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Automatic Railway Gate ControlSystem Using PLC

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Abstract: ***The aim of this project is to develop a prototype that control the railway gate using PLC (PROGRAMMABLELOGIC CONTROLLER). Whenever train touches base at the IR sensor, caution is activated at the railway crossing so that the general population get instruction thatentryway will be shut. At that point the control module initiates and shuts the gates on either side of the track. Once the train crosses, this module naturally lifts the gate. For mechanical operation of a gate DC adapted engines are utilized. We are using PLC as a main control unit. Asper the instructions produced at the PLC, the proper action (i.e., shut or lift) will be made. This logic was implemented in PLC(Programmable Logic Controller)***
Keywords: PLC, IR sensor, DC Motor

I. INTRODUCTION

When it involves public and private safety, it is always desirable to improve the signaling system and the way people are warned about potentially dangerous situations.The existing conventional signaling system most of the times rely on the oral communication through telephonicand telegraphic conversation as input for the decision making in track allocation for trains. There is a large scope for miscommunication gap due to the higher human interference in the system. At railway crossing, the traditional railway system uses the warning lights and human controlled gates to alert the people about an oncoming train .When the train leaves the station, the station agent informs the gatekeeper regarding the arrivalof the train using the telephone and telegraph. The gatekeeper closes the gate depending on the timing at which the train arrives. Hence, if the train is late because of certain reasons, then gate stay closed for an extended time inflicting traffic near the gates. The automatic railway gate control at the railway crossing the arrival of the train is detected by the sensing element placed on thetrack at a precise distance from the gate. This sensing element detects the approaching train and consequently controls the operation of the gate. When the wheels of thetrain moving over the track there will be position switch and it will send the signal to PLC to indicate train arrival.This reduces the time that gate is closed as compared to the gates operated manually. In addition, this also reducesthe human labor. This sort of automatic railway gate system is employed in associate unmanned gate crossing where the probabilities of accidents are higher and reliableoperation is needed.

II.LITERATURE REVIEW

The automatic railway gates operation has been projected using various methods. As proposed by XishiWang (1992), the process of developing fault tolerance method has been applied for both the hardware and the software components. Magnetic sensors placed undergroundto detect the train are less affected by environmental changesand recognizes the direction of movement of vehicles.

Jeong Y (2008) defined the railway auto control system using OSGi and JESS. The state of railway cross has been estimated using JESS in the technique. The issues in the technique are he insufficient inline citations and also multiple issues related to OSGI. The different methods used by locomotive pilots which can avoid the accidents and the safety measures while crossing the level crossings are also discussed. Atul Kumar Dewangan (2012) gave a detailed introduction about the present railway technology and also discussed the disadvantages of manually activated railway signals and the railway warnings at the level cross. The traindetectors act as the major component in the train automationsystem.

Banuchander J (2012) developed a method to concentrate on anti-collision system to identify the collisionpoints and to report these error cases to main control room, nearby station as well as grid control stations.Efficient Zig- Bee based Train Anti-Collision using Zig-Bee technology for railways is implemented.

Greene R.J. (2006) anticipated an intelligent railway crossing control system for multiple tracks that features a controller which receives messages from incoming and outgoing trains by sensors. These messages contain detail information including the direction and identity of a train. Depending on those messages the controller device decides whenever the railroad crossing gate will close or open. But this technique has the issue of high maintenance.

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Kawshik Shikder (2014) projected the automatic operation of railway gates using RF technology. The major issue of this technique was every train could be provided with RF technology. Thus it was economically feasible to implement.Anil M.D. (2014) proposed advanced railway accident prevention system using sensor networks. He used ZigBee RF module to communicate between base station andtrains. But, ZigBee was a short distance communicating device. Therefore it is practically not possible to implement his technique motor looks as a straight expansion over the simple DCones.

III. DESCRIPTION AND WORKING

The main idea of our project is to develop the automatic tocontrol the railway gate and traffic light at level crossingusing PLC. As a train approach the railway crossing from either side, the sensors placed in the track at a certain distance from the gate detects the approaching train andaccordingly controls the operation of the gate. The proposedsystem uses infrared sensors to detect the trains crossing theroad and motor to control traffic light and the opening orclosing of gates. The system uses two sensors to detect thearrival of the train and a second sensor to detect the leaves of the train. When the arrival of the train is sensed, signalsare provided to the traffic indicating the arrival of the train on the road such as the signal turns red and the motoroperates to close the gate. When the second sensor detectsthe train, then the signal turns green and the motor operatesto open the gate. The gate remains closed until the train completely moves away from the crossing road. Thus, automation of the gate operations at the level crossing isachieved using sensors, motor and traffic light. The signalfrom the colour resistive sensor will play important role in gate control and traffic light control process. When the PLCreceives the signal from the sensor, then it produces the output based on ladder program which is fed to steppermotor driver for closing the gate. When t ga traffic lightindicates the red signal for the vehicles that passing through the road. Similarly, when the PLC receives the signal from the receiver it indicates the train indicates the train haspassed away SWITCH gate is in open position whichindicates that by a green signal for the level crosse

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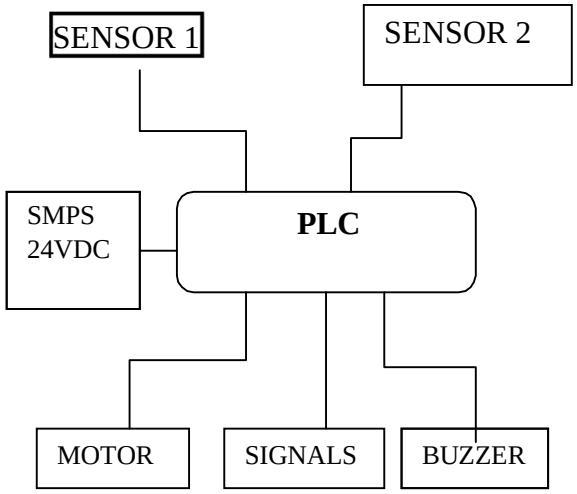
A. PLC

PLC defines as a “digitally operating electronic apparatus which uses a programmable memory for the internal storageof the instructions for implementing specific functions suchas logic, timing, counting and arithmetic, sequencing tocontrol through digital or analog input/output modules,various types of machines or processors.”

B. DC Motor

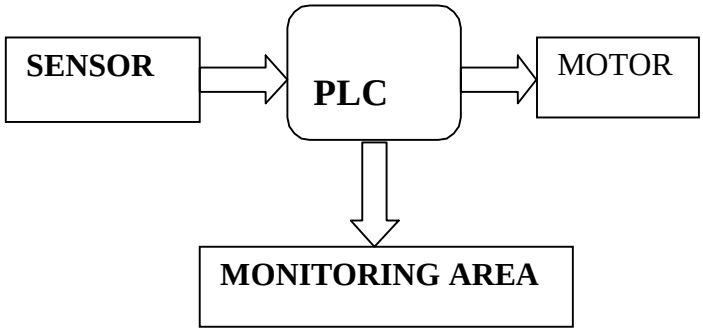
Geared DC Motors can be defined as an extension of DC motor which already had its insight details demystified here. A geared DC Motor-30RPM, 12Volts geared aregenerally a simple DC Motor with a gearbox attached toThe speed of the motor is counted interms of rotations of the shaft per minute and is termed as RPM.The gearassembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This insight will explore all the minor and major details that make the gear and hence the working of geared DC motor.At the first sight, the external structure of a DC geared

IV. BLOCK DIAGRAM



The above architecture shows the arrangement of thecomponents and connected in such a manner.here each andevery component has connected in such away tocommunicate and to do control functions of all thecomponents. By having a monitoring area all the process canbe monitored at a single place. PLC is placed in central because it does all the functions according to sensor inputs

V. SYSTEM ARCHITECTURE



Here we can see the complete flow process of the project thesignal from the sensor will play major role in complete process as an initial state the signal is sent to PLC then it produces the output base on our ladder program the it is fedto drive the DC motor only needs the pilses.As a monitoring area we will have some display arrangements to monitor complete process.here signal to the monitoring area will betaken from the PLC.

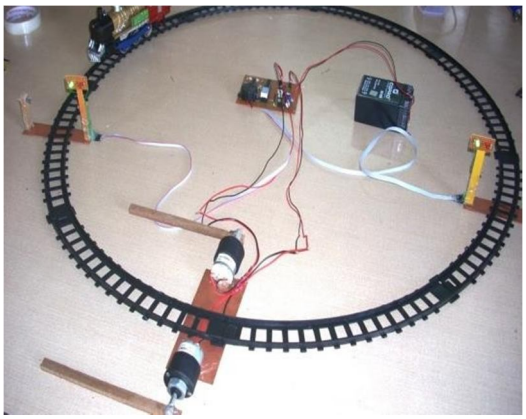
VI. ADVANTAGES

A. Saving of money
B. Move towards smart city
C. Accident avoidance
D. Human safety

VII. CONCLUSION

Now a day, PLCs are being used to reduce maintenanceand labor cost of many control systems solutions.Within nextfive to ten years many existing control systems will be replaced by PLCs.Therefore, it is highly recommended thatacomplex system like railway gate controlling will be basedon PLCs. In this project, we have developed such a control system.A prototype road and rail line model with railway gate has been created and implemented. After successful testing of the whole system, it was foundthat the developed system operates satisfactorily.

VIII. SYSTEM MODEL



VIII. ACKNOWLEDGEMENT

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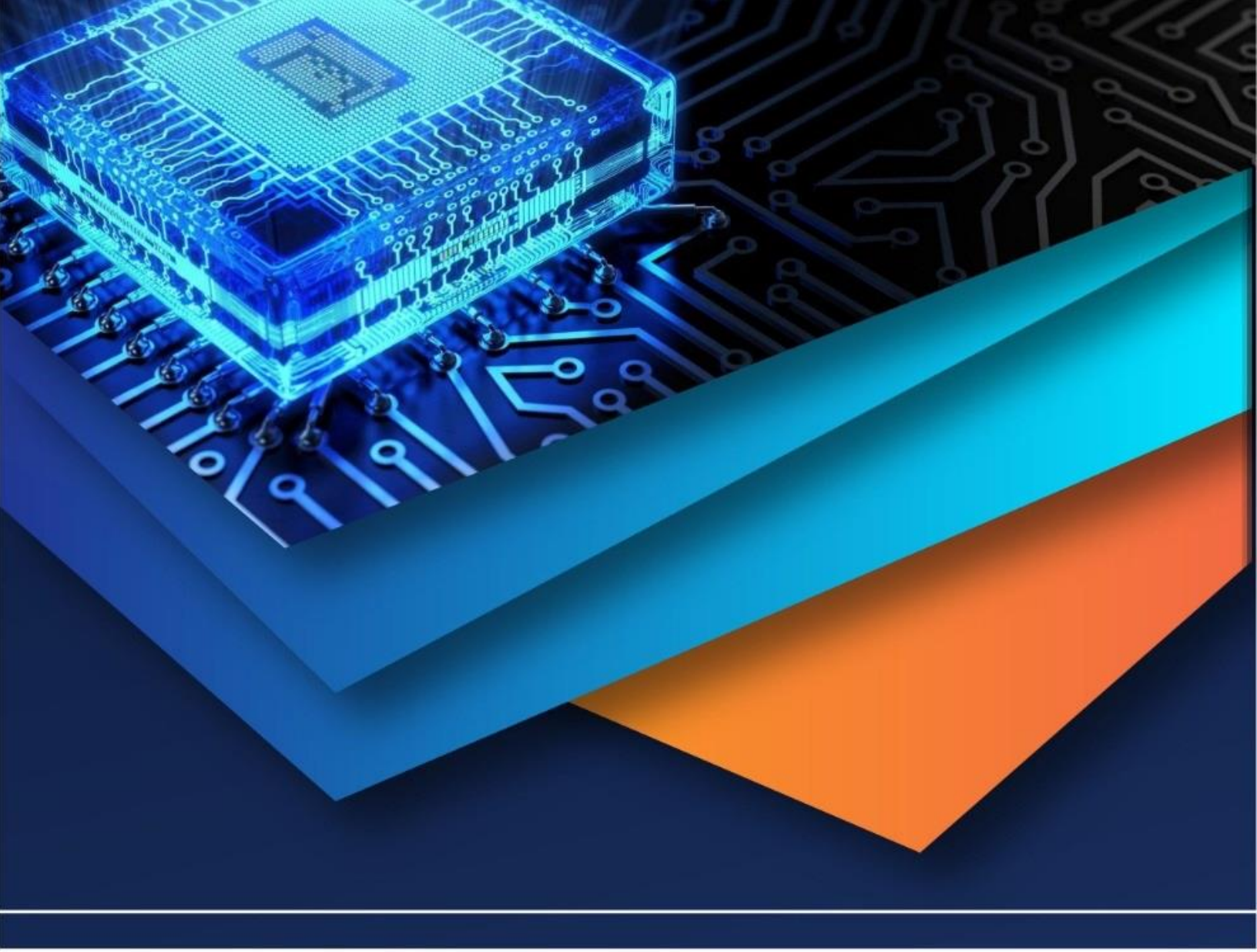

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