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AUTOMATION CONTROL OF METRO TRACTION USING PLC AND SCADA

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Abstract- The high level of error which may lead to scads of damage which may be human life or material damage, inefficiency in supporting changes such as development of new high-performance vehicles Acquisition, time consuming inefficient system of operation leads one to consider an automated railway system. An automated control system which is introduced in this paper with the help of PLC and SCADA monitoring will have a significant effect in the permitting of having an increased speed form of transportation, augmenting services which can increase the full load capacity of a given network, while flexibility in the network will help in developing a system which can be improvised to change traffic control based on the traffic variations. The system provides other prominent benefits over there room temperature counterpart in reduced size, weight (increased power density), efficiency, switching speed, reliability which will result in an overall weight, space, time saving and a save mode travel in the current society.

Index Terms- Programming logic controller (PLC), Supervisory control and data acquisition (SCADA), Infrared radiation sensor (IR), Radio frequency identification

1. INTRODUCTION

The signal systems or the controlling systems came after the creation of railway system as a mode for picking up passengers from station. With the increased time traffic there are tremendous issues in this signal systems, to avoid them an advanced technology by using PLC and SCADA hardware technique. For the elimination of human element to a certain extent has resulted in the improved performance, removal of all danger fatigue and the delay caused by the communication for acceptance into the station into the track is removed which results in time saving and efficient travelling. The flexibility and the automation technology allow an easy adjustment and the signal system to deal with changes in the traffic

2. LITERATURE Survey

Harsh Mohan Sharma has developed the railway protection system either by manual process (or) by semi-automatic process using embedded system technology. It will remove the manual work and makes the whole system fully automated. One of the two sensors used for sensing the position of train is activated as the train arrives and closes the barrier [1].

Hnin Ngwe Yee Pwint has developed the sensing of the arrival and departure of the train. This system uses the DC motor to open and close the gates automatically when it is rotated clockwise or anticlockwise direction. It reduces chance of human error [2].
Jon Otegui has developed the economic viability of given solutions should be explored, so as to design an on-board train-integrated positioning system. So that the train positioning is sensed [3].

Luís Rosa has developed the Supervisory Control and Data (SCADA) and Industrial and Automation Control System (IACS) architectures became more open and interconnected, some of their remotely controlled processes also became more exposed to cyber threats. It has longer life time cycle [4].

Manjunath Managuli has developed the vehicles tracking method is suitable more and more significant in outsized city as fit as the interchange pointer which is other protected than extra system. It provides valid instant potentials [5].

Zhuhuai Xiao had reduced the problems in hydraulic engineering construction and requirements of the concrete control system, combined with research status, the concrete vibrated and injected automatic control system with PLC is designed. It is convenient to mount and maintenance [6].

Sheng Qiang discussed the application of Programmable Logic Controllers (PLCs) in the process monitoring and control for fuel alcohol production. The PLCs are mainly utilized for collecting process data as well as realizing auto-tuning PID and sequence control strategies. It has significant profit improvement [7].

M.D.Balsarf had discussed that the scheming and construct three level elevator control system and increase its steady state & stability by using a (PLC) programmable logic controller the software used for communication is RSLogix-500/5000 PLC’S . . Industrial automation where numbers of equipment are replaced by contactor and switches [8].

Tom Bartman discussed that an unintended consequence of adopting IP communications is that supervisory control and data acquisition (SCADA) and industrial control systems (ICSs) have become very popular targets of attack. It identifies wireless access points, and verify where authentication is enabled [9].

Gaddipati Bharathi discussed here is PLC controlled Water Distribution System. It minimizes human efforts for the same. The automation thus implanted at the PCMC Water Treatment Plant has proved to be effective. It helped to overcome the problems based on level pressure, flow parameters [10].

3. BLOCK DIAGRAM
4. RFID Reader

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. RFID is a technology similar in theory to bar codes.

So, this radio frequency identification or RFID is a technology which is working on radio frequency of radio waves. Whenever this object is in the range of the reader then this RFID tag used to transmit its feedback signal to the reader. It is very similar to the technology which is used in a barcode.

RFID Automates Asset Tracking. With a portable RFID reader built into a mobile computer, staff can easily scan one or more asset tags without having to physically see the tags. With RFID, the reader can be several feet away and still get an accurate scan.

5. Programmable Logic Controller Explanation

PLC programmable memory for the internal storage of instructions for the implementation of specific function such as logic sequencing, timing, counting and arithmetic to control through digital or analog input/output module makes it apt for implementing the project. The working of PLC is by continuous scanning of the program. The scanning process involve testing input status, programming execution, check-up and correction of the output status. The input module performs four tasks electronically. First, it senses the presence or absence of an input signal at each of its input terminal. The input signal tells which switch, sensor or other signal is on or off in the process being controlled. Second it converts the input signal for on a high to a DC level usable by the modules electronic circuit. For a low or off input signal, no signal is converted indicating off third, the input modules carry out electronic isolation by electronically isolating input module output from its input. For the AC voltage input we are using DC converter consist of rectifiers and a means to step the voltage down to usable level, with a Zener diode. For input dc voltage DC to DC conversion within conversion range is required. The output of the converter is not directly connected to the CPU. The isolation block protects CPU from this surges or circuit malfunction.

6. Supervisory Control and Data Acquisition

SCADA is an industrial measurement and control system consisting of a central host or master (usually called master terminal unit – MTU) one or more field data gathering and control units or remotes (usually called remote terminal unit - RTU) and a collection of standard and/or custom software used to monitor and control remote located field data elements. Contemporary SCADA system exhibits predominantly open-loop control characteristics and utilize predominantly long-distance communications, although some elements of closed-loop control and/or short distance communications may also present.

SCADA systems field data gathering generally cover larger geographic areas, and rely on a variety of communications. It is used to monitor and control purposes. The control may be automatic or initialized by an operator command. The data acquisition is accomplished firstly by the RTU’s scanning the field inputs connected to the RTU. This usually is at a fast rate. The central host will scan the RTU’s. The data is processed to detect alarm conditions, and if an alarm is present, it will be displayed on special alarm list. Data can be of three types, they are analogue data will be placed in graphs, digital data (on/off) may have an alarm attached to one state or the other, pulse data is normally accumulated or counted.
7. **Simulation Block Diagram**

![Simulation Block Diagram]

8. **Explanation**

The simulation block consists of following blocks named as RFID readers, platforms and display. The connections are as follows; the RFID reader reads the sensors which will monitor the arrival of train. These sensors will send signals to the PLC and then the gates near the areas will be closed. The signals from PLC are sent to the platforms. Display block will be on the output side of the PLC, which will display the train details on the platform.

9. **Software Explanation**

We are using Proteus design software which is a proprietary software tool suite used primarily for electronic design automation and PCB designing. In which ISIS is used to draw schematic and simulate the circuits in real time. This technique is used to create schematics and electronic prints for manufacturing printed circuit boards.

10. **Simulation Result**

![Simulation Result]
11. RESULT EXPLANATION

The simulation results are as in the above figure. We need to control the railway traction. So, to track the signals of the train, we are using RFID (Radio frequency identification) near the closing gates before and after the crossing gating. After the train crossed the gates, the train to reach the station. Let us assume three platforms in a station, we use the IR (Infrared radiation) sensors to know the vacancy of the platform. And give the preferences regarding its vacancy. All signals are controlled through the PLC (Programming logic controller). And finally displays, the train arrives on the display board.

12. CONCLUSION

We are using the PLC application in industries. Now we are using in the real time protection applications like human’s life. It is also an alternative for human beings who operates the railway crossing gates and is also an automatic control of metro traction. In which we are using an advanced sensing device called RFID reader and RFID tag on the train engine and crossing level gates. The exact arrival of the train can be traced through the help of the RFID tags we can find out the train number and we can display it in the railway station. It helps to reduce the humans labour work and automatically closing of gates helps in safe guards human lives.

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