way to detect fault present in electric grids by considering the incoming and outgoing values of sensor with help of IOT and indicates the concerned person with a real-time location [4]. Wavelet coefficient signals were used as input to artificial neural network to find the abnormal current, faults and location. This wavelet extract features of current and feds as input to artificial neural network [5].

III. PROPOSED SYSTEM

Fault in an electric power system arises due to abnormal flow of electric current, for example

1) Short circuit fault: where current flows in an unintended path.
2) Open source faults: interruption in machine or equipment.
3) Ground or earth faults: current flows directly into earth or ground.

The different faults are detected by using the protective device in the power system, then activates the breaker, and other devices to limit the loss in the system during failure.

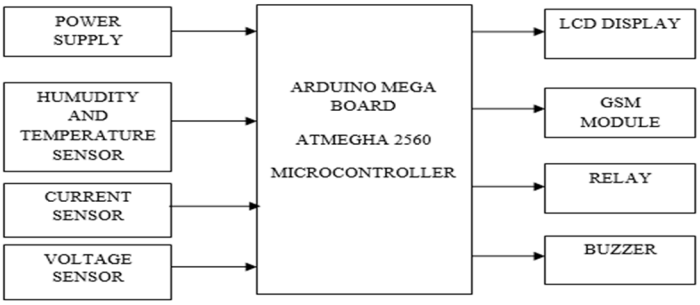


Figure 3: Block Diagram of Transmission Fault Detection

The transmission fault detecting device consist of three major components as shown in figure 3

a) Instrument transformer i.e., current, voltage and temperature sensor
b) GSM module
c) Microcontroller.

Where current, and voltage temperature sensors are connected to line which senses the corresponding value. The output values of sensor are feed to the analog to digital converter of microcontroller. If the sensor values exceeds preset value then it confirms the presence of fault in the power system. Then microcontroller classifies and calculates the fault and relays information to the module via serial communication device which serves as interface between microcontroller and the module, where RS-232 serves as connector. The device can be placed in a required region and the location of fault is calculated relative to position and value of device. Then through SIM card in module will intimate the Circuitry board about fault, and it's location to resolve the problem which helps out to bring the system back to its initial condition.

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IV. HARDWARE DESCRIPTION

This section gives brief description about hardware components

A. ATMEGA328P

Arduino Uno is a microcontroller which receives the signal from incoming device, then manipulates the signal based on program script and relays the information to the further device connected to it. ATmega328P has 14 digital input and output pins, 6 analog inputs

USB connector, power jack, inbuilt LED connector, Reset pin etc.



Figure 4: ATmega328P

B. LCD Display

Liquid crystal display is a flat panel display which emits the information of incoming and outgoing signal with the preset value. The commonly used LCD is 16×2 LCD which display 16 character per line and has ability to display in two lines i.e. 16 columns and 2 rows, and also includes three control signals, one data bus, read and write pin, enable pin, register select pin.



Figure 5: LCD Display

C. Relay

Relay is a switch operated by magnetic force when current flows through a coil in relay. Relay has two circuits normally closed and normally open which operates based on flow of current. The relay has coil, when a voltage is applied piston is pushed and connects to another end, when a voltage is removed it comes back to a normally open position.

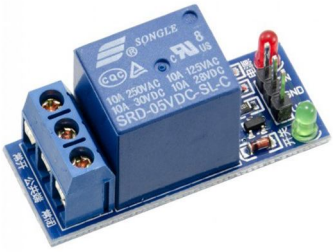


Figure 6: Relay

D. Power Supply

Power supply is an electric device which transfers the electric power to load, and it consists of step down transformer, bridge rectifier, input filter, voltage regulator, output filter and indicator unit.



Figure 7: Power Supply 12v

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E. GSM Module.

GSM module used in many mobiles, and also used for developing IOT and embedded system applications. GSM has a unique slot for SIM where it relays the information to the concerned person.



Figure 8: GSM Module

F. DHT11

DTH11 is a digital temperature and humidity sensor contains a calibrated digital signal output of temperature and humidity. This sensor is connected to microcontroller where controller receives the incoming signal from sensor and compares the reading with preset value.

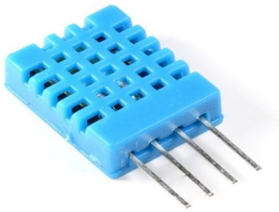


Figure 9: Humidity and Temperature sensor

G. Current Sensor

Current measurement has vital importance in many power and instrumentation system. The current sensing is done for circuit protection and control. Where it's detects and converts current to an easily measured output.



Figure 10: Current Sensor

H. Voltage Sensor

Voltage sensor is simple module can be used with Arduino board to measure external voltages that are greater than maximum value i.e. 5v in case of Arduino.

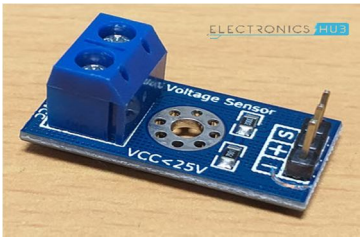


Figure 11: Voltage Sensor

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V. SOFTWARE DESCRIPTION

This section gives brief description about software requirements

A. 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 and Genuino hardware to upload programs and communicate with them. It is also called as sketches. The sketches are written in text editor and saved with file extension .ino. The software also includes libraries, third party hardware and serial monitor.

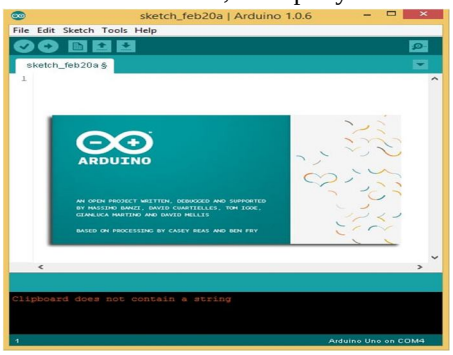


Figure 9: Arduino Software

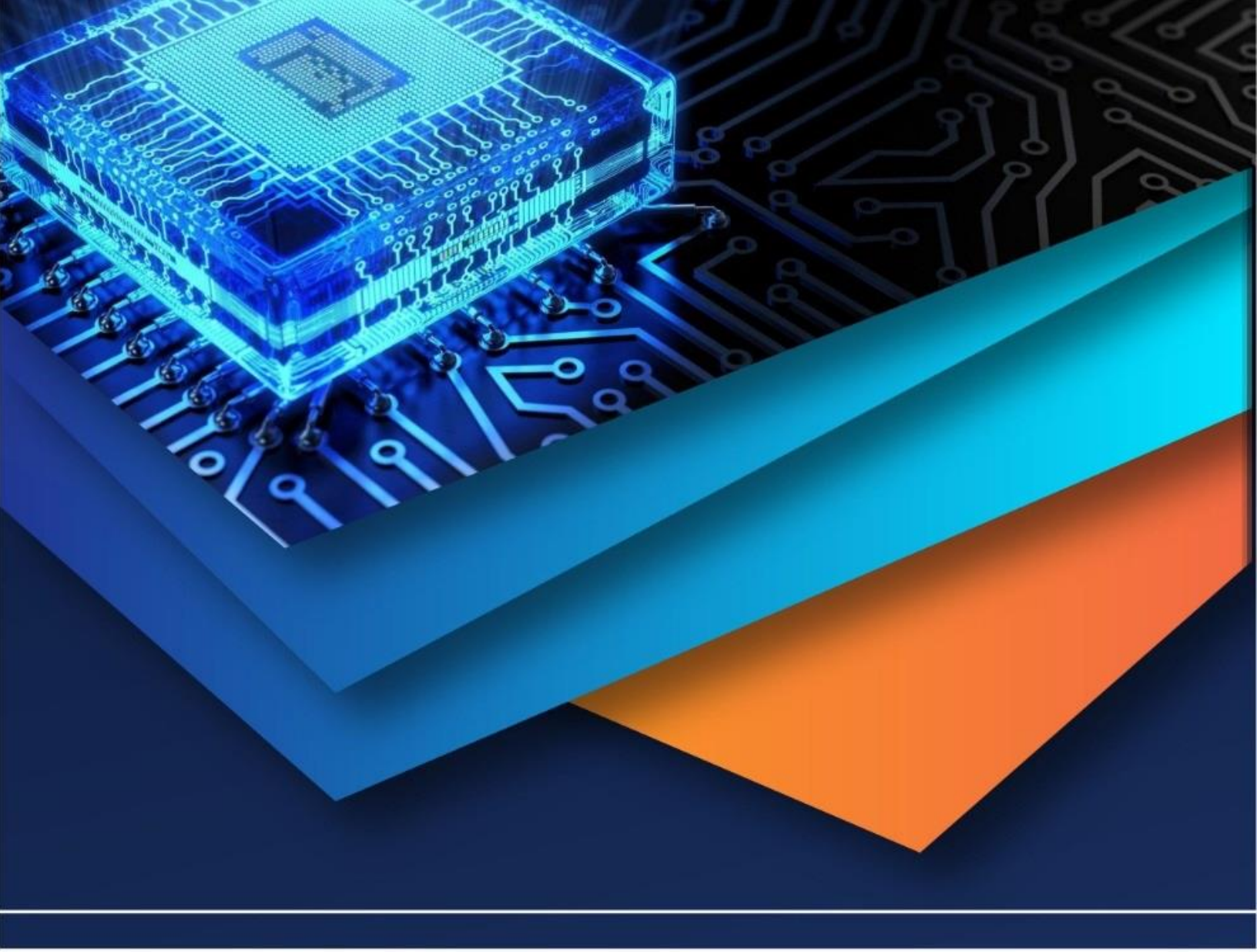
VI. CONCLUSION

In this paper, the cost optimized device used for detecting and classifying the different faults in transmission line was introduced. Where short circuits fault, open source fault and ground fault was detected with help of sensors by comparing the sensor values with preset value and triggers the alert message to the electricity board or concerned person about fault when sensor value exceeds the preset value. From experimental result it can be concluded that the transmission fault detection device is easier and highly reliable device to detect the fault within short period to maintain the continuity of work. However, only certain faults were detected but it can be achieved by using more sensors and advanced tool in the future work.

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