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RAILWAY PLATFORM BASED ON PLC CIRCUIT FOR PHYSICALLY CHALLENGED PEOPLE TO AVOID ACCIDENTS

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Abstract - *In Indian Railways, the existing railway platform for handicapped to plate open and close system is relay based open and close railway platform in plate system which is semi-automated. Our work aims at the development of novel PLC based railway platform for handicapped to avoid accident system which will be monitored by PLC. The advantage of using PLC is that a single programmable logic controller can easily run many machines. Also the problem of error correction will become simplified, unlike the old days of relay railway platform where if any alterations were required then the rewiring of panels and devices was very time consuming. Since most of the railway accidents in India happen in the platforms as per the survey, it needs to be eliminated. Even, normal people find it difficult to utilize pathway while crossing the railway tracks to travel from one platform to other. They will get some injuries during their rush time due to their carelessness. So, obviously it will be a really tedious task for handicapped people to enjoy the cheapest and fastest transport ever. They too miss the cherishful journey in the train due to such discomfort. They need an alternative solution to avoid such accidents. Our work focuses on the development of user-friendly dedicated movable platforms for handicapped people. It will further enhance the safety of the physically challenged people with additional salient features.*

1. INTRODUCTION

Railway is lifeline of India and it is being the cheapest modes of transportation are preferred over all other means of transportation. When we go through the daily newspapers we come across many accidents in railroad railings. Railroad-related accidents are more dangerous than other transportation accidents in terms of severity and death rate etc. Therefore more efforts are necessary for improving safety.

Railway accidents may be classified by their effects, e.g.: head-on collisions, rear-end collisions, side collisions, derailments, fires, explosions, etc. They may alternatively be classified by cause, e.g.: driver and signalman error; mechanical failure of rolling stock, tracks and bridges; vandalism, sabotage and terrorism; level crossing misuse and trespassing; natural causes such as flooding and fog; hazards of dangerous goods carried; effectiveness of brakes; and adequacy of operating rules.

India's deadliest rail accidents were the Bihar train disaster (500–800 killed), the Firozabad rail disaster (358 killed), the Gaisal train disaster (285 killed) and the Khanna rail disaster (212 killed). Railway accidents are generally catastrophic, in that the destructive forces of a train usually no match for any other type of vehicle. Train collisions form a major catastrophe, as they cause severe damage to life and property. The place where railway platform intersects each other at the same level is known as open in a plate.

Railways being the cheapest mode of transportation are preferred over all the other means .When we go through the daily newspapers we come across many train accidents occurring at unmanned railway crossings. This is mainly due to the carelessness in manual operations or lack of workers.

We have developed an easy solution for the same. Using simple electronics components we have tried to automate the control of railway platform. As a train approaches the railway crossing in from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the plate..

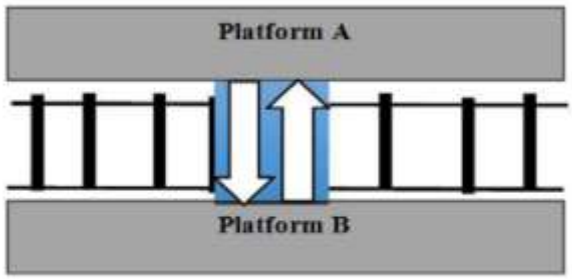
1.1 EXISTING SYSTEM

Initially mechanical railway platform plate open and close was used which consisted of levers, pulleys, steel wire to control signals and channel iron to operate points. Locking between signals and signals, or signals and points were done using levers and a tappet system in the locking frame. Levers and the signaling equipment had direct mechanical connections. However, in this type of railway platform the area of control was limited. Then relay plate in railways is introduced. In Indian Railways, the existing railway platform for handicapped to plate open and close system is relay based open and close railway platform in plate system which is semi-automated

1.2 PROPOSED SYSTEM

Our work aims at the development of novel PLC based railway platform for handicapped to avoid accident system which will be monitored by PLC is proposed as shown in Figure below. The advantage of using PLC is that a single programmable logic controller can easily run many machines. Also the problem of error correction will become

simplified, unlike the old days of relay railway platform where if any alterations were required then the rewiring of panels and devices was very time consuming.



PLC systems will be helpful in collecting and storing information for reporting, troubleshooting and maintenance indications and much more. So PLC based railway platform for handicapped to avoid accident system will prove to be a more efficient. For the communication between PLC and computer LAN cable has been used.

The proposed work concentrated mainly on the comfort of physically challenged people since they require special attention and care. The handicapped people can also make use of our proposed system by ourselves without the help of any other people. They can travel from one platform to other with the help of movable pathways between platforms. It will reduce the risk of accidents majorly occur in the platform crossing pathways. The proposed system aims at developing dedicated user-friendly movable platform pathways for physically challenged people. It will be really a great blooming system for the physically challenged people.

OPERATION OF PROPOSED SYSTEM

The work is based on automation in railways and PLC is the heart of automation. The hardware and the software are the two important areas in our work. In this work, Rexroth IndraLogic L20DP PLC is used for controlling the inputs and outputs. Input supply to the PLC is given through a RPS. The rating of the RPS is 24V. The PLC used here is a compact PLC which has fixed number of inputs and outputs. In this kind of PLC model, the CPU contains 8 digital inputs and 8 digital outputs. One diffused inductive sensor has been used for the positioning of the railway platform sensor distance control and monitoring control.

A geared hydraulic cylinder has been used for running the hydraulic cylinder for controlling the extending and retracting of pathway between platforms. The proposed work is simulated using Indra Works Engineering using Ladder Programming. The working of the proposed system is categorized under four sub modules. They are listed as follows.

1. Sensing train
2. Sensing People in Movable Pathway
3. Movement of Pathway
4. Emergency Actions

SENSING TRAIN

Inductive proximity sensors are used to find the arriving train into particular station. For security purpose and to take suitable actions, the sensors have to be placed at a suitable distance away from the station on all available tracks. Inductive sensors detect the presence of metallic objects. Their operating principle is based on a coil and high frequency oscillator that creates a field in the close surroundings of the sensing surface.

The presence of metal in the operating area causes a change in the oscillation amplitude. This change is identified by a threshold circuit, which changes the output of the sensor. The operating distance of the sensor depends on the coil's size as well as the target's shape, size and material. Inductive position sensors have a long track record for reliable operation in difficult conditions.

Consequently, they are often the automatic choice for safety related, safety critical or high reliability applications. Such applications are common in the military, aerospace, rail and heavy industrial sectors. The reason for this solid reputation relates to the basic physics and principles of operation, which are generally independent of: Moving electrical contacts, Temperature, Humidity, water and condensation Foreign matter such as dirt, grease, grit and sand.

SENSING PEOPLE IN MOVABLE PATHWAY

Capacitive sensors are placed in the movable pathway across platforms for detecting the presence of handicapped people in the pathway. It ensures additional security to the passengers. When a person is utilizing the pathway, the capacitive sensors automatically send commands to the PLC. Capacitive sensors are used for non-contact detection of metallic objects & nonmetallic objects (liquid, plastic, wooden materials and so on). Capacitive proximity sensors use the variation of capacitance between the sensor and the object being detected. When the object is at a preset distance from the sensitive side of the sensor, an electronic circuit inside the sensor begins to oscillate. The rise or fall of such oscillation is identified by a threshold circuit that drives an amplifier for the operation of an external load. nA screw placed on the backside of the sensor allows regulation of the operating distance. This sensitivity regulation is useful in applications, such as detection of full containers and non-detection of empty containers. Capacitive transducers are used in highly dynamic fields. Their high resolution and resistance to temperatures of up to 200 °C predestine capacitive transducers for dynamic measurements in extreme environments. Capacitive displacement sensors are used for distance measurement in low- temperature as a reference system for other distance sensors. Other typical

applications are tolerance testing in mass production, vibration measurement, strain measurement, thickness measurement and thickness control of thin metal foils, thickness measurement of plastic foils during production and bending of wafers in semiconductor production and many more.

MOVEMENT OF PATHWAY

Double acting hydraulic cylinders controls the movement pathway across the platforms in our proposed system. Hydraulic cylinders get their power from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinders are allowed to be in extending position till any train is sensed by the inductive sensors placed at a distance from the stations. The extended hydraulic cylinders create the movable pathway across the platforms. The number of pathways depends upon the size of the station and it also depends on the number of platforms present in the station. When a train comes in the sensing field, the command is send to PLC. PLC send signal to hydraulic cylinders and perform suitable actions as per the Ladder Diagram. The hydraulic cylinders will come to retract position at a single condition that some train should come inside the sensing field and at the same time, the person should not be present in the movable pathway. This condition is proposed for confirming the security of the physically challenged people who are utilizing it.

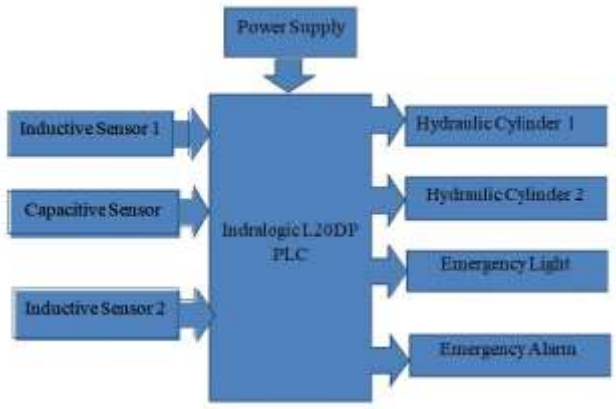
EMERGENCY ACTIONS

The emergency actions are to be initiated by PLC when the physically challenged people need help. As soon as the people are under danger, immediate actions have to be taken out. Consider when a train comes inside the sensing area, but some people are making use of the pathway. As per the automated logic, if the sensors transmit data to PLC that train is coming and Suddenly PLC triggers hydraulic cylinder to retract back to its initial position, it will create serious injuries to the people or even death.

In order to overcome this limitation, during the aforementioned situation instead of sending command to hydraulic cylinders, PLC send command to emergency lights and emergency alarm. It will keep on glowing and buzzing until now the physically challenged people get down from the pathway. Else the light and the alarm keep on glowing and producing sound continuously. So the person from the control room can also understand the situation that someone life is in danger and immediate actions have to be taken out. They can also help the people to comfortably utilizing the system. It is concluded that the proposed system acts as a low cost technology which can create very much comfort among physically challenged people. It will encourage them to use train transport who are hesitating and afraid of dangerous accidents faced in existing railway platforms.

2. BLOCK DIAGRAM OF PROPOSED SYSTEM

The block diagram of the proposed system is shown in Figure. The IndraLogic L20DP PLC acts as the central control of the whole system which provides control and actuating operations.24 V DC power supply acts as the driving force of the controller. The controller commands the output devices to perform specific operations as per the data gathered from the various sensors.



PROPOSED SYSTEM DESIGN

The proposed work is based on development of automation system for the comfort of physically challenged people. PLC acts the heart of automation. The hardware and the software are the two important areas in our work. In this work, Rexroth IndraLogic L20DP PLC is used for controlling the inputs and outputs. The proposed work is simulated in Indra Works Engineering using Ladder Programming. The working of the proposed system is categorized under four sub modules. They are listed as follows. Sensing Train Sensing People in Movable Pathway Movement of Pathway Emergency Actions

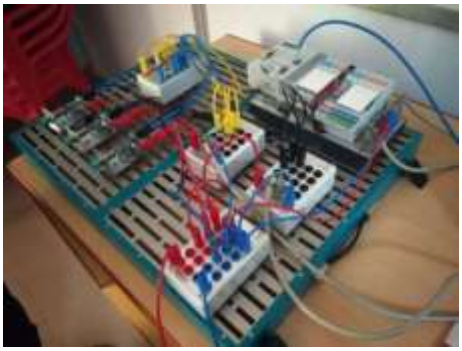
PROGRAMMING Instruction List

```
0001 PROGRAM PLC_PRG
0002 VAR
0003 S1 AT %IX0.0: BOOL;
0004 S2 AT %IX0.1: BOOL;
0005 PC1 AT %QX0.0: BOOL;
0006 PC2 AT %QX0.1: BOOL;
0007 PF_Sensor AT %IX0.2: BOOL;
0008 alarm AT %QX0.2: BOOL;
0009 Light AT %QX0.3: BOOL;
0010 End var
```

HARDWARE IMPLEMETATION

The hardware implementation of the proposed automation system is shown in Figure. The proposed smart crossing pathway is implemented using Rexroth IndraLogic L20 DP

PLC. The ladder diagram is drawn in IndraWorks Engineering and completed the successful simulation. The successfully simulated program is loaded into PLC and prototype of the proposed system is implementation and the performance of the proposed system is also verified.



3. CONCLUSIONS

Automatic railway platform plate control system is centered on the idea of reducing human involvement for closing and opening the railway crossing pathway which allows and prevents humans from crossing railway crossing pathway plate. The railway platform is a cause of many deaths and accidents. Hence, automating the plate can bring about a ring of surety to controlling the plate.

Human may make errors or mistakes so automating this process will reduce the chances of platform accidents while crossing across tracks. Automation of the closing and opening of the railway gate using the switch circuit reduces the accidents to a greater extend. The obstacle detection system implemented reduces the accidents which are usually caused when the railway line passes through the forest.

The proposed system is able to perform all the operations without involvement of any human. This system is able to detect trains coming on same track and also this system can perform automatic railway crossing pathway plate opening and closing. This system is specially designed for physically challenged people.

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