

RELAY AND LDR-BASED AUTOMATIC RAILWAY SIGNAL AND GATE CONTROLLING SYSTEM

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ABSTRACT: -The goal of this study is to take efforts toward implementing an automatic railway signaling system and an automatic gate control system that uses electromagnetic relays. The railway signaling system is responsible for train movement safety as well as train control and efficient administration. This device will assist us in avoiding accidents at level crossings and on lines shared by two trains. With the use of sensors and LDR, this system will prevent any human error in the signaling system. The system's ability to determine whether blocks are occupied or otherwise impeded, and to communicate that information to oncoming trains, results in autonomous functioning. Unlike more current traffic control systems, which require external control to establish a flow of traffic, the system works without it. The relay will be connected to the traffic lights that show whether a train is moving or stopping. The block signaling system governs the signaling system.

KEYWORDS— automatic railway signaling system, automatic gate controlling system, LDR, block signaling system

INTRODUCTION: - The railway signaling system is essential for monitoring the railway network and preventing accidents. In a country with the world's largest railway network, such as India, the railway signaling system must be extremely efficient and quick to react. The automatic railway signaling system aids in the acquisition of quick-reacting signals and the avoidance of human errors in signal control.

In this project there are 4 alerts among stations aside from the sign of the platform. All those alerts are managed with the aid of using electromagnetic relays which might be utilized in 3 mild sign block circuit. To manipulate the railway crossing gate LDR and LASER alerts are used. Automatic block signaling machine includes a sequence of alerts that divide a railway line into a sequence of phase or blocks. For the railway crossing the signaling machine is semi-computerized and forestalls or slows down the educate motion in presence of occupied track at the extent crossing.

OBJECTIVE: - The main objective of this project work is to avoid any human errors in the signalling system which will avoid the occurrence of accidents due to negligence. The use of relay helps to increase the speed of response of the system and also increases the range of protection. The LDR and LEASER system is used as an alarming system which will trigger the buzzer if there is any fault on the track or if there is any other train on the same track.

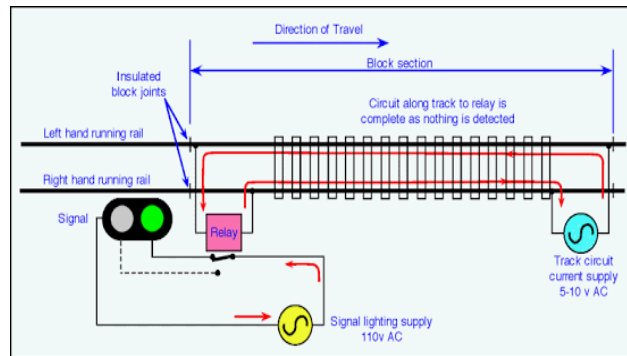


Figure 1: Signalling System.

THEORY: - In block signalling system just one train can reside a piece of a track or specific block. The block is set by the track circuit. From fig 2 we are able to see how the train axle help to finish the circuit and form a brief circuit path preventing this to flow further showing the position of the train and this controlling action is done by electromagnetic relay.

The operation of the relay depends on the movement of the train on the track circuit. The track consists of two lines; one in all the road is usually in negative potential and therefore the other line contains a small air gap in between two parts. This gap helps in avoiding magnetic saturation within the lines hence reducing the equivalent impedance of the track. the full body of the train is at negative potential and therefore the overhead line gives 25 KV supply. All the relays are given positive potential.

When the train pace connecting the 2 parts of the track circuit it supplies the relay and hence it controls the signal/s connected to the relay. This relay controls the signal/s by the assistance of three block signalling system.

There are mainly three signal colours that are used (1) red light signifying to prevent (2) traffic light signifying to hamper the train (3) green light meaning the following track is obvious and good to travel.

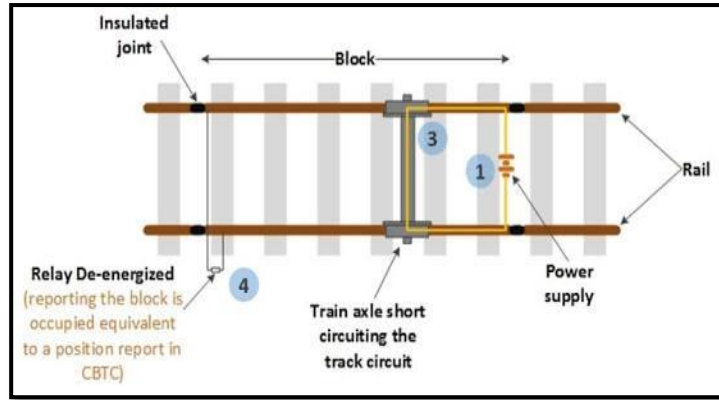


Figure 2: Mechanism of track circuits to energies the relay.

The gate of the extent crossing must be monitored whenever a train is nearby to avoid accidents. It's common to listen about an accident at the railway crossing. Railway gates are opened or closed manually by a gate keeper, the information about arrival of train for opening or closing of door is received from nearby station. But some railway crossings are totally unmanned and plenty of railway accidents occurs at these unmanned crossways. To avoid the human intervention at level crossings completely, automation of the railway gate control is required. In this project there is a signal before the level crossing which is showing the driver whether the track is clear or not. The gate is semi-automatic and is governed by LASER and LDR. For an occupied track the laser beam does not falls on the LDR hence the motor does not starts and the gate does not close, the signal will be red and once the track is cleared the signal will turn green and the motor starts the gate closes. Fig 3 shows the flow chart of how the gate is controlled by LDR and LASER.

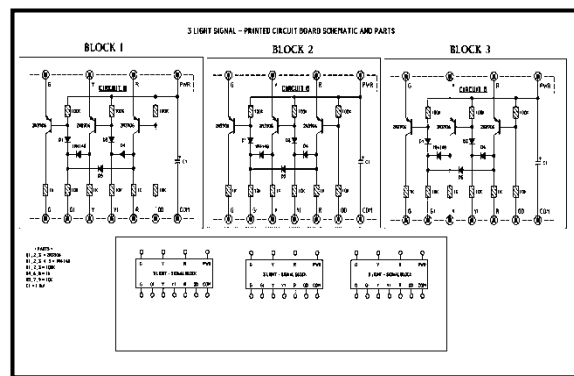


Figure 3: 3 Block system circuit.

Fig 3 shows the 3-block circuit diagram which is been controlled by the electromagnetic relay. The signalling system is controlled by the 3-block system and the relay.

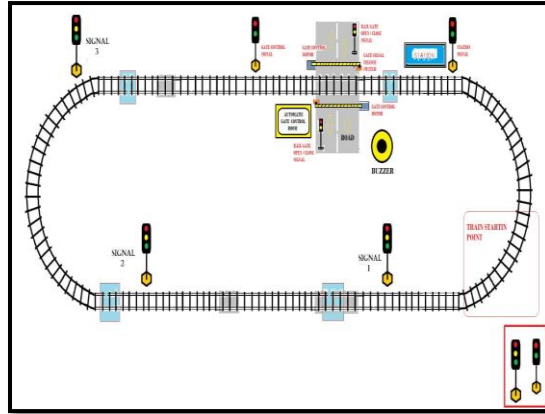


Figure 4: Schematic diagram of railway track.

Fig 4 describes the working of this project. The train starts from the station or shed if the signal is green, once the last compartment touches the track circuit the signal changes to red. When the train is in between the station signal and signal 1 the train will be in first block of the three-block system. The signal 1 is green and station signal is red. Once the train is in between the signal 1 and signal 2 the train is in block 2. Signal 1 is now red and signal 2 is now green and the station signal is yellow. Again, for block 3 the signal 3 will be green and signal 2 is red and signal 1 is yellow.

The gate of the level crossing needs to be monitored whenever a train is nearby to avoid accidents. It is very common to hear about an accident at the level crossing. Railway gates are opened or closed manually by a gate keeper. The information about arrival of train for opening or closing of door is received from nearby station. But some railway crossings are totally unmanned and many railway accidents occur at these unmanned level crossing. To avoid the human intervention at level crossings completely, we need to automate the process of railway gate control.

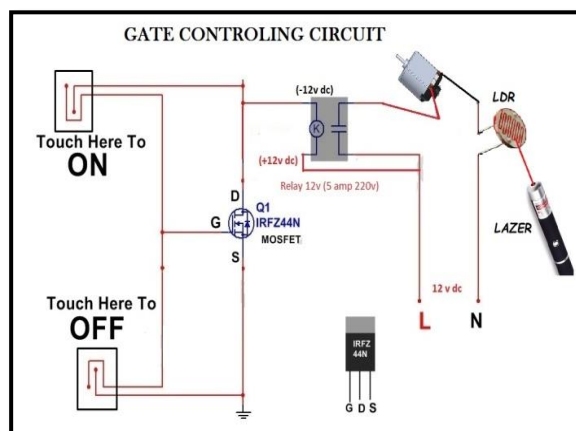


Figure 5: Gate control circuit.

In this project there is a signal before the level crossing which is showing the driver whether the track is clear or not. The gate is semi-automatic and is governed by LASER and LDR. For an occupied track the laser beam does not falls on the LDR hence the motor does not start and the gate does not close, the signal will be red and once the track is cleared the signal will turn green and the motor starts the gate closes. Fig 7 shows the flow chart of how the gate is controlled by LDR and LASER. Fig 5 shows the gate control circuit.

By the help of delay timer circuit, the duration of green signal at the station can be the signal will be green for two minutes in this project. Fig 6 shows the delay circuit of the station signal.

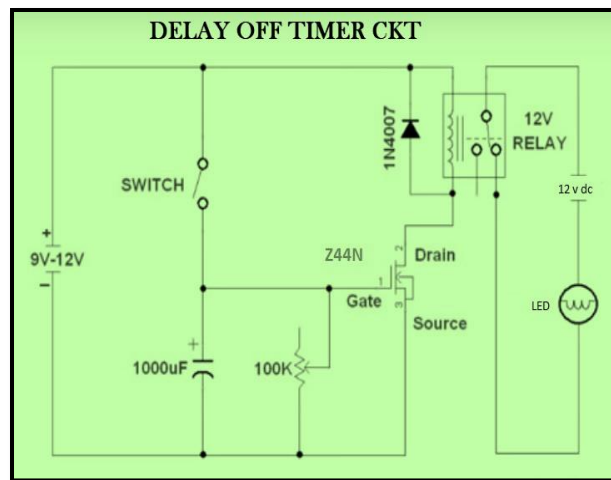


Figure 6: Delay timer circuit for station signal control. controlled.

The whole operation of this project is shown by the help of a flow chat shown in fig 7.

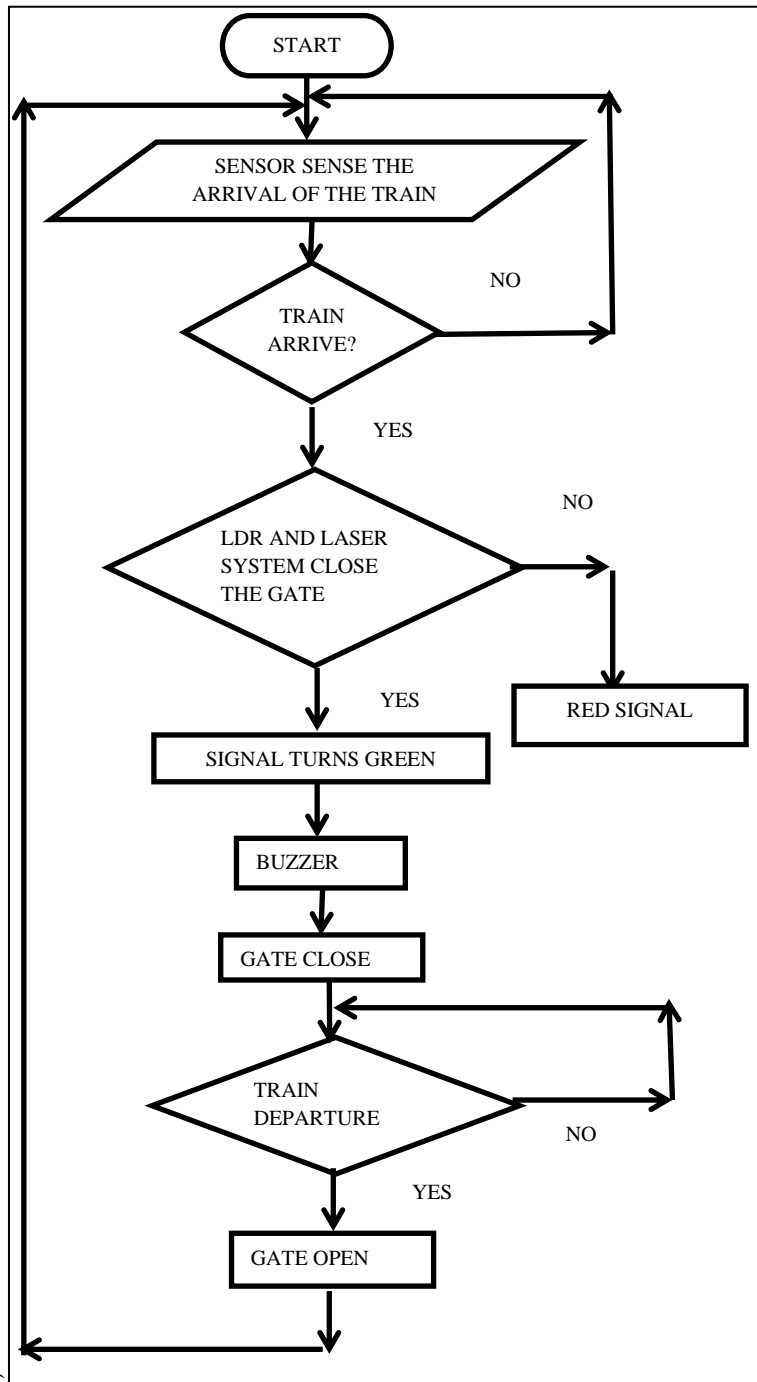


Figure 7: Flow chart of the gate operation using LDR and LEASER.

HARDWARE MODEL

Railways transportation is considered as the cheapest mode of transportation over all other means of transportation but in our day-to-day life we come across many news of accidents occurring on the railway tracks or at the level crossing. This occurs mainly due to the carelessness in manual operations or lack of workers. This project helps in removing the problems faced by the current system.

The components that are used are

1. LDR
2. Electromagnetic relay
3. Laser
4. Transformer
5. Rectifier circuit using diode
6. Smoothing
7. Regulator
8. Vero Board
9. Soldering iron
10. LED
11. NPN transistor
12. Resistor
13. Capacitor
14. Servo motor.
15. Power supply



Figure 8: Circuit Control Box

The tracks are covered with aluminum foil to make it conductive. When the last coach of the train crosses the platform signal the signal next to the platform turns green by the help of the relay.

CONCLUSION: - This project has many advantages such as it will reduce number of accidents occurring at the railway level crossing, it will improve the accuracy and reduce errors occurring due to manual operations. It will reduce the collision of train and also superintend the route of a particular train which will remove any delay of the train to reach its destination.

Security can be implemented by placing tracker in the train in order to monitor the location of the train in case of any issue. By this mechanism, presence of a gatekeeper is not necessary and automatic operation of the gate through the motor action is achieved. Electromagnetic relay performs the full operation i.e., sensing, changing the signals. The circuit is simple and easy to build.

FUTURE SCOPE: - This system can be modernized with the help of Artificial Intelligence. The entire track consists of number of IR modules.

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