AUTONOMOUS ROBOTICS FOR UNDERGROUND CABLE FAULT MONITORING AND DETECTION

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The basic principle of Electromagnetic theory is to detect discontinuity in the cable .Nowadays the trend of laying cables for various purpose is to lay underground. . Most of the companies choose cables laying the underground because the climatic adversities don't affect this. There are many difficulties in laying the cables and once laid , it is difficult and costly to fix it. So to overcome this issue, we have designed a robot which is capable of finding where the complaint lies, so the engineer can directly get the hole digged at that point and fix this issue.

KEYWORD: NE555, LM386, ULN2003A, IM7805, PIC16F7876

1. INTRODUCTION

Till the last decade the cables where made to lay overhead and currently the scenario is to lay underground cable, which is superior to the earlier method. This is because the cables beneath the soil are not affected by the change in weather conditions. The cable breaks due to many reasons and very difficult to find it. Currently, the location is find and dig the cables out from the location and check it manually to find the exact point of discontinuity. Currently we aim to develop a robot which can help us to locate the break from an external point. When the cable is short-circuited then robot locate the exact position of discontinuity. A cable fault can be occurred due to any defect, inconsistency, weakness or non-homogeneity and it affects the performance of cables. All faults in cables laid under the soil, are different and the success of a cable fault location system depends on the practical aspects and the experience of the operator. To complete this, it is necessary to have personnel trained to test the cables successfully. An efficient cable fault location service must include, taking full control of electrical safety, pinpointing the position of the fault, excavation, repair of the cable, testing of the repaired cable and return to service reinstatement of the ground service The current practice of short circuit eradication involves digging out the cable manually which is too tedious a process. Identifying the location of an underground cable fault can often present some difficulty, in addition to delaying the reinstrument of critical plant and processes. In this context we aim at developing a robot that can locate the break from an external point. In case of short circuit occurrences in an underground cable the robot can be so programmed as to move over the faulty cable and locate the exact discontinuity point.

2. METHODOLOGY

2.1 Problem analysis

The actual implementation of our robot is fields where the cables are laid and the robot size is bulky. Hence, for the presentation sake, we have developed a model of actual robot and the fault detection is done on a wire that is laid on the floor. As more priority is for accuracy, we have decided to use simple low speed DC motor drive. For higher speed movement, we can use stepper motor. One of the main drawback is prize of motor and motor drive is costly. Also we have initially thought of testing Open loop circuit also. Due to time constraint and the requirement of a high amplifier circuit we have chose to avoid this for the time being.

2.2 Proposed system

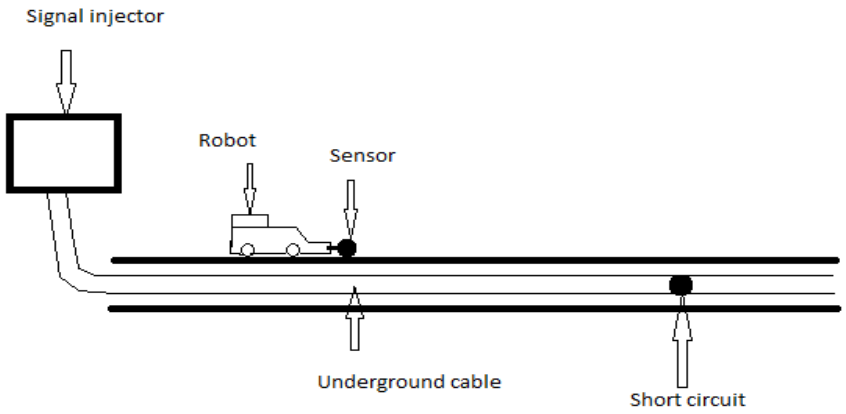
The main concept behind the proposed system is Faraday's law. If a current is flowing through a conductor there will be a EMF generated around it. Here, use a inductor circuit to generate a voltage using the EMF .In cases of short circuit, the EMF generated will be minimum and there will be a negligible voltage generated. Hence we have provided a condition where voltage is less than say 20(binary value), the robot will stop and that will be the point of discontinuity. This voltage is amplified using a LM386 circuit and compared with the reference voltage in PIC and based on the values we drive the robot forward, to the right and left. Also, there is HALL sensor, which will provide us the number of revolution the wheel has covered and this when multiplied by the circumference of the wheel will provide the distance moved from the origin .There is a LCD which will display the distance moved and field strength.

2.3 Working principle

Cable short detection robot basically as 2 units Signal generator, Robotic Part short circuit cable is checked for its continuity by passing a 3 KHz low frequency signal. We use a signal generator to generate this signal. The

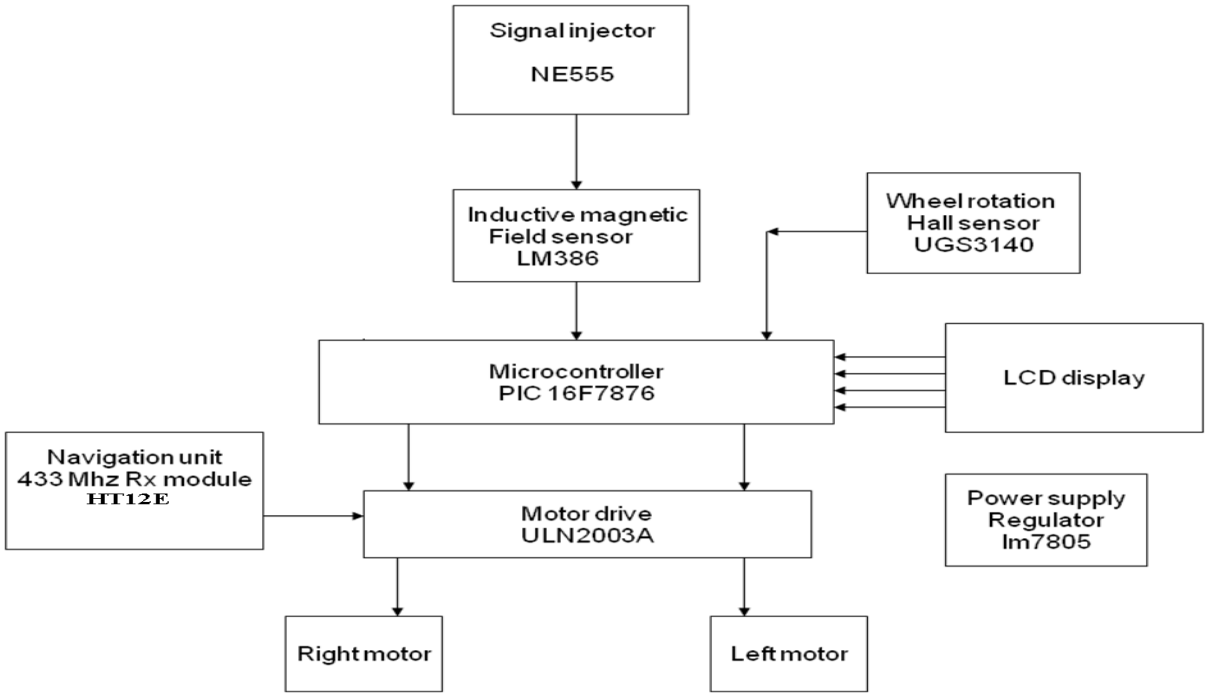
AC signal passing through a conductor, it produces a magnetic field around it. This magnetic field is sensed by t using a inductor circuit. The AC signal sensed by robot is then amplified using a LM386 circuit. The amplified signal is rectified and converted to DC and the DC level is provided to the analog input of microcontroller. Then it converts this analog input to digital signal. The robot movement is controlled by the program in the microcontroller. When the robot reaches the point where the discontinuity lies, the magnetic field will be zero. In such case the input signal at the analog input port will be minimum. When the input signal strength is less than 10 (binary reading), the PIC is programmed to display, short circuit Detected. This is displayed in LCD.

Figure:2.3.1

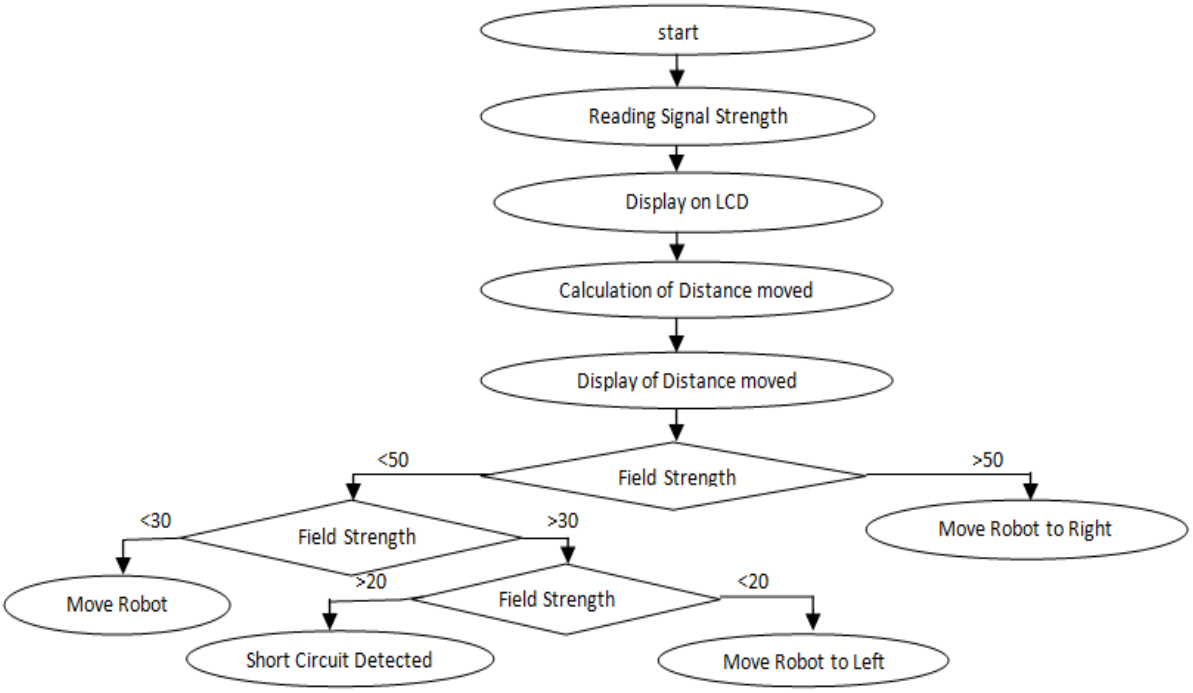


Basic principle

2.4 Block diagram



2.5 Flowchart



Advantage

- ❖ Used for short circuit detection in underground cables from an external point.
- ❖ Reduce manual labour and cost.
- ❖ Cost effective

Disadvantage

- ❖ Not self reliable
- ❖ Cannot fix the issue
- ❖ Complex in twisted wires

Application

- Used for cable short error detection

3. RESULTS AND DISCUSSION

This Robert detects the short circuit in the underground cables. This project will be very useful to companies like BSNL .We can identify the fault in the underground without digging. If a current passing through a conductor there will be a EMF generated around it. Here use a inductor circuit to generate a voltage using the EMF .In cases of short circuit, the EMF generated will be minimum and there will be negligible voltage generated. Hence we have provided a condition where voltage is less than say 20(binary value), the robot will stop and that will be the point of discontinuity. This voltage is amplified using a LM386 circuit and compared with the reference voltage in PIC and based on the values we drive the robot forward, to the right and left. Also, there is HALL sensor, which will provide us the number of revolution the wheel has covered and this when multiplied by the circumference of the wheel will provide the distance moved from the origin .There is a LCD which will display the distance moved and field strength

4. CONCLUSION

Currently, digging along the cable laid and then pulling the cable out and checking whether the fault exists in the cables is a difficult work. This is not only is wastage of manpower and money for the companies, but this also causes a lot of inconvenience to the normal public. The cable fault detection robot will solve this issue to a great extent and will be really helpful for such application. The robot designed as user-friendly and can be easily controlled and the robot is cost effective. As a part of future enhancement, we would like the robot to have a camera, using which a person sitting outside can see them in a monitor. Moreover, applying telepresence to this robot , can make the robot capable of fixing the issue

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