Design & Development of automated Railway Signalling & Interlocking By Using PLC

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Abstract- *Railway is very much Important in day today life in India. Now days in world, lots of People are using different types of transport facilities such as flights, trains, buses, cars etc. But most of the people in our country prefer traveling in trains. The reason may be the comfort for long journeys and comparatively lesser travelling charges. Though the railways has implemented many safety standards for the safe journey, still there are some rail accidents that leads to the loss of many precious lives and loss . The major causes for accidents in railway are mainly due to, manually controlled railway track and mis-signalling due to fog and mist. In railway signalling system, interlocking refers to arrangement of junction or crossing in such a way so as to avoid the collision of trains and we can able to reduce waiting time of trains.*

The main objective of this project is to automate the railway signalling &track changing to share the railway track & avoid collision. This project is specifically developed keeping in mind the case study of Lonawala-Pune local train transport wherein the priority is given to express train and local train is side-tracked manually at "Khadki" Railway station to avoid time collision The prototype model has been developed and tested successfully to demonstrate the automation in railway signalling and track changing using PLC.

I. INTRODUCTION

Indian Railways is considered as the largest railway in Asia. It is also the fourth most heavily used systems in the world and carries about 14 million passengers every day. The track route length of Indian railways is more than 65,000 kilometers. The operation and management of such a huge system has involved many phases of improvements and developments ever since it has started. In early days policemen were sent ahead at the line of sight to regulate the movement of a train . Now a days , over hundreds of railways running on track every day. As we know that it is definitely impossible to stop the running train at immediate is some critical situation or emergency arises. Train accidents having serious consequence in terms of loss of human life, injury, damage to Railway property. Railway safety is a crucial aspect of rail operation over the world. Railways being the cheapest mode of transportation are preferred over all the other means. There were many developments in railway system in the recent years. But always the current system have many disadvantages mainly due to the use of mechanical relay system. For this purpose we choose Programmable Logic Controller. A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.

In railway signaling system, Interlocking refer to arrangement of junction or crossing in such a way so as to avoid the collision of trains. The main purpose of signaling and interlocking is to check a route request and provide a suitable track which will not cause any collision.

Railway signaling has become more important because of less track and the use of high speed trains, local trains on same track. since the most important aspect of a railway signaling system is safety ,the decision-making "interlocking system" is the critical element of a railway-signaling system. To satisfy the safety standards set for railway-signaling system, the interlocking software design must be taken into account, using formal methods. In this project an automated-based railway signaling and interlocking system is introduced and implemented, using a programmable logic controller on a this railway model.

II. OBJECTIVE

The main objectives of this project are

- To automated railway signaling
- Automated track changing
- To avoid time collision
- Interlocking as well as signaling and interlocking is to check a route and provide a suitable track which will not cause any collision. This will also help to increase the safety in railway system

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III. BLOCK DIAGRAM

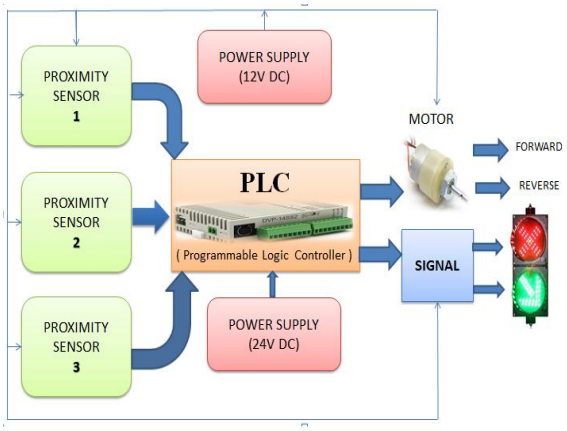


Fig.1 Block diagram of PLC based automation of railway signalling and direction control of motor

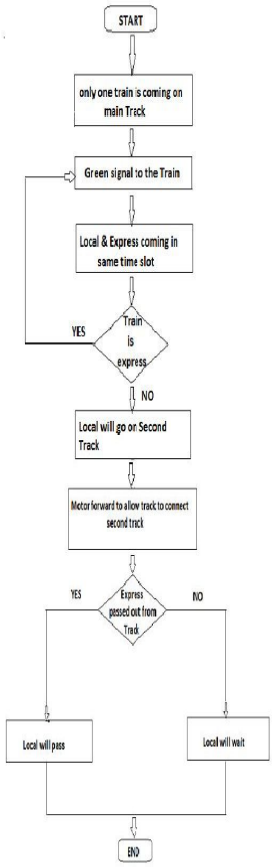
Fig.1 depicts the block diagram of design and development of automated railway signaling & interlocking using PLC. It consists of PLC system. In this there are two main part PLC based railway signaling and interlocking. Proximity sensor is used for check the availability of track and give suitable track.

Anti-collision System Anti-collision will be implemented using the Proximity sensors fitted on the Train side. The obstacle sensor sense the obstacle using proximity photo sensor and detectors. The signal will be fed to the PLC.As soon as the signal is received the PLC will take the necessary action to stop the train. The proximity sensor essential is a transceiver which helps to transmit the signal to the programmable logic controller (PLC). Using the same principle as that for change track, we have developed a concept of automatic track switching. Considering the situation where in an express train and a local train are travelling in same direction on the same track, the express train is allowed to travel on the same track and the local train has to switch on to the other track, indicator lights have been provided to avoid collision. Here the operation is performed using a stepper motor. In practical purpose this can be achieved using electromagnet.

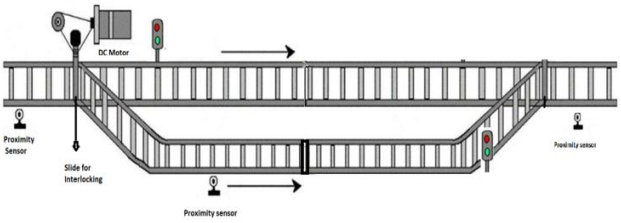
IV. ALGORITHEM

Step 1: Start the Process.
Step 2: Only one Train is coming o n Main Track.
Step 3: Green Signal to the Train.
Step 4: Local and Express Coming in same Time Slot.
Step 5: If Train Is Express,
Yes: Go to Step 3.
No: Go to Step 6.
Step 6: Local will go on 2nd Track.
Step 7: Motor Forward to allow Track to connect 2nd Track.
Step 8: Express Passed out from track.
Yes: Local will pass.
No: Local will wait.

V. FLOWCHART



Visual construction



ADVANTAGES

1. The new system would reduce the Delay time due railway crossing is eliminated by proposed system
2. Track utilization would get enhanced to over five trains an each hour each way.
3. Signals are automatically operated once the train occupies the track then next train is automatically given the signal to enter sub-section.
4. Maintain a safe distance between trains running in the same direction on a single line.
5. At the diverging tracks to give indication about the direction to move.
6. Automatic signaling and interlocking reduce the operational time also Helps in proper & safe working of the system.

LIMITATION

1. For small distance, cost is more and system is not efficient.
2. This system is proposed for given time frame.
3. There is no track management for same time train.

VI. CONCLUSION

Hardware has been developed and It has been tested for Time based collision of local and express and priority has been given to express and local train has been side track using motor forward and reverse operation Automate Railway signalling and interlocking is archived by using PLC

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