Chapter 51
An Expert System-Based Automation in Indian Traction System for a One Way Single Platform Station by Introducing PLC

Eshan Samanta
https://orcid.org/0000-0003-1599-520X
Global Institute of Science and Technology, India

Arif Ahmed Sekh
https://orcid.org/0000-0003-0706-2565
UiT The Arctic University of Norway, Norway

Debnarayan Khatua
Global Institute of Science and Technology, India

ABSTRACT

Nowadays, it is very often that some portion of the Indian traction system is still suffering from a single line railway transportation. This in turn creates a havoc disturbance in maintaining the proper sequence of traction control system. Also, passengers are taking risk to catch the train which is already in motion but no such action has been taken to eliminate these consequences. It has been found that more or less various works have been done on Automation in Railway Crossing Gate using Microcontroller and IR Sensor. Thus, it is often decided to develop an idea for the Indian traction system to ensure better controlling action by introducing Limit Switches as Tactile Sensors and by introducing HMI using PLC. The purpose here to take control over various controlling domains, including Railway crossing gate are as follows: Track signal, crossing level signal, alarm notification, and platform edge fence. The proper sequencing needs to be operated via a 128 I/O module with 2 KB memory size small PLC kit.

DOI: 10.4018/978-1-6684-3694-3.ch051

Copyright © 2022, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

INTRODUCTION

The most important part of the transportation system in the present world is now a days the one and only traction system. In India some portion of the country is still suffering from deficit security system and the result is unnecessary death due to unavoidable accident. Many areas are not so well furnished due to single track communication system. The lack of spaces are not supporting government to set a double track railway communication system for a reliable and fast communication process. The accident prone the passengers' inrushes while the train is in motion. For upgrading the security system of traction system to reduce the accidental issues (Dhande and Pachareney (2017); Reddy, Kavati, Rao, and Kumar (2017); Sharad, Sivakumar, and Ananthanarayanan (2016)) some of the articles have been published on security system associated with railway automated level crossing gate based on IoT. Priyanka et. al. (Priyanka, Saranya, Shanmathi, and Baranikumar (2015)) have shown a method to control unmanned railway crossing gate control with database collection and fixed RF tags on each level crossing to communicate with each other, in order to gather the details about the level crossing, train location, train timings and density of vehicles passing the level crossing. Dewangan et. al. (Dewangan, Gupta, and Patel (2012a,b)) has promoted a technique on frequency modulation based railway gate control and they have also introduced micro-controller based railway gate control conception as well. Many articles presented the security enhancement procedures (Al-Zuhairi (2013); Banuchandar, Kaliraj, Balasubramanian, Deepa, and Thamilarasi (2012); Pwint, Tun, and Tun (2014)) by introducing a IR sensor operated micro-controller based railway gate control. In all the cited articles one particular focused point is level crossing gate. The purpose is to reduce accidental issues occurring since early times. Apart from level crossing gate there are many other portion exist with high risk factor of accident but these articles have not discussed about the following. Younis et. al. (Younis and Frey (2006)) has shown a method of implementing PLC in developing automation setup for industrial purposes. This idea of implementing PLC has given a direction to develop multiple domain controlling concepts. In this paper a discussion is made on the best way to ensure automation in traction system by introducing a centralized controller PLC is the best one to follow as its scanning technology is very fast to accommodate with any kind of on off logic circuitry. Apart from this it is also quite affordable to follow up one time investment with full time reliable services. In this controlling portion the programming language followed up in PLC programming is ladder logic diagram indeed to make it easier to understand by any of the operator just to maintain a consistent cycle for each and every execution.

This paper has six main contributions: 1. Comparison presented between Conventional circuit and Ladder logic, 2. Safety fence controller along the platform, 3. Signal controller of road vehicles, 4. Signal controller of Train, 5. Alarm notification to update status of the train, 6. Level crossing gate controller.

These entire different tasks have been performed by introducing PLC as automated system. The rest of the paper presents the entire work under section 3, section 4.1, section 4.2, section 4.3, section 5 and concluded the same with proper correlated simulation outcomes.

BLOCK DIAGRAM OF AUTOMATION SYSTEM

In Figure 1 a general block diagram is presented. The block diagram is a set of three different blocks. The concerned blocks are inputs, PLC module and outputs. Inputs to the PLC module are fed from limit switches that are pressed by the train flanges and a push switch to be pressed by the console operator.

14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/an-expert-system-based-automation-in-indian-traction-system-for-a-one-way-single-platform-station-by-introducing-plc/291679

Related Content

Co-Creating Digital Transformation
Özgecan Kalkan (2022). *Handbook of Research on Digital Transformation Management and Tools (pp. 415-434).*
www.irma-international.org/chapter/co-creating-digital-transformation/311934

Blockchain-Powered Decentralized Finance (DeFi) in Digital Marketing
Khatere Rafiei (2025). *Dynamic and Safe Economy in the Age of Smart Technologies (pp. 91-104).*
www.irma-international.org/chapter/blockchain-powered-decentralized-finance-defi-in-digital-marketing/377631

Data Augmentation Using Deep Convolutional Generative Adversarial Network (DCGAN) for Urdu Numerals
Aamna Bhattiand Rafia Mumtaz (2025). *Generative AI Foundations, Developments, and Applications (pp. 1-20).*
www.irma-international.org/chapter/data-augmentation-using-deep-convolutional-generative-adversarial-network-dcgan-for-urdu-numerals/373331

Effects of Deep Learning Technologies on Employment in the Field of Digital Communication Systems
Thomas Alan Woolmanand Philip Lee (2021). *International Journal of Innovation in the Digital Economy (pp. 35-42).*
www.irma-international.org/article/effects-of-deep-learning-technologies-on-employment-in-the-field-of-digital-communication-systems/287754

A Household Internet Adoption Model Based on Integration of Technology Acceptance Model, Theory of Planned Behavior, and Uses and Gratifications Theory: An Empirical Study on Iranian Households
Shima Mohebbi, Vahid Khatibiand Abbas Keramati (2012). *International Journal of E-Adoption (pp. 51-69).*
www.irma-international.org/article/household-internet-adoption-model-based/64342