Railway Control System using PLC

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Abstract
Recently the railways signaling system has become one of most important systems because of their necessities in community where they help in transfer people and many type of goods by linking the main port with other ports. A rail track switching system has been designed to control railway track controlling devices including railway switches. These systems are responsible for safe train operation and must prevent collision and derailments from happening.

Keywords: Servo Motor, Limit Switch Sensor, Microcontroller.

Introduction
Automation is the technology by which a process or procedure is accomplished without human process [1]. A PLC is a programmable logic controller (PLC) is a specialized computer used for the control and operation of manufacturing process and machinery and complex systems. It uses a programmable memory for the integral storage of user-oriented instructions for implementing specific function including on/off control, timing, counting, sequencing, arithmetic, and data handling.

Programing logic control (PLC) is used in almost every aspect of industry to expand and enhance production. Where older automated systems would use hundreds or thousands of electromechanical relays, a single PLC can be programmed as an efficient replacement. The functionality of the PLCs has evolved over the years to include capabilities beyond typical relay control. Sophisticated motion control, process control, distributive control system, and complex networking have now been added to the PLCs.

Basic elements of automated system
Power – to accomplish the process and operate the automated system.

Program of instruction – to direct process.

Control system – to actuate the instruction.[1]

A control system is an interconnection of components forming a system configuration that will provide a desired system response. The basis for analysis of a system is the foundation provided by liner system theory, which assumes a cause-effect relationship for the components of a system. Therefore a component or process to be controlled can be represented by a block, which in turn represent a processing of the input signal to provide an output signal variable, often with power amplification. An open – loop control system utilizes a controller or control actuator to obtain the desired response [2].

In contrast to an open – loop control system, a closed – loop control system utilizes an additional measure of the actual output to compare the actual output with the desired output response. The measure of the output is called the feedback signal. A feedback control system is a control system that tends to

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maintain a prescribed relationship of one system variable to another by comparing function of these variable and using the difference as a means of control. A feedback control system often uses a function of a prescribed relation between the output and reference input to control the process. Often the difference between the output of the process under control and the reference input is amplified and used to control the process so that the difference is continually reduced [3].

A rail network even more than a road network must be controlled if trains are circulate in total safety. This control is taken care of by interlocking. Throughout its journey a train will run on various track section controlled by an interlocking system installed by the trackside inter locking authorizes the train to continue its journey or not. This process consist of two major stages: Firstly with regard to the road network by controlling level crossing Secondly with regard to the rail network as a show below:

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Result and Discussion

The first result we have acquired from the normal situation for the traffic light at intersection which that the green light lights up always to move the cars.
The second result we have acquired once the train arrival sensor (I0.0) the traffic light will light up the red light to stop the cars in order the train can continue move forward safety and without collisions with cars.

Figure 2.1: Result 1
The third result we have acquired once the train pass sensor (I0.1) the traffic light will light off the red light and light up the green light for cars to continue moving.
The fourth result we have acquired once the train arrival sensor (I0.2) and sensor (I0.5) detect arrival of other train here the red light will light up for other train to stop it and convert the rail path to another rail in order the main train can continue his journey using other track

Figure 2.3: Result 3
The fifth result we have acquired once the main train pass sensor (I0.3) the rail path will return to normal and green light will light up for other train in order to continue his journey.
The sixth result that we have acquired that once the main train arrival sensor (I0.4) and there is another train arrival on right rail and sensor (I0.7) detect it the red light will light up for the two rail (left & right) and adjust the rail path on normal.
The seventh result similar to sixth result but in this result the other train comes from the left rail and the sensor (I1.1) detect it and also light up the red light for the left rail and also for the right rail and adjusts the rail path to normal in order the main train can continue his journey safely.
At the eighth result once the main train pass sensor (I0.6) the rail path will convert to right track and light up the green light for train on the right in order to continue moving.

Figure 2.7: Result 7
The ninth result we have acquired that once the train on right pass sensor (I1.2) the rail path will convert to the left track and the green light will light up for the train on left in order to continue his journey.
Figure 2.9: Result 9

References


