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SIGNALLING SYSTEM FOR UNMANNED LEVEL CROSSINGS

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ABSTRACT

The objective of this paper is to provide a solution to the accidents that takes place at un-manned railway crossings of Indian Railway, with the application of laser n sensor and comparators. Most of the accidents are due to negligence of rules. We are here describing a way to tackle this problem with LASER and PHOTO-SENSOR to make a signalling system which indicates an approaching train. This will reduce the loss of precious life and costs very low to be installed in any un-manned crossing.

Keywords: Comparator, Laser, Photo-resistor, Solar Energy, Un-manned Crossings.

I. INTRODUCTION

Railway is the cheapest and time saving means of travelling. Indian railway is one of the world's largest rail networks covering approx 15,000kms on track and 65,436 kms on route with 7,172 intermediate stations.[1] The place where railroad crosses the roadways at same level is called 'level crossings'. Normally such crossings have a manned controlled gate to cut off road traffic for the approaching train.

But in some rural and outskirts areas there is an unmanned crossing. The rule is "STOP; WATCH; LISTEN" i.e. Stop at the crossing; look both sides for approaching train; listen for the whistle. But in this world of hurry, no one has a time for stopping and looking, they just simply have a casual look and crosses. But the train approaches at a speed of 110 km/hr. This means 31 meter in just a second. It is a speed worth noticeable by naked eyes. And thus leading a crash accident with a lot of casualties. It has been noticed that mostly such accidents occurs in broad daylight.[2]

Fig: 1 AN UNMANNED LEVEL CROSSING.

Here we are proposing a signalling system which uses a laser and a photo-resistor sensor on the either side of the track.

The Setup

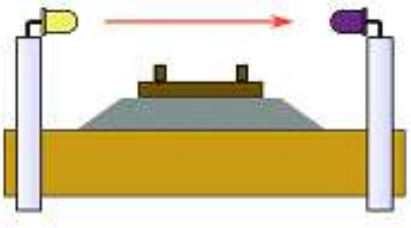

Fig:2 Laser And Sensor Placed on Track.

The Photo-resistors are placed on one side of track and on other side the other side a laser beam is directed to it. When a train approaches it cut the light beam, which falls on the photo-resistor. This will lead to the "RED COLOURED LED LIGHTS" on the level crossing to glow. And when the train passes it will again set the laser light to fall on the photo-resistor and the LED LIGHTS will turn off.

Fig:3 Common Chassis For All Types of Wagons.

As railway uses a various types of wagons, so we have to place our setup at the level just above the wheels which is same for all types of wagons. For the power source, a solar panel and a battery is to be used. The circuit for this proposal needs very less power as we are using LED indicator which requires very less energy.

II. THE CIRCUIT

The Circuit consist of a led which act as indicator , a photo- resistor which act as sensor, a laser which act as light source and the main component. A solar panel and battery to provide electricity. A comparator to read the sensor.

1.1. The LED indicator

LED stands for "Light Emitting Diode" it is a p-n junction diode which emits light when activated. When activated Electrons recombine with the holes and produces Light in form of 'Photon'. It requires very less power, and these days widely used, so is ideal for Indicators. We need Red light to indicate approaching Train as Red is noticeable from a long distance.

1.2. Photo-Resistor

Photo resistor is also known as Light Dependent Resistor (LDR) or Photocell. It is a variable Resistor which is controlled by the amount of light falling on it. When the light beam falls on the receiver section of photo-resistor, then it offers a very low resistance. But in dark it offers a very high resistance. The variance of resistance on the effect of light makes it suitable for the light sensing. The resistance also varies on the intensity of light.

1.3. Laser

LASER simply stands for Light Amplification by Stimulated Emission of Radiation. We are using Laser as it is small but a rather powerful light source. We have placed the laser so that it falls on the photo-resistor to activate it. We have chosen LASER LIGHTS over other source as it is compact and uses very less power. The power

input and the strength of laser would depend on the "Width of the track at the crossing". The resistance of Photo Resistor depends upon the frequency of the laser light also.

1.4. Comparator

Comparator is an electronic device which compares the input Voltages. It has two inputs (V_1 & V_2) and one output (V_{out}). The output varies accordingly to the input. Output (V_{out}) is 1 when the input voltage V_1 is greater than input voltage V_2. And output (V_{out}) is 0 when V_1 is less than V_2 [4]. The block diagram of Comparator is given as:

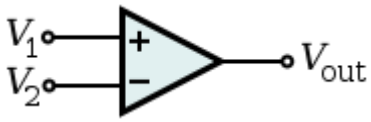

Fig:4 Block Diagram of comparator

Comparator is used to read the sensor (photo-Resistor) according to which the decision of signalling is taken. The circuit is designed so that the output will lead to the LED and signalling the approaching train.

1.5. Solar panel and other power components

For the circuit to work it need power source. A solar panel and a battery would be ideal for this as sun is the prominent source of energy. One m^2 area of solar panel produces 1000Watt[3] which is sufficient for our circuit.

1.6. Circuit Diagram

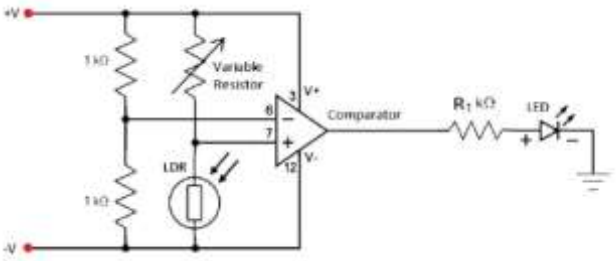

Fig:5 Circuit Diagram for Reading Sensor(LDR).

The voltage V is to be selected as per the Comparator. The Variable resistor is provided so that in case of change in frequency or intensity of the light it could be changed for the circuit to work. The resistor R_1 is provided to control the current to the LED indicator. The final setup may look like

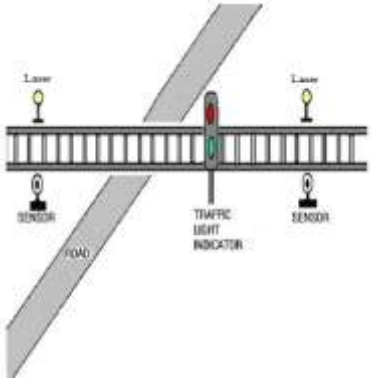

Fig:6 The Final Setup of Sensors

II. CONCLUSION

This paper is intended to reduce the accidents at level crossing with a very less input cost. As everything in the world has its limitations, so do this system. If a person ignores the signal then this system fails. This system also fails if any animal or other obstruction is there in between laser n sensor. Foggy weather also affects the efficiency of this system. But still this system has much more benefit rather than limitations.

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