Alarm System for Underground Optic Fibre Cable

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***Abstract*—This fault detecting system is used find the fault in the optical fiber line across the customer sides. The received power supply microcontroller. The microcontroller is operated in low power mode to save power consumption. Exact location of the fault occurred in the optical fiber line**

Keywords-Iot,optical fibre, fault detection, iot, alarm system

I. INTRODUCTION

Fiber optics communication is developed immensely in the past two decades. It is seen much lower interference and attenuation in optical fibers compared to copper wires. The fiber is a strand of silica based glass protected with a transparent cladding. The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre.By using an alarm system will help to detect exact fault place. So problem can be solve within time .

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II. LITERATURE SURVEY

There are many related studies based on optical fiber fault detection.This paper is about Introduced Underground Cable fault detecting system using Arduino.this research is based to identify the distance of underground cable fault from base station in kilometers using Arduino board. This greatly reduces the time and operates effectively. In this it is possible to detect the location of open circuit fault. Location of the fault is detected from the server unit. This paper is about Introduced Underground Cable fault detecting system using Arduino.this research is based to identify the distance of underground cable fault from base station in kilometers using Arduino board. This greatly reduces the time and operates effectively. In this it is possible to detect the location of open circuit fault. The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre.By using an alarm system will help to detect exact fault place. So problem can be solve within time

III. RESEARCH GAPS

Fiber optics communication is developed immensely in the past two decades. It is seen much lower interference and attenuation in optical fibers compared to copper wires. The fiber is a strand of silica based glass protected with a transparent cladding. The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre.By using an alarm system will help to detect exact fault place. So problem can be solve within time ..

IV. PROBLEM DEFINITION

All optical fiber cables are sensitive to damage during shipping, handling, and installation. Some of the important parameters that need special attention during cable installation are

Cable bending radius: Optical fiber cables are designed with a minimum bending radius and maximum tensile strength. The cable should never be bent below its minimum bending radius. Doing so can result in bending losses and/or breaks in the cable's fibers. Generally the minimum bending radius of a fiber cable under load is 20 × D, where D is the diameter of cable; the minimum bending radius of a fiber cable under no load is 15 × D.

Cable Placing Tension: Optical fiber cables are designed with a maximum tensile strength. The cable should never be loaded beyond its maximum tensile strength. Exceeding the cable's placing tension provided by Sterlite in the Cable Data Sheet/Specification, can alter cable and fiber performance and shorten its service lifetime.

V. PROPOSED METHODOLOGY

Optical fiber fault recognition and adaptation involves of two stages: I) Fault Recognition Phase and II) Fault Adaptation Phase.

The method of error recognition and adaption involves of two stages: I) Fault Recognition Stage: This stage is to pinpoint the place where optical fiber cable has been cut due to some reason like structure of road. The device which is recycled for this is called Optical Time Domain Reflectometer.
II) Fault Adaptation Phase: This stage is to make OFC joint with slight spice damage. The device used for linking is called mixture splicer. To understand this concept considers a example. Adopt there are two telephone connections A and B which are located at a distance of D from each other. Both the telephone connections are connected through 0ptical fiber cable. Due to some reason the Optical fiber cable which link A and B is cut. After the Optical fiber cable breakdowns between A &B, the optical fiber diffusion equipment‘s installed at A&B start exhibiting visual alarms. After observing the visual alarms it is supposed that the OFC break between A’&B’. To prove this statement or to know the real place of Optical fiber cable break, Optical Time Domain Reflectometer is connected to fiber at A or B or both and the distance of fiber is measured.
There can be only two possibilities

The distance of fiber (Y) = D which suggest there is no Optical fiber cable break.

The distance of fiber (Y) < D which suggest optical fiber cable broke has been broken.

When the distance of fiber Y is recognized this is a lesser amount of than D because the Optical fiber cable has been cracked. Currently to repair the Optical fiber fault breakdown, the distance X is equal to Y from A is slow along the Optical fiber cable way on the road through space meter or any car.

Two digs are made on both the sides once the optical fiber cable reaches Distance X, at distance of 1020 meters. The length between crack and the cut should not be big if so it is hard to detect fault.

It is to pull breakdown cable from both the sides once after making two digs. The digs and placed a new cable between both the digs.

Both the trimmings of the original cable are connected with the cracked ends of old cable. The device which is used to make optical fiber cable joint is called mixture splicer or splicing mechanism. The optical fiber cable joints are cover by mutual shutting box. Then the combined shutting boxes are located

below the digs and digs are occupied with earth. The communication between A and B starts again as the Optical fiber cable. Error is corrected. Currently the space between A and B = D + the length of the new fibre.

BLOCK DIAGRAM
The device which is used to make optical fiber cable joint is called mixture splicer or splicing mechanism. The optical fiber cable joints are cover by mutual shutting box. Then the combined shutting boxes are located

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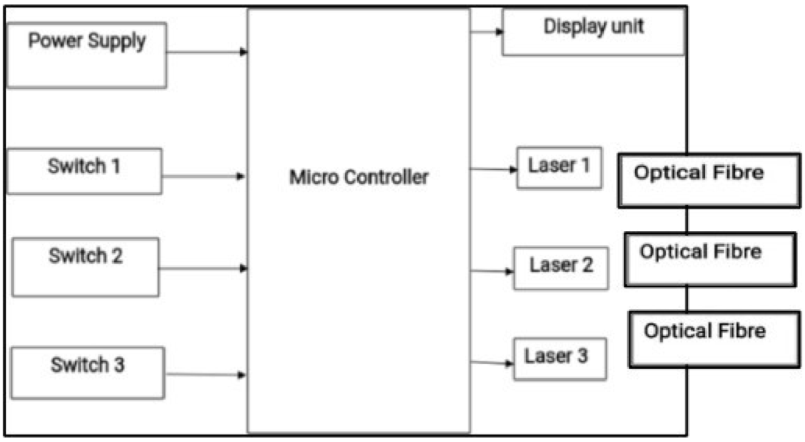

Fig.1. visual representation of block diagram. 1.

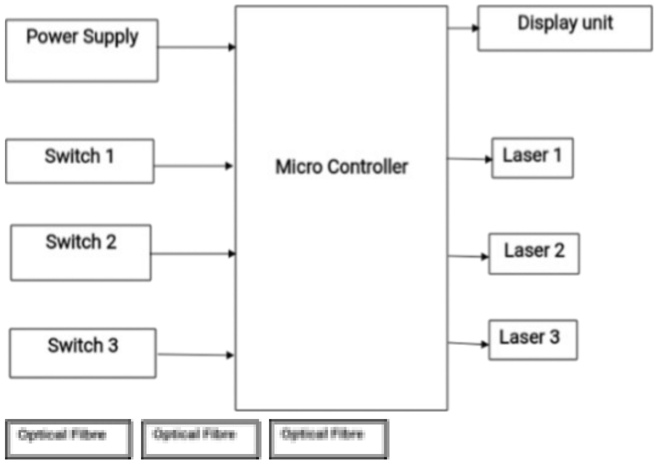

Fig.2. visual representation of block diagram. 2.

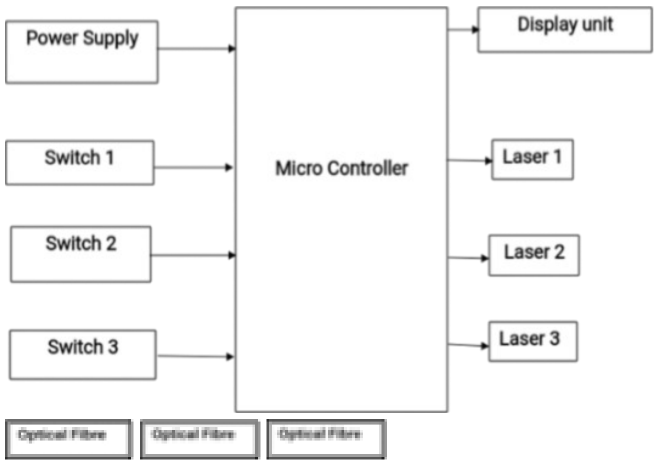

Fig.3. visual representation of block diagram. 3.

Transmission unit

In transmission unit switches are connected as line 1, line 2, and line 3. Adapter is used to activate PIC16F877A microcontroller and hence switches, laser, LCD gets activated through Microcontroller.
LCD displays the title of project. Laser transmits monochromatic light in order to transmit data to optical fiber. Optical fiber carries light signals.

Laying Of Underground Cables

Underground cables are, of course, meant to be installed or laid under the ground. The reliability of underground cable network highly depends upon proper laying of cables, quality of cable joints and branch connections etc. There are three main methods of laying underground cables, which are - (i) direct laying, (ii) draw-in system and (iii) solid system. These three methods are explained below with their advantages and drawbacks.

Direct Laying Of Underground Cables

This method is the most popular as it is simple and cheap. The cables to be laid using this method must have the serving of bituminised paper and hessian tape so as to provide protection against corrosion and electrolysis. The direct laying procedure is as follows.

Laying Procedure

A trench of about 1.5 meters deep and 45 cm wide is dug.

Then the trench is covered with a 10 cm thick layer of fine sand.

The cable is laid over the sand bed. The sand bed protects the cable from the moisture from the ground.

Then the laid cable is again covered with a layer of sand of about 10 cm thick.

When multiple cables are to be laid in the same trench, a horizontal or vertical spacing of about 30 cm is provided to reduce the effect of mutual heating. Spacing between the cables also ensures a fault occurring on one cable does not damage the adjacent cable.

The trench is then covered with bricks and soil to protect the cable from mechanical injury.

Draw-In System

In this method, cast iron or concrete pipes or ducts are laid underground with manholes at suitable positions along the cable route. The cables are then pulled into the pipes from the manholes. Usually, an additional pipe/duct is also provided along with the three cable ducts for carrying relay protection connections and pilot wires. Distance between the manholes should be such that pulling in the cables is easier. At corners or while changing the direction of route, radius of the corners must be longer. The cables that are to be laid in this way need not be armoured but must be provided with the serving of hessian and jute in order to protect them when being pulled.

Solid System

In this method, the cable is laid into troughing of cast iron, stoneware, asphalt or treated wood. When the cable is laid into the position, the troughing is filled with a bituminous of asphaltic compound and then covered over. Cables to be laid in this manner could be just lead covered as the troughing provides a good mechanical protection.

This method is very rarely used nowadays as it is more expensive and requires skilled labour and favourable weather conditions.

RaySense Buried Fiber Optic Intrusion Detection System

Up to 100km/62miles per processing unit.

Within 3-20m/10-60ft resolution over the entire perimeter

Full cut-immune self-healing available

Terrain following installation

Flexible software based zoning configuration Covert deployment of buried highly sensitive fiber sensors Detects and locates multiple simultaneous intrusions over the whole fiber Sensing standard single-mode fiber Distributed Acoustic Sensing (DAS) Technology Signature-based detection – Detection By Classification Can be used on the fence and underground with the same cable and controller No electronics or power required in the field IP based Remote control and monitoring – Software-based zones Immune to EMI and lightning, intrinsically safe in explosive atmospheres.

With the longest fiber optic monitoring capabilities in the market, the RaySense provides 100% perimeter coverage for long range applications with no gaps between sensors, the cable is the sensor.The system detects and locates intrusions based on signature database to avoid any false.The detection capability is based on acoustics which allows the cable to detect without any physical movement of the cable which allows it to be buried in any type of ground.The RaySense requires no power in the field and installation minimizes the need for trenching and expensive installation methods.The RBtec point intrusion detection system is the most cost-effective, high-performance solution for the protection of long perimeters and other infrastructure.

Deploying RaySense fiber optic intrusion detection system provides reliable perimeter security for up to 100 km/62 Miles through a single fiber-optic cable, detecting and locating within 6 meters/20 feet over the entire perimeter. Daisy-chaining additional controllers provide unlimited reach. Seven different levels of actual physical sensitivity, through the cable configuration, optimize system performance for different media requirements, including chain link fence, buried cable, or wrought iron. Additionally, because of the extreme sensitivity, the cable can be used with a protective conduit without affecting required sensitivity and allowing greater installation flexibility, convenience and system longevity.

A DAS is an advanced variant of an Optical Time Domain Reflectometer (OTDR) that monitors the coherent Rayleigh backscatter noise signature in a fiber optic cable as pulsed light is sent into the fiber. The coherent Rayleigh noise generates a fine structure in the backscatter signature of the fiber cable. The DAS focuses on the Raleigh component to increase its prominence in the backscatter trace.

DAS is optimized to measure small changes in the coherent Rayleigh noise structure that occurs from pulse to pulse. Since the coherent Rayleigh noise structure is generated interferometrically within the fiber by the relative locations and strengths of local scattering centers intrinsic to the structure of the glass, very small physical (acoustic or vibration) disturbances at a point in the fiber can make detectable changes in the interferometric signal.

Utilizing fiber-optic cable, the system is the most economically competitive technology currently available for long distances. Requiring only a single alarm processing unit (APU) to cover up to 100 km/62 Miles, combined with a rugged fiber-optic sensing cable, results in the most cost-effective solution for large perimeters with only a few components.

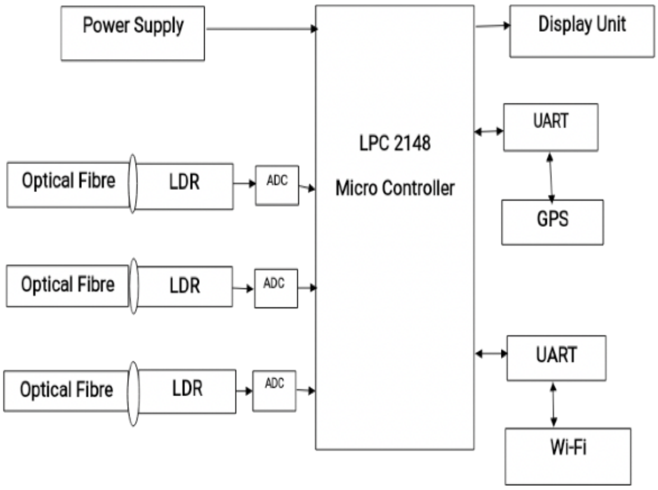

Fig.4. visual representation of transmission unit.

2. Receiver unit

In receiver unit adapter is used to activate LPC2148 Microcontroller and hence optical fiber, LDR sensor, ADC gets activated through microcontroller. Optical fiber is given as input to another Microcontroller unit. Optical fiber is connected to LDR sensor. LDR sensor is connected to analog digital converter. LCD connected displays the fault occurred.

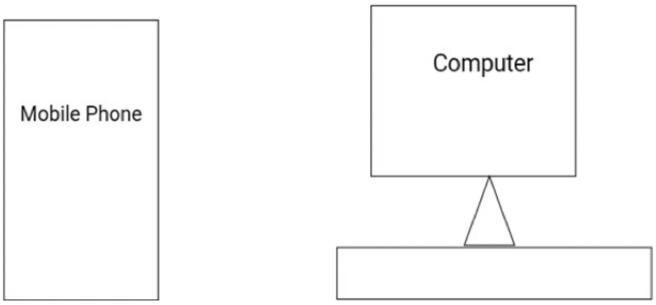

Fig.5. visual representation of experimental unit.

3. Server unit

In server unit if fault occurs in Line 1, Line 2, Line 3. GPS determines the exact location and this message are automatically sent to mobile phone and laptop through app. The actual problem of detecting faults and find where the actual fault has occurred by finding the exact position or locations in latitude longitude form and also find the accurate distance of breaker points. By using software's can encrypt the land transfer at controlling section and actual action will be working out.
The device which is used to make optical fiber cable joint is called mixture splicer or splicing mechanism. The optical fiber cable joints are cover by mutual shutting box. Then the combined shutting boxes are locatedbelow the digs and digs are occupied with earth. The communication between A and B starts again as the Optical fiber cable. Error is corrected. Currently the space between A and B = D + the length of the new fibre.

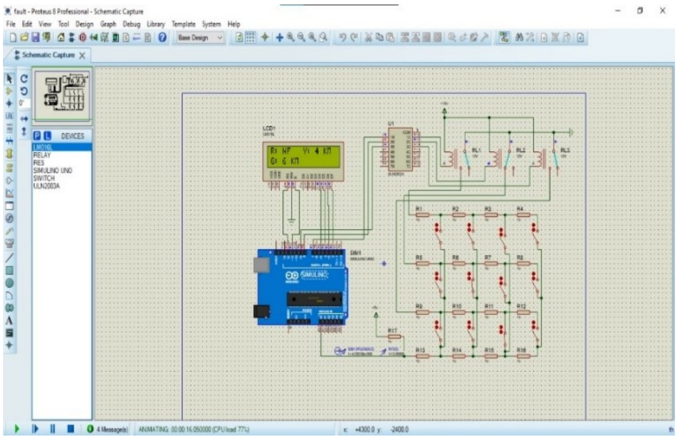

Fig.6. visual representation of simulation software

VI. CONCLUSION

From this project it is possible to simplify the actual problem of detecting faults and find where the actual fault has occurred by finding the exact position or locations in latitude longitude form and also find the accurate distance of breaker points. By using software's can encrypt the land transfer at controlling section and actual action will be workingout.

VII.FUTURE SCOPE

In this project,we have detected the short circuit fault.We can also detect the open circuit faults using capacitor and measuring impedence of the AC circuit.

VIII. REFERENCES

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