

# Smart Fault Finding Technology in Under Ground Cable

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**Abstract**— Today robotics is one of the fastest growing engineering fields. Robots are designed to remove the human factor from labor intensive or dangerous work and also to act in inaccessible environment where human interface is not possible. In this project implementing a robot which is capable of moving inside underground pipes and detecting cable faults and cracks in pipelines. Since the pipe gallery has very high pressure, temperature and toxic gases, which cannot be reached by humans, therefore a robot has been implemented that has sensors which are used to detect the cable faults or crack and the conditions inside the pipe. The use of PIC 16f690 microcontroller to detect the cable fault and to send the location of the fault and send it to the authority. Here to control the motors of the robot, motor driver IC l293d is used. When the fault get's detected then microcontroller firstly beeps the buzzer and sends the location of the fault through GSM (Global system for mobile) module which is SIM800 module to the authority.

This system is very smart due to use of AGV (automatic guided vehicle). The underground, which is larger to an earlier method. Because, underground cables are not affected by any adverse weather condition like pollution, heavy rainfall, snow and storm, etc

**Keywords**—: GSM; AGV; PIC (16F690).

## I. : INTRODUCTION

While the literature on these topics is extensive, effort has been made to limit the discussion to areas that are most relevant to the later chapters of this work, namely limitations on this project. It is found that distribution cables is a looming issue facing electric utilities in California and throughout the United States. A variety of technologies and tests are available for evaluating underground cables, but there is often little correlation between what is diagnosed and what is found when the cable is pulled out and examined. The project team studied various cable failure mechanisms to better understand failure causes and to identify improved failure detection methods.

Here use of an automatic guided vehicle in our system to detect an underground cable fault. By using PIC 16f690 microcontroller to detect the cable fault and to send the location of the fault and send it to the authority. Here to control the motors of the robot, motor driver IC l293d. When the fault get's detected then microcontroller firstly beeps the

buzzer and sends the location of the fault through GSM (Global system for mobile) module which is SIM800 module to the authority. This system is very smart due to use of AGV (automatic guided vehicle). The underground, which is larger to an earlier method. Because, underground cables are not affected by any adverse weather condition like pollution, heavy rainfall, snow and storm, etc.

### A. History:

Till last decades, a million miles of cables are threaded in the air across the country. But currently it is laid in the underground, which is larger to an earlier method. Because, underground cables are not affected by any adverse weather condition like pollution, heavy rainfall, snow and storm, etc.

But, when any problem occurs in cable, it is very difficult to find the exact location of the fault due to not knowing his exact location of the cable. Day by day, the world is becoming digitized so the project is proposed to find the location of fault in digital way. When the fault occurs the process of repairing related to that particular cable is very difficult.

The fault of the cable mainly occurs due to many reasons. They are: inconsistent, any defect, weakness of the cable, insulation failure and breaking of the conductor. To overcome this problem, here is a project namely underground cable fault distance locator, used to find the location of the fault for underground cable.

Before attempting to find underground cable faults on direct hidden primary cable, it is essential to know where the cable is situated and what direction it takes. If the fault occurs on the secondary cable, then knowing the exact route is even more critical. Since it is extremely difficult to find a cable fault without knowing where the cable is, it makes sense to master cable locating and tracking before start the fault locating process.

## II. . BLOCK DIAGRAM

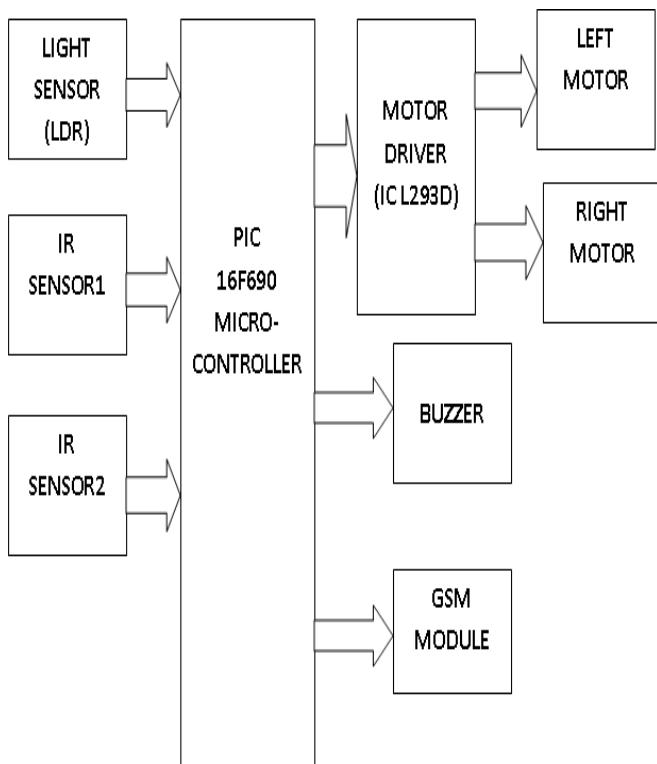


FIG: 1 BLOCK DIAGRAM



FIG: 2 Features microcontroller:

The microcontroller 256 bytes of EEPROM data memory. It have Internal ADC (analog to digital converter) and also Internal crystal. This is 20 pin IC out of which 18 pins can be used as input output pins and rest of two are used for Vcc and GROUND.

## 3. LDR: LIGHT DEPENDENT RESISTOR

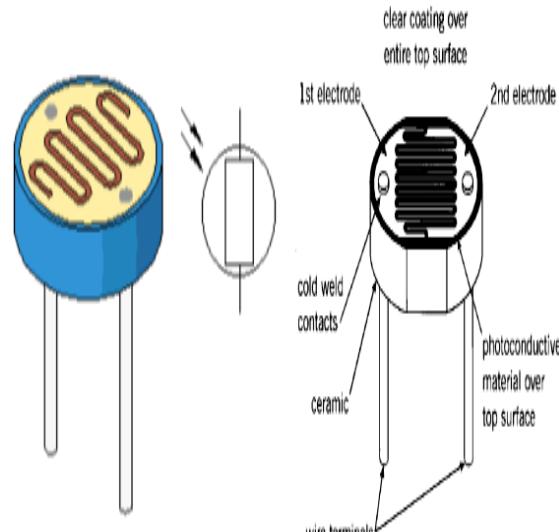


FIG3:LIGHT DEPENDENT RESISTOR

- In this project using one light sensor to detect the light emitting from light source.
- Two IR sensors also used in this project to guide the vehicle.
- Use of microcontroller from PIC (peripheral interface controller) family.
- One GSM module is used to send the location of the break point.

Two motors used to run the robot and one motor driver IC is used to drive the motor .When the wire get break the light underneath that cable get emitted and when robotic Vehicle passes over that light the robot get stopped. The light sensor senses the light. At same time the buzzer gets ring and one message about the location of the breakpoint get sent to the authority

## 2. : HARDWARE REQUIREMENTS

1. PIC MICROCONTROLLER (PIC 16F690)
2. LDR(LIGHT DEPENDANT RESTITOR)
3. IR SENSOR
4. GSM MODULE

## 1. MICROCONTROLLER (PIC 16F690)

A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.

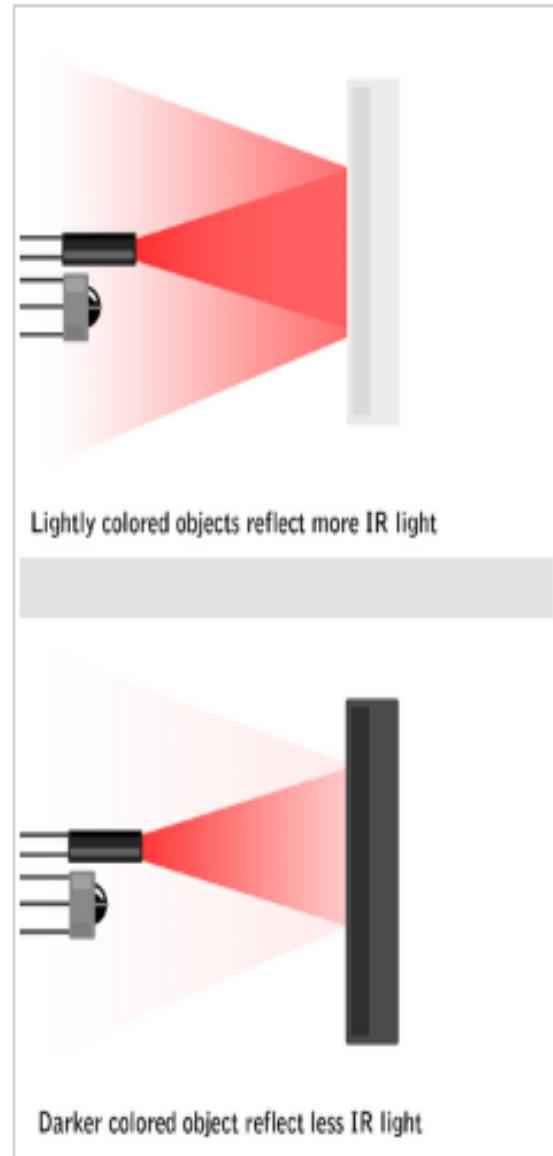
#### 4. WORKING PRINCIPLE OF LDR

A light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the material's conductivity is increased when light is absorbed by the material. When light falls i.e. the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. Hence when light having enough energy strikes on the device, more and more electrons are excited to the conduction band which results in a large number of charge carriers. The result of this process is that more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased. This is the most common working principle of LDR.

#### 5. IR SENSORS

- FIG:4 IR SENSORS

- An infrared sensor is an electronic device that is used to sense certain characteristics of its surroundings, by either emitting or detecting infrared radiation.
- Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. IR sensors can measure the heat of an object as well as detect motion. Infrared radiation extends from the nominal red edge of the visible spectrum at 700 nanometers to 1 mm. This range of wavelength corresponds to a frequency range of approximately 430 THz down to 300 GHz.



*Depiction of the operation of an IR Sensor to measure brightness*

- An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detect motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistance and these output voltages, change in proportion to the magnitude of the IR light received.

## 6..GSM MODULE



FIG: 5 GSM MODULES

The SIM800 is a quad-band GSM/GPRS module design for the global market.

It works on frequencies GSM 850mhz.SIM800 features GPRS multi slots class 12/class10

## General Features:

- Support upto 5\*5\*2 keypad.
- One SIM card interface.
- Support Bluetooth function.
- Power supply 3.4V to 4.4V.
- Support SIM card 1.8V, 3V.
- USB port: can be used as debugging and firmware upgrading.
- Dimensions: 24\*24\*3mm

## ADVANTAGES:-

- Very easy to control monitor the parameters.
- Automatic control makes circuit smart.
- Very much cost effective.
- Easy to design.
- This project has very low power requirements.

- Fast response time.
- Simple in design and installation.

## DISADVANTAGES:

As our cables are underground the gsm module may responds at some places only as per the range of the modem is concern.

## APPLICATIONS:-

This project is useful in industries where the net of cables is used through underground. This project can be applicable for any underground cable lines between two cities or countries

## CONCLUSION:-

The smartness of this project makes it different from any other project related to this field of electricity.

## ACKNOWLEDGEMENT:

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the people who made it possible, whose constant guidance and encouragement crown's efforts with success.

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Finally, immensely thankful to parents and all my friends for their constant support and encouragement which was the fuel propelling my effort.

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