

# Intelligent Fault Detection In Optical Fiber Cable Using Arduino.

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**Abstract:**— in an intelligent fault detection system using Arduino in optical fiber communication. The idea behind this fault invigilating module is to monitor the received power supply in optical fiber. The Arduino UNO which consists of Atmega 328 microcontroller is used along with the sensor unit. The output of the sensor is designed and simulated by employing Proteus ISIS simulators to monitor the received power supply in the optical fiber. The sensor unit is used for the simulation consists of a LDR along with an op-amp. If there are any abrupt changes in power of optical line, the fault message is displayed on the LCD which is interfaced with Arduino and at the same time the date and time of fault occurrence will be transferred to LCD and RF transmitter, RF receiver receives this signal and send message through GSM.

**Key words**—Optical fiber cable, LED& photodiode, Arduino UNO board, RF Module, GSM module.

## I. INTRODUCTION

In today's society, advances in technology have made life easier by providing us with higher levels of knowledge through the invention of different devices. However, each technological innovation harbors the potential of hidden threats to its users. The principle of fiber-optic communication is based on the transfer of the signal through an optical fiber from one place to another place. The light is a form of electromagnetic carrier wave which is modulated to carry out information. Optical fiber is mostly used to transmit telephone signals. The optical fiber has an advantage over existing copper wire in long-distance and higher applications because of much lower attenuation and interference. Fiber-optic communication systems have primarily installed over long-distance applications, because of its infrastructure development within cities was relatively time-consuming and difficult, and fiber-optic systems were expensive and complex to install and operate, so the optical fiber is an integral part of modern day communication infrastructure and can be found along roads, in buildings, hospitals and machinery. The optic fiber is a strand of silica based glass surrounded by transparent cladding and its dimensions is similar to those of a human hair. Light can be transmitted along the fiber over great distances at very high data rates, providing an impeccable medium for the transport of information.

Today, optical fiber technologies play a key role in opening up real broadband access to the end user. Monitoring and identification against fiber fault is essential for continuous service delivery to customers. Therefore, any service outage dutremendous financial loss in business for the service providers. A fiber optics-based sensing network

applicable for fault detection in power system is presented. The proposed scheme is secure and immune from interferences. At each monitoring location, passive rugged fiber-Bragg-grating based sensors are used.

## II. OBJECTIVE AND SCOPE

The objective of this project is to implement the low cost, accuracy, good maintainability of the product, also to reduce the operation time and to increase the production rate of the product. This project has a large scope as it has the following

Features which help in making it easy to use understand and modify it:

## III.RELAVANCE

The fault detection is clearly described from where the sensor, converts the light signal into its equivalent voltage and after amplification, it fed into the Arduino UNO development board for further processing. Then, the Arduino compares the voltage with a threshold voltage, if it fall below that level then it sends the message to the RF transmitter to receiver through GSM. Every time Arduino is getting the voltage from the sensor output, the value is displayed on the LCD also. We are proposing the intelligent fault detecting system in an optical fiber to find the fault in the fiber optic cable. Among the various parameters we are going to monitor the Received power of fiber optic cable.

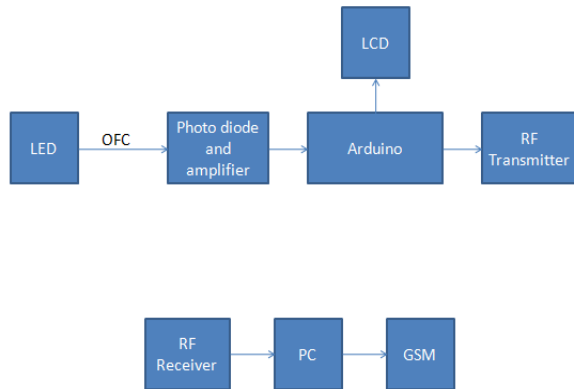
## IV. DESCRIPTION

### ◆ Block diagram

In bellow fig.1. shows that the block diagram of fault detection of optical fiber cable which consist

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photodiode for light detection & LED at input side of optical fiber, Arduino UNO consider as main brain of our project, RF module used for RF transmitter connected to the Arduino and receiver connected to the PC. Last GSM module is used for sending the detected fault in optical fiber cable to the end user through the SMS.



**Fig.1. Block diagram**

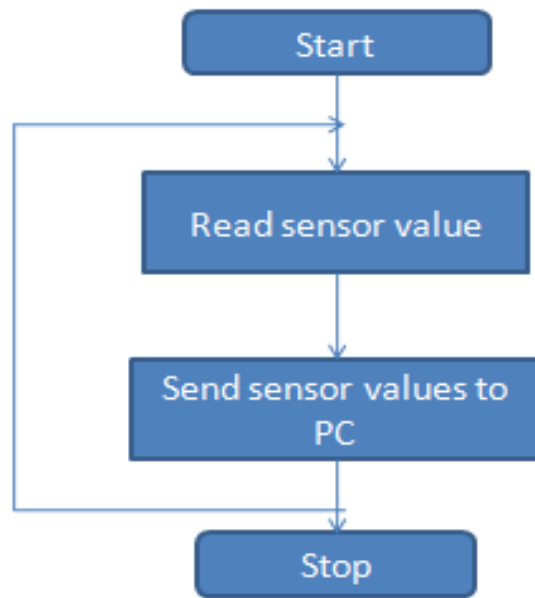
**◆ Operation:**

- 1) In an intelligent fault detection system using Arduino we can implement optical fiber communication system. The idea behind this fault invigilating module is to monitor the received power supply in optical fiber.
- 2) The principle of fiber-optic communication is based on the transportation of the signal through an optical fiber from one part to another. The light is a form of electromagnetic carrier wave which is modulated to carry out information.
- 3) Optical fiber is mostly deployed to transmit telephone signals. LED or LASER is used as input source for optical fiber cable. The OFC carries information in form of light & to amplify these signals gives to amplifier. Photo diode senses this light signal.
- 4) The Arduino UNO which consists of Atmega 328 microcontroller is used along with the sensor unit. If there are any abrupt changes in power of optical line, the fault message is displayed on the LCD which is interfaced with Arduino. RF receiver receives these signals and send message through GSM.
- 5) In this intelligent fault detecting system in an optical fiber used to detect the fault in optic fiber line, detect fault in the line by designing a fault monitoring module. Fault monitoring module is designed by LED and laser power monitoring circuit.

6) When Arduino reads analog values, sensor sense these analog values and compare to previous set value. In this comparison if sensed value is less than set value then it send the message through GSM. Our proposed system response quickly alerts the system behavior by sending SMS to monitoring person and main monitoring system.

7) We are proposing the intelligent fault detecting system in an optical fiber to find the exact location of fault in the fiber optic cable. Among the various parameters we are going to monitor the Received power of fiber optic cable. Likewise, we can use different parameters to monitor the fault in that cable.

**V. FLOWCHART**

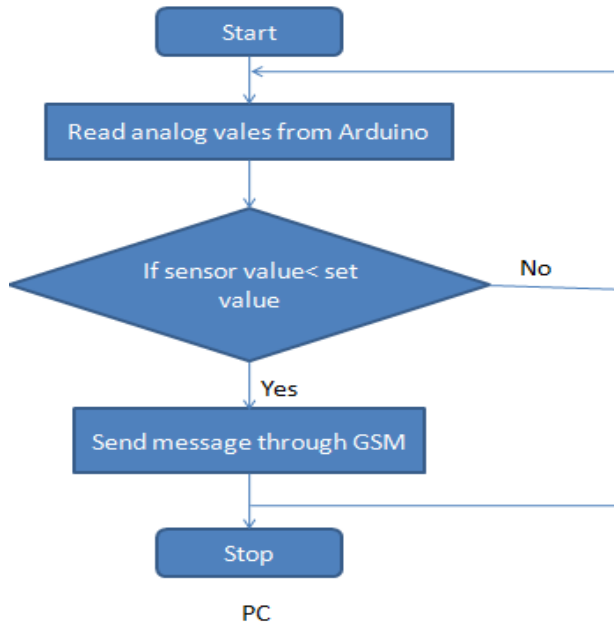


**Arduino**

**Fig.2. Flowchart for Arduino**

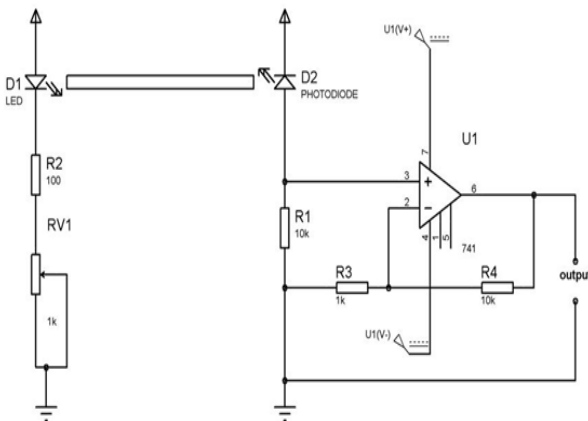
**Steps:**

- ◆ It represents the steps involved in this work. Initialize the sensor and get the equivalent analog output voltage.
- ◆ Initialize Arduino and read the analog value.
- ◆ Check the condition by comparing with threshold voltage and display it on the LCD.
- ◆ If condition true, the fault information is sent to the user through GSM.
- ◆ If the condition is false, then no change in the database.



PC  
**Fig.3.Flowchart for PC**

**VI. CIRCUIT DIAGRAM**



**Fig.4.Circuit diagram**

Above fig.4. Shows that the circuit diagram of fault detection in an optical fiber cable in which uses one optical fiber cable, first LED emits the light signal at input of optical fiber cable this light rays travels through the optical fiber cable and photodiode detects light signal and it receives the light from LED or LASER. In this circuit diagram we use the OP-amp LF411 and their pins connections are described below. The non- inverting pin of op-amp is connected to photodiode. The inverting pin is

connected to the reference voltage of 5v. The 7th pin is connected to 9v power supply. The pins 1st, 5th are left free. Across the 6th pin output voltage is taken. Likewise we use total six optical fiber cables in our project which having separately LED and photodiode also op-amp circuit.

**VII. SOFTWARE & HARDWARE USED IN PROJECT**

- **Software :**
  - 1) Visual basic++The Arduino program is written in the C++ programming language.
  - 2) The data is received from Arduino using a custom built Java program which responds the serial port to which Arduino is connected.
- **Hardware :**
  - Development board: Aurdino UNO.
  - Aurdino : 328(ATMEGA) mc
  - GSM Modem : GSM modem.
  - Sim Card : Standard 16k GSM sim
  - LCD display : 16x2
  - OFC : Optical Fiber Cable.
  - RF Transmitter & Receiver
  - LEDs, Photo diodes & Amplifiers

**VIII. CONCLUSION**

Today optical fiber technology play key role in opening up real broadband access to the end user. There may be problem with communication due to accidental damage of the fiber optic cable although problems with communication channels are an important issue for civil application such as service provider threats to the security of communication are considerably higher in military and government application. Monitoring and identification agains fiber fault is essential for continues service deliver to customer. So the main purpose of this project is to locate the place where the optical fiber cable (OFC) has been cut due to some reason like construction of road.

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\* [www.ardiuno.com](http://www.ardiuno.com)

