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PLC BASED RAILWAY INTELLIGENT SAFETY ALARMING SECURITY SYSTEM

Pratik Kadam[1], Ashirwad Gaikwad[2], Dnyaneshvar Kanse[3], Hrutuja Bhutkar[4], Komal Padmale[5], Prof. A.A.Mane[6]

[1,2,3,4,5,6]*Electrical Engineering, Shivaji University (India)*

ABSTRACT

In this project we introduce the PLC based railway alarming security system by its application. These applications are automatic gate control i.e. open and close operation of railway gate. Tunnel power saving, the lamps at both ends of tunnel are always ON. Middle lamps become ON when train is passes from the tunnel. Anti-collision system, in that when two tracks are joining at a point and train is arriving from both tracks we give green signal to fast train and red signal to slow train. When fast train is crosses outside sensor it gives green signal to the slow train.

Keywords: PLC, DC Motor, (Infrared Sensors) IR Sensors.

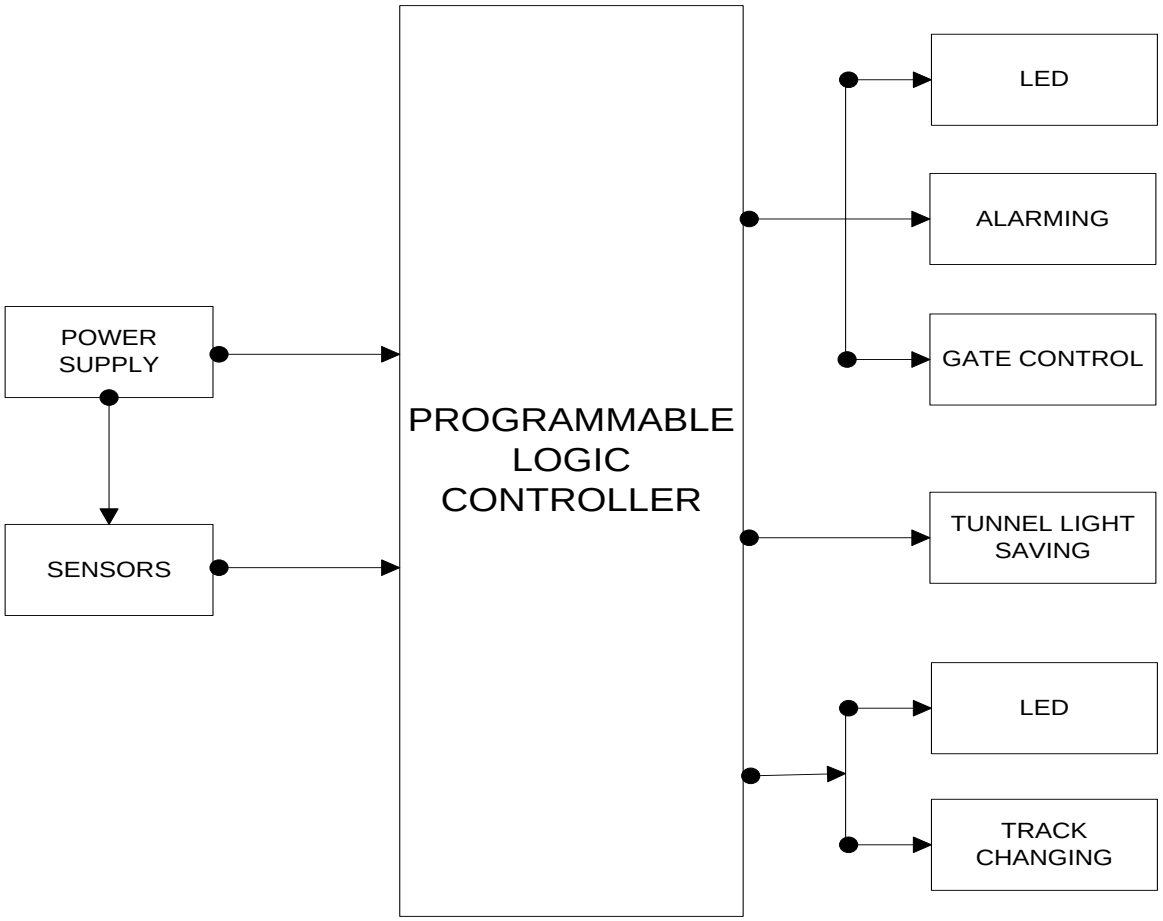
I. INTRODUCTION

The place where track and highway/road intersects each other at the same level is known as “level crossing”. There are mainly two types of level crossing they are manned level crossing and unmanned level crossing. Railways being the cheapest mode of transportation are preferred over all the other means .When we go through the daily newspapers we come across many railway accidents occurring at unmanned railway crossings. This is mainly occurred due to the carelessness as well as let massage receiving by that person in manual operations or lack of workers Though rail transport in India is growing at a rapid pace, the associated safety infrastructures are not up to international standards. To demonstrate the gravity of the problem, official statistics say that there have been 14 accidents in 2011, 15 accidents in 2012.

Now a days Indian Railway use Route Relay Interlocking (RRI) system for controlling of train operations. In RRI system operations of controlling requires large number of relays, which make system complicated as well as unreliable. Also RRI system requires large man power. To overcome this problem we introduce new system which is PLC Based Railway Intelligent Safety Alarming Security System. In the project we use various sensors for controlling action of train. It helps to increase accuracy, speed of operation and reliability of the system.

II. RAILWAY INTELLIGENT SAFTY ALARMING SECURITY SYSTEM

BLOCK DIAGRAM DISCRIPTION:



BLOCK DIAGRAM OF OVERALL SYSTEM

PLC

PLC is invented to replace traditional control panels whose operations depend on the electromagnetic logic relays that are based on timers in industrial control systems. PLCs are capable of monitoring the inputs continuously from sensors and producing the output decisions to operate the actuators based on the program. Every PLC system needs at least these three modules:

- **CPU Module**

The brain of the whole PLC is the CPU module. This module typically lives in the slot beside the power supply. The CPU consists of a microprocessor, memory chip and other integrated circuits to control logic, monitoring and communications.

- **Power Supply Module**

PLC requires a single regulated, 12 to 24V (+/- 5% ripple) DC power supply for the CPU and I/Os. It is recommended that whenever possible, use a higher power supply voltage since the voltage difference between ON and OFF state is wider for operation at higher voltage.

- **One or more I/O Module**

The I/O module provides the physical connection between the equipment and the PLC. Opening the doors on an I/O card reveals a terminal strip where the devices connect. There are many different kinds of I/O cards which serve to condition the type of input or output so the CPU can use it for its logic. It's simply a matter of determining what inputs and outputs are needed, feeling the rack with the appropriate cards and then addressing them correctly in the CPUs programme.

PLC is programmed interface between input sensors &output devices. The PLC is an assembly of solid state digital logic elements design to make logical decisions and provide outputs. PLC is used in the application of data handling, storage. PLCs are widely used in motion control, positioning control, torque control. PLCs are used in the application of data handling, storage.

⦿ PLCs are widely used in motion control, positioning control, torque control.

Used in safety critical applications, mining, food, beverages, metal, petrochemical and chemical process.

IR SENSOR

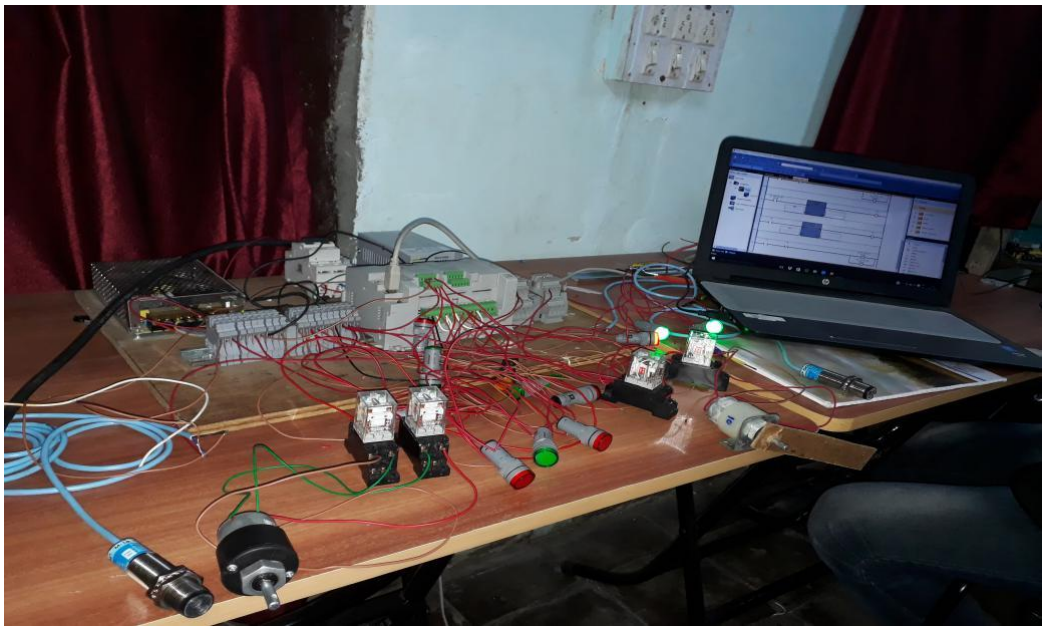
It is high power infrared emitting diode (950 nm) GaAlAs / GaAs. TSAL6100 is a high efficiency diode. It is pair of transmitter and receiver. It works on a principle of line of sight. This sensors will use for implementing automatic gate control and tunnel power saving. IR receiver consists of Photo Diode. A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation.

III. AUTOMATIC GATE CONTROL

Automatic gate control for railway gate is important to reduce occurrence of accidents at unmanned railway gates. In an automatic gate control we use IR sensors, dc motors having 10 rpm speed, LED lamps for signal and buzzer for alarming.

Two IR sensors are used to both side of railway gate. When train arrives in particular direction first IR sensor sense the train, then buzzer start alarming, gate start to close. When gates are closed signal for train become green and signal for vehicles become red. At the time of closing of gate motor rotates in clockwise direction.

When train crosses the gate second sensor sense the train, then gate start to open that time signal for train become red and signal for vehicles become green. When the gate is opening motor rotates in anticlockwise direction and buzzer start alarming.



AUTOMATIC GATE CONTROL

IV.ANTICOLLISION

Anti-collision will be implemented using the IR sensors fitted on the track side. The IR sensor senses the train using IR detector. The obtained signal is fed to the PLC. As soon as signal received the PLC will take the necessary action to stop the train.

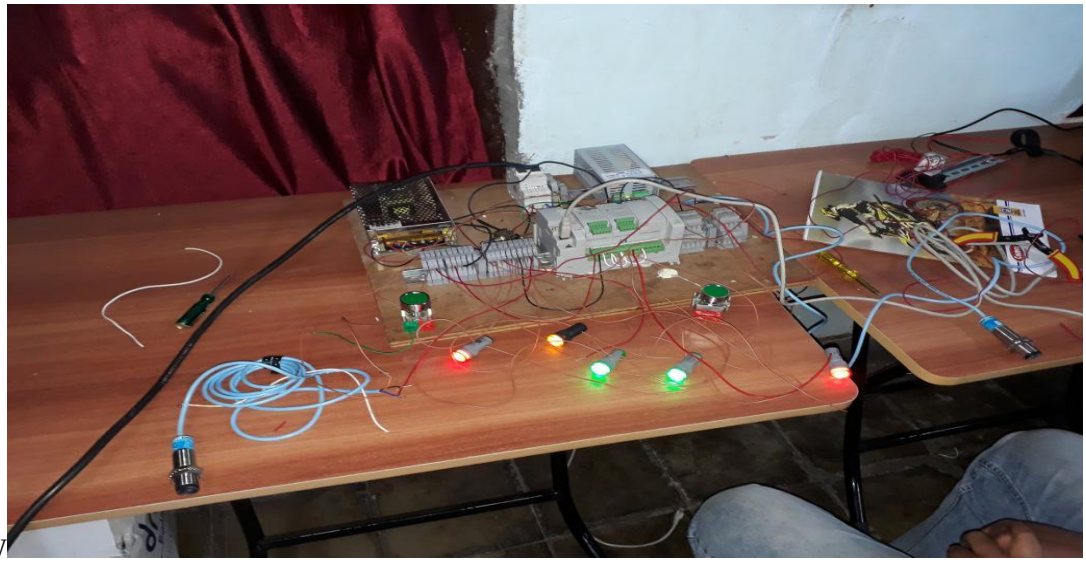
Considering a situation where to trains running on two different tracks at same direction and going through further on only one track, first train who passes sensor will receive green signal and second train who passes another sensor will receive red signal. When first train passes exit sensor the second train will get green signal. In this way we can avoid accidents of two trains running in same direction.

As no change in necessary to make to the infrastructure of existing system, the cost implementation of this system is also less. The system has been designed and simulated proteus real time simulation software.

V. TUNNEL LIGHT/POWER SAVING

Tunnel power saving is implemented using two IR sensors. First sensor will be fitted at entrance of the tunnel and second sensor will be fitted at end of the tunnel. At initial condition the lamps at both ends of tunnel are continuously ON and middle lamps are OFF. When train crosses the entrance sensor then at the same time the

signal is sent to the PLC to do the function according to the ladder diagram fed to PLC. At the same time PLC produce the output signal to middle lamps which goes ON and after train crossing exit sensor then it produce another signal and sent to the PLC, which produce another output signal to middle lamps which goes OFF.



TUNNEL POWER SAVING

VI.CONCLUSION

PLC BASED RAILWAY INTELLIGENT SAFETY ALARMING SECURITY SYSTEM is more efficient and secure system. It gives total security to the trains which are coming at a junction are secured by using IR sensors which gives appropriate signals to the trains to ensure secure traveling path to all the trains coming towards the junction. This completely eliminates the collision of two trains traveling at a junction by using micrologix800, which gives fast response for signal operation.

In automatic gate control when train arrives towards the gate and sensor senses it and gives signal to the PLC which generates output and close gate. When train departs from gate then exit sensor senses it and gives another signal to the PLC and gates are open. The DC motor of 12V, 10 rpm controls the gate operation and gives appropriate opening and closing operation of gate.

We can save electrical power by using tunnel light saving for operation of train inside the tunnel. Initially the lamps of both ends of the tunnel are ON. The particular lights will glow and turn OFF when train passes through tunnel.

The total security and reliability are achieved by using anti-collision and gate control respectively with tunnel power saving.

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