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FAULT DETECTION IN TRANSMISSION LINE USING ARDUINO UNO

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ABSTRACT

This research, which focuses on the three crucial areas of generation, distribution, and transmission, offers a novel strategy to improve problem identification and isolation in power systems. Understanding how critical it is to identify problems quickly, our approach combines the Arduino UNO, ULN2003, Relay, Resistors, LCD display, and Moving switches to accurately simulate and locate errors. The system quickly identifies and isolates problems that occur on various lines by utilizing Arduino UNO programming, and it outputs accurate feedback on the LCD display. This feedback contains detailed information about the problem, including its location (i.e., exact line and distance) and kind (e.g., open circuit, short circuit). Depending on where the issue is and which line is impacted, the LCD's output can be adjusted to provide customized information for effective fault management and system recovery.

INTRODUCTION

These days, electricity plays a critical role in our daily lives. Numerous fault types in the power system arise from natural disasters (such as lightning strikes, tree branches colliding with transmission lines, and overloading). Line to line, line to ground, and line to line to line faults may develop as a result of this short circuit or fault. There are more line-to-line faults in the power system that has the potential to harm electrical equipment. Thus, it is imperative to fix this issue as quickly as feasible. About 80% of power system faults are caused by line to ground faults. The most difficult duty for electrical engineers is locating the defect precisely so that it may be fixed quickly and the customer can continue to receive supplies. Therefore, by developing the programmable software that would be placed in the Arduino UNO, a defect may be found. It will display the precise location and kind of issue.

Reliability in transmission line performance is essential to preserving power systems' stability and effectiveness. Transmission line problems, on the other hand, have the potential to stop the flow of electricity, resulting in power outages and possibly damaging equipment. In order to reduce downtime and guarantee that customers receive an uninterrupted supply of electricity, defects must be promptly detected and isolated.The most difficult duty for electrical engineers is locating the defect precisely so that it may be fixed quickly and the customer can continue to receive supplies. Therefore, by developing the programmable software that would be placed in the Arduino UNO, a defect may be found. It will display the precise location and kind of issue.

The Arduino UNO microcontroller is used in the suggested fault detection system together with complimentary parts including the ULN2003, relay, resistors, LCD display, and moving switches. Every element has a distinct function in the defect detection process:

1. Arduino UNO: The brains behind the system, in charge of gathering, analyzing, and making decisions about data. In order to monitor the transmission line and take corrective action when defects are found, it communicates with sensors and actuators.
2. ULAN2003: The relay is driven by an array of high-voltage, high-current Darlington transistors. When a defect is identified, it has enough power to activate the relay switches.
3. Relay: An electromechanical switch that keeps malfunctioning transmission line segments isolated from the rest of the system. To stop additional harm, the relay disconnects the faulty segment as soon as a problem is identified.
4. Resistors: These parts are utilized to model transmission line fault scenarios. For testing and validation purposes, various fault types can be simulated by applying resistive loads at certain places.
5. LCD Display: Provides real-time feedback on the status of the transmission line and any detected faults. It communicates relevant information to operators or maintenance personnel for prompt action.
6. Moving Switches: Used to create faults at predetermined locations along the transmission line. By manually triggering the switches, various fault scenarios can be simulated to evaluate the system's responsiveness.

METHODOLOGY

Create a code first, then install it on an Arduino UNO. The module will work in accordance with the code. The Line to Line fault is detected by it. Three transmission lines were established using resistors. Additionally, each phase uses four moving switches to produce a fault. Additionally, the code is constructed so that if a fault arises from the first moving switch in the R phase, the LCD will show that the fault happened at a distance of 1 km in both the R and Y phases. The LCD will show NF, or "No Fault," if there is no problem. Red, yellow, and blue LEDs (5 mm) are utilized for the R, Y, and B phases, respectively. Below is a diagram of the circuit.

CIRCUIT DIAGRAM

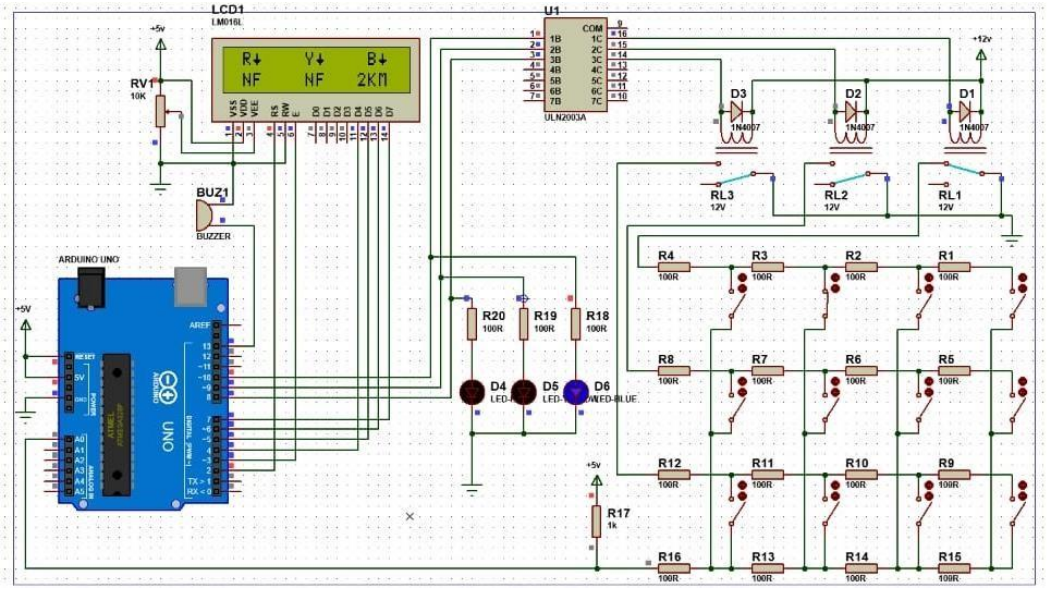
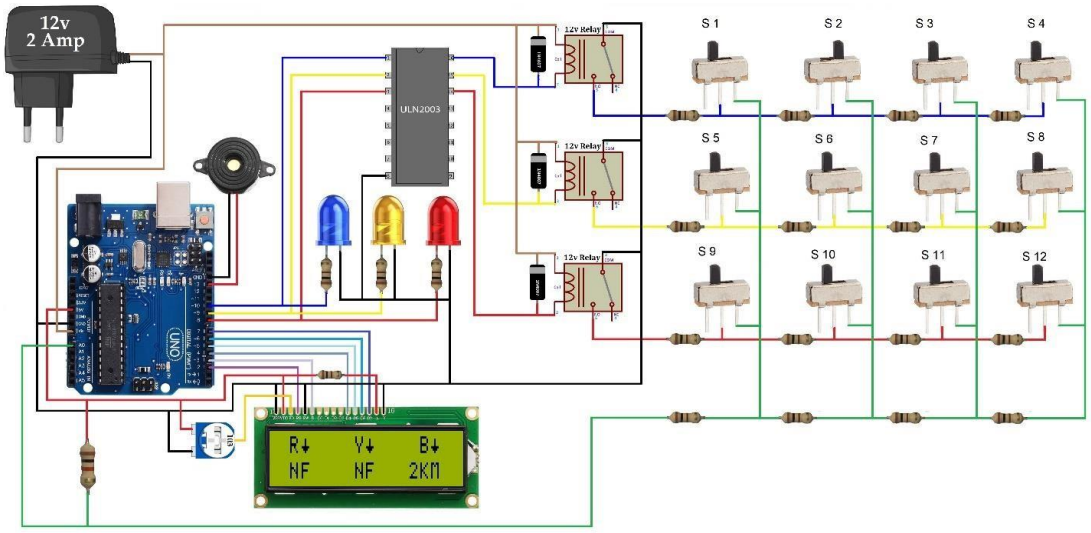


Figure 1 : Modeling And Analysis

COMPONENTS USED :

Sr no.	Component Name	Rating	Quantity
1	Arduino UNO	12 V DC	1
2	Power Adapter	12 V	1
3	Resistor	100 ohm	19
4	Resistor	1K ohm	1
5	ULN 2003	-	1
6	Potentiometer	10K ohm	1
7	Slide Switch	-	12
8	Buzzer	12 V	1
9	LED (Blue , Red , Yellow) 5mm	5V	3
10	16 pin IC base	-	1
11	LCD display (16cm x 2cm)	12 V	1
12	I2C module	12 V	1
13	Veroboard (20cm x 12cm)	-	2
14	5 Pin relay	12 V	3
15	Male And Female Header	-	2

CIRCUIT DIAGRAM :



MODEL :

RESULTS AND DISCUSSION

RESULT:

Knowing the precise position of the defect allows for early detection and removal of the fault. by creating the programmable software that the Arduino UNO would be equipped with. On the LCD display, the output will be displayed along with the fault's location. Line to line faulting will occur. The circuit diagram depicts how the components are arranged.

The result is obtained by Creating Fault Across Slide Switch. Slide Switch Numbering is as shown in Circuit Diagram.

Sr no.	Slide Switch number	Output
1	4	R↓ Y↓ B↓ 4KM 4KM NF
2	7	R↓ Y↓ B↓ 3KM NF 3KM
3	9	R↓ Y↓ B↓ NF 1KM 1KM
4	12	R↓ Y↓ B↓ NF 4KM 4KM

CONCLUSION

These days, there is an enormous need for energy due to the fact that all industrial and other labor requires it. As a result, overloading occasionally happens, affecting the life of electrical equipment and transmission line conductors. Due to this circumstance, a natural disaster has occurred. In order to provide consumers with electricity without a prolonged time of power supply disruption, it should be identified early and corrected sooner. This programmable device allows for instantaneous fault location detection, allowing for the quick removal of the defect and maintenance of the power supply.

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