3.3.2-Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

3.3.2.1. **Total number of books and chapters in edited volumes/books published and papers in national/ international conference proceedings year wise during last five years**

Findings of DVV: Provide Cover page, content page and first page of (Development of Automatic Train Safety System Safety grills to avoid railway platform accidents PLC Based Automatic Car Washing System Performance and analysis of electric vehicle Design of PLC and Aurduino based sorting setup with Conveyor belt and Industrial Manipulator) with ISBN numbers, title, author, Department/ School/ Division/ Centre/ Unit/ Cell, name and year of publication.

Clarification for findings of DVV:

Cover page, content page and first page of with ISBN numbers, title, author, Department/ School/ Division/ Centre/ Unit/ Cell, name and year of publication attached herewith.

- Development of Automatic Train Safety System Safety grills to avoid railway platform accidents
- PLC Based Automatic Car Washing System Performance and analysis of electric vehicle
- Design of PLC and Arduino based sorting setup with Conveyor belt and Industrial Manipulator

Nagaraj Kalyanappa Timalapur

Digitally signed by Nagaraj Kalyanappa Timalapur
DN: CN = Nagaraj Kalyanappa Timalapur, C = IN, S = Maharashtra, O = JSPM'S Bhivarabai Sawant Institute of Technology & Research, OU = OTHERS
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(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Proceedings of

9th International Conference on Electrical Energy Systems ICEES 2023

23 - 25 March 2023

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PAPER PRESENTATION SCHEDULE

Paper Presentation Session - 7

Date: 24/03/2023 (Friday) **Time: 01.30 PM – 03.30 PM**

Meeting Link: https://meet.google.com/dcn-rrpd-sfp

Session Chair

Dr. B. Ashok Kumar, *Assistant Professor, Department of EEE, Thiagarajar College of Engineering*
Dr. R. Leo, *Associate Professor, Department of EEE, SSN College of Engineering*

ICEES-166 **Design of Zeta Converter for HEV**

Maithili P, Dhurga Sri S, Jayanthish MJ, Balaji R

ICEES-170 **IOT based battery monitoring system for solar PV fed DC-DC converter**

Dr.M.Nirmala, Vijaya Varshini V, Siva S, Sanjay Kumar R

ICEES-172 **A Robust Framework for Traffic Object Detection Using Intelligent Techniques**

Nandhini T J, K Thinakaran

ICEES-173 **Power Management for PV-Wind and Hybrid Energy Storage Integrated Micro Grid**

Abishek M, Gokul R, Karthiga P, Lokesh P, Banumathi S

ICEES-176 **Hysteretic Controlled Quadratic Boost Converter-Three Phase Inverter fed PMSM for E-Car with Enhanced Time Response**
S.Bhavani, A.Sivaprakasam

ICEES-177 **Charging station slot booking system using IoT**

R.Aruna, R.Dinesh, P.Lakshmanaraj, L.Rajesh

ICEES-181 **Analysis of air gap flux density of 3 Ph SQIM by 3D Maxwell and MMf permeance method under no load condition**
Payal Suthar, Dr. Ketan Badgujar

ICEES-182 **Enhanced Renewable Energy Equipped Remote Village Power Supply Management Using Hydrogen**
P.Vimal, Dr.G.Sivasankar

ICEES-183 **Modern Power System Operations in Effective Transmission Congestion Management via Optimal DG Capacity Using Firefly Algorithms**
Thiruvel A P, Thiruppathi S, Dr. Chidambararaj N, \ Aravindhan K

ICEES-184 **Comparison of the Heat Transfer Capability of Various Nanofluids in a Flat Plate Solar Collector**
Utkarsh Verma, Shivraj Yadav, Gaurav Kumar, Raj Kumar Singh

ICEES
109

Safety Grills to Avoid Railway Platform Accident

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The goal of this research is to prevent a train accident, preventing costly injuries and fatalities in the process. Therefore, railway departments can benefit from this project. Because train accidents are more commonly happening in India this project notifies the microcontroller of the status of each train's IR transceivers.

Keywords: *IOT, railway, Arduino, autonomous platform*

ICEES
112

Development of Automatic Railway Train Safety System

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Fire and smoke can be detected by the automatic railway safety system, which can then trigger a series of alarm-driven events. A motor that is pictured in the project as a chain-pulling device or a breaking system activates when a fire is detected. As a result, the train can be stopped in this way, and the passengers and other payloads can then be protected. Along with breaking, the device emits a buzzer to warn passengers in the area so they can exercise caution in the event of a fire in the train. The Railway Authorities are also received an SMS, which will aid them in making timely decisions to putout the fire and evacuate the-train. Hence this project offers a very-robust for safety in the Railways which works automatically help of microcontrollers and sensors.

Keywords: *Train Safety, Fire, Smoke, Buzzer etc*

SAFETY GRILLS TO AVOID RAILWAY PLATFORM ACCIDENT

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***Abstract*—The goal of this research is to prevent a train accident, preventing costly injuries and fatalities in the process. Therefore, railway departments can benefit from this project.**

Because train accidents are more commonly happening in India this project notifies the microcontroller of the status of each train's IR transceivers. The goal of this research is to prevent a train accident, preventing costly injuries and fatalities in the process. Therefore, railway departments can benefit from this project.

Keywords— IOT, railway, Arduino, autonomous platform.

I. INTRODUCTION

India's modern railway system is entirely artificial and not device-managed. We utilize bridges at train track stations. It is far away. For old or disabled people, the bridge is a difficult and long route to use. This paper defines the helpful response.(1) By using a sensor that is mechanically utilized to be near or open cellular grills, in particular, the route of the train is sensed. Sensors are placed on each side of the track to detect the motion of the train. (2) The ultrasonic sensor will let the Microcontroller detects the trains. The controller will pulse the servo motor to instantly close the barrier gates when it notices a train on one track.. The Indian railway system is one of Asia's largest rail networks. (3) One of the safest forms of public transportation is the railroad, and maintaining the network's safety is its main concern. It is a great task to create a system that is reliable and safe.

Unmanageable platform crossings are one of the Indian Railways' trouble spots and a major cause of accidents. (4) The short horizontal grill that can be moved or slide horizontally by the sensor and motor to be adjusted after and before the arrival of the train. (5)The Depending on whether a train is present or not, one section of the grill or platform that is connected from the first platform to the second section will be moved or slide to the second platform extremely smoothly. That will keep the people who will suffer from them in a comfortable position.

The height of a rail platform is the height above the top of the rail or the passenger platform at a station. (6) The ATR height of the floor of rail vehicles is referred to as a term connected to train floor height. Recent studies have shown that while passenger injuries are on the increasing, fatalities in railway accidents are quite rare. (7) The safety of human life is more important in this project, which is built to avoid accidents and reduce associated costs. The idea is converted into an idea with the concern, and the flow of that idea is shown below in the flow process.

II. EXISTING SYSTEM

The railway platform is not well-developed in the current method. Currently, to get from one platform to another, we use steps. People with physical restrictions may find it difficult to use the steps to get from one platform to another. People occasionally just walk across the railroad tracks without using the stairs. They run a chance of dead as a result. People frequently are using the trains that are on the opposite side to cross from one station to another, which could be harmful.

III. OPERATION OF PROPOSED SYSTEM

Heavy rain and fog make it difficult for trains to run on schedule. The suggested system uses an IR sensor to detect each train's position and transmit that information to a microcontroller. According to the most recent social analytics poll, climbing up the overhead steps is the worst part of using the Indian Railways for physically challenged people.

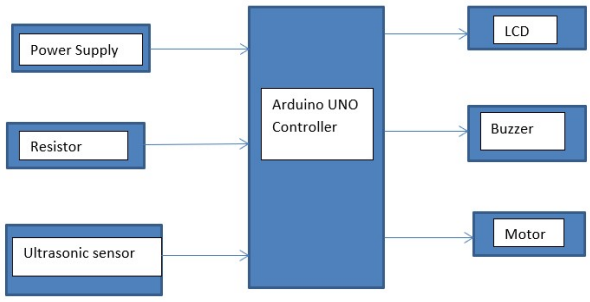

Fig.1 Operation of Proposed system

Our suggested approach as shown in Fig. 1 specifically corrects or resolves the issue by presenting the interesting concept of using a Wi-Fi module system.

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Nowadays, because we all have smartphones Rather than going to a display board, it is easier to connect to the network and determine whether the platform is open. To alert users when a platform opens and closes, we use the default application. The ultrasonic sensor recognizes the train as it approaches the station and provides the controller the pertinent information. The ultrasonic sensor detects moving people and informs them with a buzzer or light after informing them of the train's existence. A synthetic platform could be built to instruct or serve any other purpose once the train has arrived at the destination. The artificial grills once more close and alert the passenger to the train's departure as soon as it leaves the platform. A new synthetic platform is created after the train has left, and passengers are advised to utilize it. Our project's primary goal is to cut electricity usage even more. Unwanted accidents can be minimized as results.

This technique also saves a lot of time significantly more than the previous ones. In response to the new technique described below, people enter and exit the platform from the train via grills and gates.

IV. BASIC BLOCK DIAGRAM

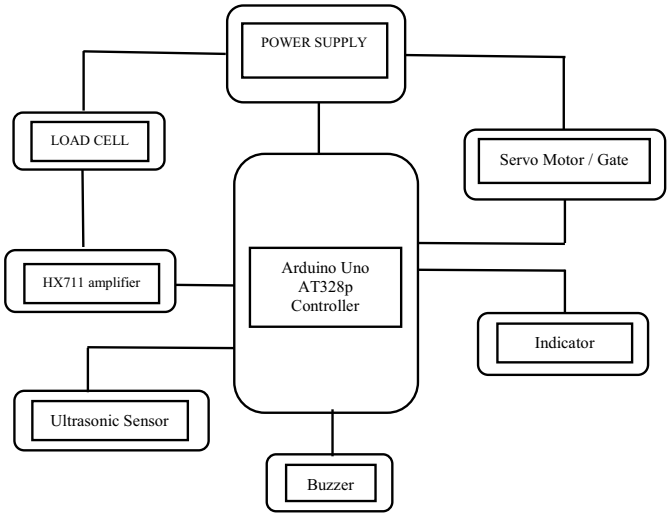

Fig.2 Block diagram

This is prototype project of design of safety grill to avoid railway platform accident. Firstly, we use load cell for measuring railway weight. Then we use ultrasonic sensor for measuring the distance, level and obstacle after that for the indication we can use the different appliances as like different color LED and buzzer. Then we used servomotor as a railway Barrier gate. then we used the resistor for opposition to flow of current. Due to this resistor LED is not burn. That's why resistor is used. In this project HX711 module is also used. it is an analogue to digital converter for load cell. Then in this project Arduino controller is main device. Above all these components are interfacing the Arduino controller. As per application, working we can applying the logic programming and it interfacing to the sensor. Any input and output device are interfacing the Arduino controller. When the power supply is ON, if yellow light/signal is blinking then the gate will move into an upward position. Suppose train comes on the station, train weight can be detected with the help of sensor and both gates moves in downward position. The Train runs forward direction till station comes. Once train will reach to the station and sensor sense it. After that both gates will open. Gate on opposite side will be in closed position due to which entry will not be given to the passenger who are entering from non-platform side. Then we have set delay of 30sec.if 30sec countdown is over or completed then gate will automatically closed or it is in downward position. As train left platform both gates are open. It is the final working of our project. Fig.2 represent the block diagram of proposed system. After that how to work the system will show with the help of Fig 3 flowchart. Fig .4 & Fig .5. shows the actual model of proposed system with open and closed grill.

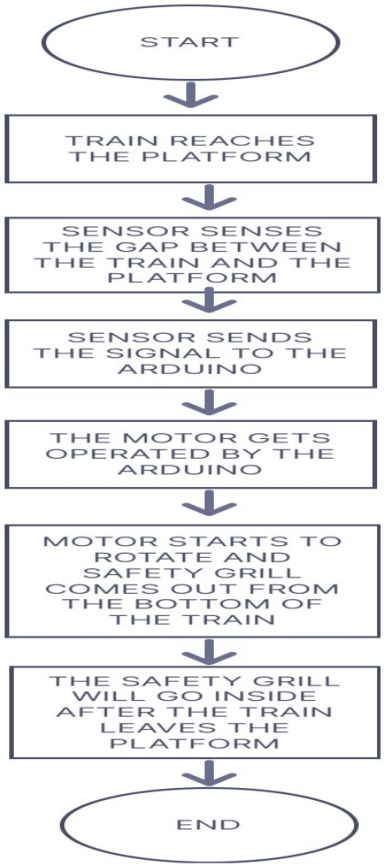

Fig.3 Flowchart of Execution

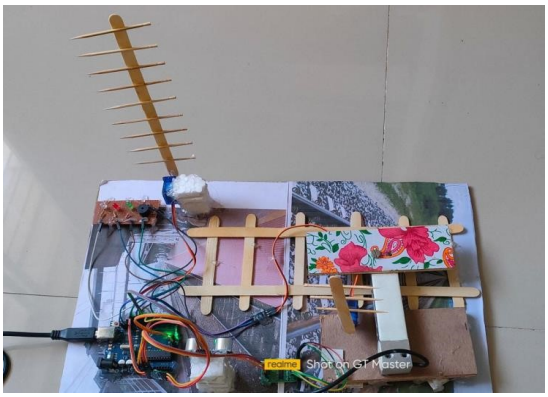

Fig.4 Final Model (Open Grill)

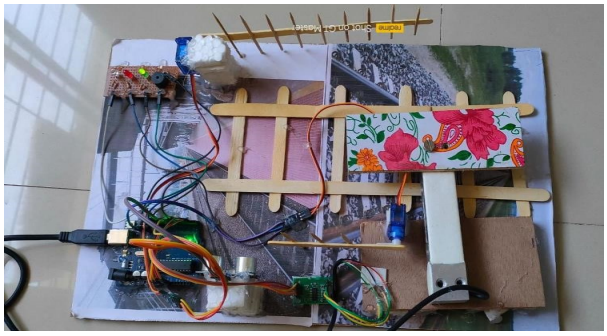

Fig.5 Final Model (Closed Grill)

V. CONCLUSION

Here, a brilliantly designed moving artificial platform is built to lessen the stress of passengers utilizing stairs to go from one platform to another, which is time-consuming, especially for people who are physically impaired. Our proposed system or model gives clear idea how to minimize the accident that happens during the boarding of passenger who came late or want to catch the train after departure of train. Here, IR sensors are utilized to detect trains, and the artificial platform is opened and closed in reply to train arrival and departure. Mostly people coming at last minute try to board in train even it is in motion, which causes major accident. These accidents may be tolerated as our proposed system impose the barriers as soon as train start departing. Future improvements included an artificial platform with high load-bearing capability.

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SECOND INTERNATIONAL CONFERENCE ON INNOVATIONS IN CLEAN ENERGY TECHNOLOGIES

ICET 2023

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The objective of this International Conference on Innovations in Clean Energy Technologies "ICET 2023" is to provide a platform for researchers, engineers, academicians and industrial professionals to present and discuss smart green technologies for sustainable future with recent advances, trends, and development which is taking place all across the globe.

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Important Dates

Paper Submission	2nd March 2023
Notification of Acceptance	10th March 2023
Registration	15th March 2023

Publication & Registration Details

Category	Fees
Student	INR 3000
Faculty	INR 4000
Foreign participant	USD 200

Theme

Hydrogen Energy, Engine & Fuel, Air Quality, EV , R & D / Manufacturing for smart technologies based products, Green buildings/ Smart Cities, Pollution Control, Waste Management, Hydropower, Materials Processing, Characterization and Applications, Simulation and Modelling, Solar & wind Energy, Biomass Energy, Fuel Cell, Bio-Energy, Energy policy, Carbon Sequestration, Other Area of Energy & Environmental Engineering

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As per information received from conveyor of ICET 2023, Bhopal, the papers entitled

1. PLC Based Automatic Car Washing System Performance and analysis of electric vehicle
2. Design of PLC and Aurduino based sorting setup with Conveyor belt and Industrial Manipulator)

Will be published online by SPRINGER in the month of May 2024

PLC BASED AUTOMATIC CAR WASHING SYSTEM

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Abstract **–** Automobile wash systems supports fully automated car washing in a short amount of time. We show a clever PLC-based vehicle wash system that can entirely automate the automobile cleaning operation. The system comprises of a four-stage vehicle washsystem. It is made up of a tiny conveyor belt that mountsto a car. It has an infrared sensor that recognizes when a car in the system is parked. Upon detecting, the technology now initiates the belt movement via a motorised mechanism, and the vehicle proceeds to the first step. This step includes a preliminary sprayer that sprays water over the automobile before passing it on tothe following stage. The following is a spinning brush device that rotates dual brushes[1].

The next one is a spinning brush system, which rotates two brushes to clean and wipe the car further. The following stage is a dual sprayer, which sprays water from the top and bottom of the vehicle to wash it simultaneously from both sides. The belt now transports the vehicles to the last phase, whereby DC fans are usedto dry the vehicle after it has been washed. The technology enables an automated automobile washing procedure by detecting the vehicle and controlling its movement at each phase. The water thrown on the vehicle is collected under the mesh of the system and asses through a filter before being utilised for the next wash, saving a lot of water that would otherwise be lostin car washes[2].

Keywords – PLC, Proximity sensor, SMPS, HMI, Ladder Diagram.

I. INTRODUCTION

A car washing system is a simple way for preserving orkeeping the vehicle's exterior clean. A car's front surfaces must be kept clean to minimize corrosion and oxidation and to reduce the occurrence of minor scratches. This provides efficacy in automatically cleaning the car with the help of a Control System (PLC). This is used to technique consists of two types washing & cleaning. Washing also consists of three types first clean water is spray over the motor, followed by detergent water, and finally, normal steam is sprayed[3].

After that, the cleaning phase started. During the wash cycle, moisture in the vehicles is eliminated with cotton brushes. PLCs are specialized computers that are used for process control and operation. They use a Memory that could be customized to contain two or more jobs and conduct business such as timing, counting, on/off control, and so on. Many electromagnetic relays were utilized in older systems, but they have now been replaced by PLCs, which quickly alert the data of completion and emergency. The ladder logic of a Trading firm automated vehicle washing machine isbuilt from around washer's function employing programmed delays. The manual process of repairing a car involves more labour and water[4].

Our goal in this study for create a Fire of Automation extinguisher robot that can identify fire hazards autonomously, alert surrounding fire service authorities, and take action to prevent fire spread. Three criteria areused to detect a fire hazard: temperature, smoke, and flame. These characteristics are measured using three separate sensors. If the temperature or smoke level exceeds a certain threshold, the robot considers the condition to be a fire hazard. In this case, the robot begins running along a specified course, utilising its flame sensor to seek for.

fire. When a flame sensor detects a flame, the robot begins throwing extinguishingelements including such water, foam, gas, or other extinguishing materials.

A robot is a mechanical creation that performs human functions and behaves like a person. Sensors, control systems, manipulators, power supply, and software are the most important components of a robot. It is about constructing systems and connecting motors, cables, andother components. Robots are designed to minimize human effort in demanding or hazardous work conditions, as well as to function in inaccessible locations. The fire sprinkler the time has come for a robot to detect and extinguish a fire on its own. People and property can be saved at a considerably greater ratewith very modest fire damage if such a device is invented. Our aim was to create a model system that could detect and extinguish a fire on its own[5].

II. BLOCK DIAGRAM AND OPERATION

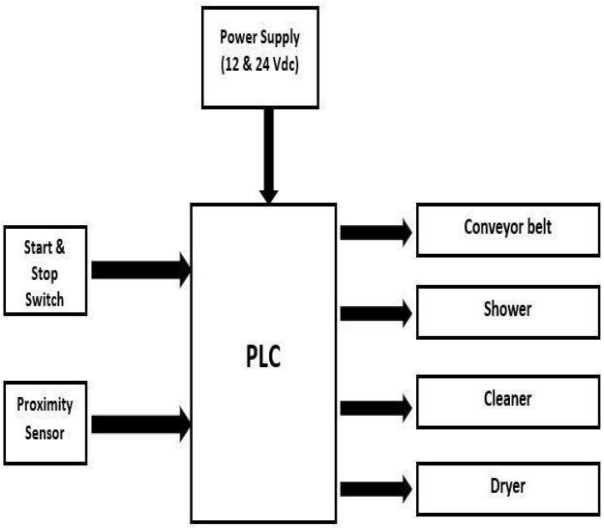

Fig.1 Block Diagram of System

A. Car Entry (1st Section)

Whenever the energy infrastructure is pressed, the conveying motor commences to evolve, and preferably, the starting components opens with both the auto, and when the prolong is delayed, the first unit proceeds to evolve so under command of the plc. A conveyor motor were protected by a relay, and the automobiles progressed to the next unit.

B. Soapy Water Sprinkler (2nd Section)

The PLC relay enters the backcourt when the initial sensor

alerts the PLC that such motor is in the second unit. As the current unit shuts down, the conveyor continues and the auto arrive at the next unit.

C. Brusher (3rd Section)

When such second sensor notifies the PLC that the van is in the defending team, the PLC relay initiates every third unit. The conveyors then seal the same as in the previous article, and the carriage arrives at the next unit.

D. Clean Water Sprinkler (4th Section)

When the computer receives the information from the third sensor. The vehicle is in the 4th unit, which again is managed by the PLC Relays. The feeder continues inthe same closure as the previous module, and the vehiclelands at the next unit.

E. Dryer (5th Section)

When the fourth sensor informs the PLC that perhaps thevehicle is in the fifth unit, the fifth revolution occurs with the Scada Relay. And the succeeding unit is matched by a corresponding unit. except, this sensor now locks the conveyor, and it is over with one timer. The conveyor may use the 5th section to flip on and offwhen the timer's period is over.

Following component are used:

DELTA PLC, HMI, DC Motor,12v SMPS, Proximity sensor, Relay, Conveyor belt

III. HARDWARE DESIGN

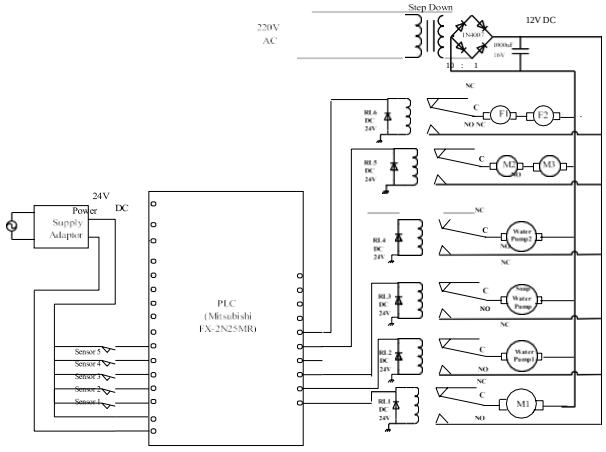

Fig.2 Hardware design of system

Depicts the overall circuit design of the proposed system. The fundamental component of the support system is the Programmed Logic device to the Controller (PLC). PLC (MITSUBISHI) is utilized in this system to handle the function of the vehicle detection washing system. It has10 input pins and 14 dedifferentiated.

A step backwards inverter converts a 220AC supply voltage to a 24V supply voltage. The rectifier links a 24V intermittent current to a 24V direct existing capacity and a 12V dc power supply to the motors. IR were connected using sensors. The Y0 signal of the PLC Scada during To the segregating. attached the conveyormotor. The filter of Mac Y0 output to the genereting to the motor is tied to the conveyor motor. Dc Power brush motors are coupled to the paralleled output Y3[6]. The digital output Y4 is then connected to the pump motor 2.

A. PLC-based Automatic Washing System Operation:

The roller carries the pickup through the numerous cleaning procedures. DC motors drive the conveyor belt through belts and brushes. A conveyor functions successfully when its components are in good conditionand properly positioned[7]. When a vehicle enters the conveyor, a switch is flicked, and the conveyor begins to move with the assistance of a motor, transporting thevehicle to the next segment. When the vehicle enters thewash to the section, sensor 1 detects it and releases the sprinkler, which closes automatically after 10 seconds. Conveyor is going until it reaches the next stage (Final wash), at this moment sensor 4 recognises the car and the sprinkler opens for 10 seconds before shutting. The conveyor has moved on to the next rung (Drying). As it approaches the latter discussion, Sensor 5 senses the car's dry fan, which starts dry for 10 seconds before shutting off[8].

B. System Flowchart of PLC

Depicts the system flow chart of the PLC- based automatic car washing system. Initially, the conveyor was upgraded. When sensor 1 senses a motor, the conveyor stops and water pump motor 1 runs for 10seconds[9].

IV. FINAL MODEL

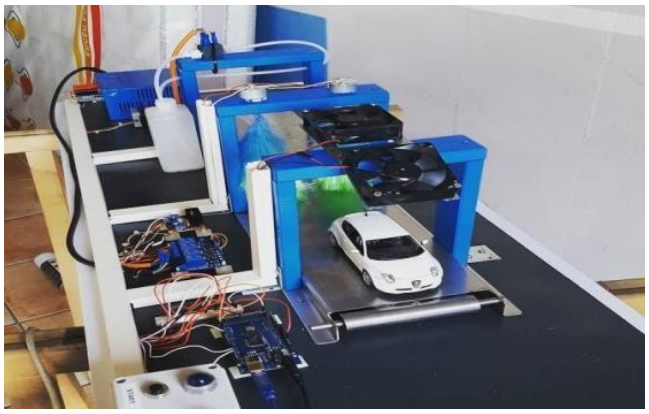

Fig.3 Actual model

V. LADDER DIAGRAM

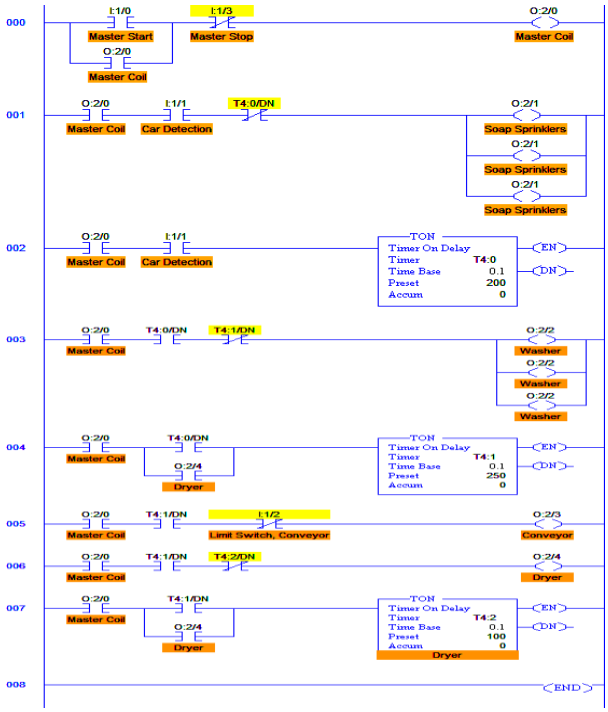

Fig.4 Ladder diagram

The project focuses on the development of a firefighter robot that may be deployed to extinguish a fire. It may also be operated using a smartphone. As there is aBluetooth module.

VI.ADVANTAGES

- This project helps in saving water.
- Saving Time.

VII. DISADVANTAGES

- Primary instrument is high.
- System installation is complex.

VIII.APPLICATIONS

- In automobile manufacturing firms and service stations.
- Car replacement and station upkeep.
- Automobile body building industry.

IX. FUTURE SCOPE

It could possibly be accomplished in the future utilizing sun's radiation, geothermal heating, and a variable-speed drive vacuum pump. It can also be added to include an interior wash, an underground chases system, a money or token system, and a metre that monitors the number of washed wheels.

X. RESULT AND DISCUSSION

The project helps us save water and time while washing the car, and the system is simple to use, however the initial installation cost is significant, and the system installation is a bit complicated. When timer in the Programming ladder diagram reached the preset value, the conveyor ladder came to a halt at the location of therelevant nozzle. When such aggregate reaches the specified washing time, the conveyor starts and moves the car to the next nozzle area for the next phase. The proportion of particle can be adjusted to modify the washing time.

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Design of PLC and Arduino based Sorting Setup with Conveyor Belt and Industrial Manipulator

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Abstract. Due to demand and supply the production rate of industries has increased. Most of manufacruring industries are manufacturing different size, colour, shape & different weight of product so sorting thing is necessary in manifacturing sectors. Manual sorting is a labor-intensive, slow, inconsistent and time consuming task that needs specialized workers. While automated solutions are dependable, quick and time-effective when it comes to sorting, The items could be the same metal or non metal objects or color or various colors.The system would be able to identify the objects and then classify them according to metal, non metal or color. Things may come in variety of slots. As a result, various objects and parameters call for various processing techniques. Our goal is to categories things using metal, non metal, color-based things and the results will then be further sorted utilizing integrated.

Keywords: Time-effective, Dependable, Programmable Logic Controller, Conveyor Belt, Automation, Packaging, Automatic Robotic arm

1 Introduction

The main job that needs to be done in many sorting enterprises is object sorting. Industries that require visual inspection conducted by human operators prefer the old method of manual sorting. This conventional method is cumbersome, time-consuming, and expensive for industries. It is now challenging to find employees who are qualified and eager to embark on the laborious process of inspection. Embedded vision is used in the proposed system to develop and implement an automatic method for classifying and recognising products based on metal, non-metal, colour [1].

Nowadays, conveyor belt systems are frequently employed as item separators in industrial facilities, cement plants, power plants, and facilities that process food. In the vast majority of assembly mechanical applications, conveyor belts are a very popular and extreme solution [2].

The significance of process automation has grown in recent years as the expansion of any industry directly depends on it. Robots with sensors and actuators are employed inindustries for accurate output and accuracy [3].

Earlier suggested sorting approaches were mostly based on machine vision, hyperspectral imaging PLCs, and/or other sensors [4]. Nevertheless, these proposed approaches have significant drawbacks, including low sorting efficiency, large time intervals between inputs, inaccuracy in identifying various items, machine limitations for specific tasks, separate programming for each activity (increases machine complexity), and manual operation. This study has three major aims [5].

First task is to count number of entering objects on conveyor belt using counter. Second task is to distinguish among metal and non-metal using proximity sensor. Third task is sorting the objects on the basis of color.

2 Literature Survey

The fundamental function of a conveyor system is to carry things from one destination to another. People may now move objects that are too big or heavy for them to carry by hand thanks to the design [6]. The time it takes to move objects from one place to another is decreased via conveyor system. Their classification is purely based on metal and non-metal and color. Human labour is frequently adequate when dealing with an industry with a modest rate of production [7].

Robotics and industrial automation are crucial for corporate expansion. Product quality and adaptability are the primary factors in the industrial sector [8]. In the 1980s, robots carried out inefficient operations like as welding, material transportation, painting, and machine tending. In the 1990s, it was anticipated that industrial robots would play a large role in applications requiring a high degree of precision and accuracy [9]. In order to guarantee the precision and quality of the goods, autonomous robots with sensors are deployed, which continuously accelerates industrial growth. Robots are designed for a specific task using sensory input to achieve this accuracy [10]. By precisely identifying the properties of tiny particles in a fast-moving stream in real time, it would be able to open up new possibilities for industrial sorting operations [11].

3 Design of System

Table 1. Components used with specifications

COMPONENTES	SPECIFICATIONS AND RATINGS
PLC	Mitsubishi, Model no. GC35MH-16MT-DS, Power Input- 24volt DC, 400mA, 9.6watts
Conveyor Belt	Torque- 2.5kg/cm, Separation Motor- 45RPM
Relay	Universal Relay, Model No. BN 1433298, 24volt DC, 10A, 4 Pins
Servo Motor	DC Geared Motor, 12v, 100RPM, Torque up to 2 kg-cm
Inductive Proximity Sensor	Connector M8, 3 Pin, stainless steel, sensing distance-2/4mm
Capacitive Proximity Sensor	PCK Series, Plastic Housing M18, 3 Pin, stainless steel, sensing Distance-8mm
Color Sensor	TCS3200 Colour Sensor (R, G, B)
Arduino	ATmega328p, 5Volt, I/O PINS- 14, Flash memory- 32kb
Robotic Arm	3D printed robotic arm
Push Button	Start, Stop

As above table no.1 mentioned information in brief of components used is as follows:

3.1 Programmable Logic Controller

Above figure shows (fig1) the specification of a PLC. A programmable logic controller (PLC) is a user-friendly electronic device that includes both hardware and software to control the functioning of equipment and system processes. The advantage of utilising a PLC is that it is simple to programme and reprogramme. Mitsubishi PLC was employed in this project. To programme the PLC, we utilised CODESYS. CODESYS licences are free and can be lawfully installed on additional workstations without copy protection.

3.2 Conveyor Belt

Table 1 shows the specification of conveyor belt. In this system we have used 2 conveyor belts. First one is main conveyor belt which we have denoted by A and second conveyor belt is packaging belt which is denoted as B.

3.3 Relay

The relay used works on 24 Volt DC with 4pins. Two relay coils are used for each motor. Relay is divided into two parts that is input and output. This relay is interfaced with PLC.

3.4 DC servomotor

The direct current motor transfers electrical energy into mechanical energy, which is used to rotate the conveyor belt. The speed of the DC motor may be varied across a large range by changing the supply voltage or the current. We had used two motors of rating 12volt, 100rpm for conveyor motor.

3.5 Sensor

Sensors are devices that are frequently used to detect and respond to electrical or optical signals. Sensor converts the physical parameter like temperature, pressure, humidity, speed, etc. into a signal which can be measured electrically. A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. In our project we have used three sensors-

3.6 Capacitive Proximity sensor:

A capacitive proximity sensor is a type of sensing device that detects metallic and nonmetallic items on a conveyor belt. To produce a sensing field, a capacitive

proximity sensor employs dielectric principles of capacitance. A capacitive proximity sensor does not have to make physical touch with the item or target. In our project we have used sensor of Autonics CR18-8DN, 12VDC with dimensions of 12.7×12.7×2.8 cm.

3.7 Inductive Sensor

Inductive sensors use principle of electromagnetic induction to detect target or objects. Here we have used inductive sensor to detect the metallic objects on the conveyor belt. With a rating of 12VDC, 8mm with 3 core cable inductive sensor is used in this system.

3.8 TSC3200 Color sensor

A wide range of their wavelengths may be detected by the color sensor. This sensor may be used for a variety of color recognition tasks, including color matching, sorting, and more. It has a microcontroller interface. We are using TSC3200 sensor. TCS 3200 is responsible for detection of objects based on their color like RED, GREEN, BLUE. The sensing range is 10 +/- 3mm, 0.394 +/- 0.118 in.

3.9 Arduino

A arduino is a miniature microprocessor on an integrated circuit that regulates the functioning of an embedded device. It features 14 pins of ROM storage, 4kb of RAM storage, and 32 bytes of RAM storage. In the microcontroller, an on-chip crystal oscillator with a crystal frequency of 12MHz is implemented. ATmega 328p ardunio is used to interface color sensor and Robotic arm.

3.10 Robotic Arm

3D printed robotic arm is used to pick up job or object which are classified according to color. Arm rotates in 30 degrees to pick up red color object, on 60 degree it picks up green colored objects and on 90 degree blue colored objects will be picked up. This robotic am is interfaced with microcontroller.

4 Operation

Below figure shows the block diagam of a system. Block Diagram represents easy understanding of a system.

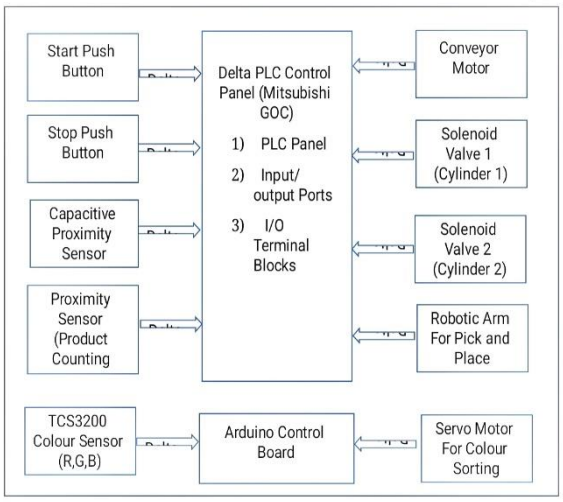

Figure 1. Block diagram of system

Above figure

shows block diagram of a system. As shown in (fig.1) all the sensors are interfaced with PLC. First, we provide a 230 volt AC supply to the SMPS. There are two of them. First, the SMPS converts 230 volts AC to 24 volts DC. PLC is powered by a 24 volt DC supply. The second SMPS converts 230 volts AC to 12 volts DC. This is the system's power wiring. PLC input is connected to push button, capacitive, and inductive sensors. The relays served as interfaces with the Mitsubishi PLC. Relay is connected to three DC servomotors. A color sensor and a robotic arm are linked to a microcontroller. This is the system's control wiring.

The PLC receives power from the SMPS. When we press the push button, the conveyor belt A begins to rotate ahead. The counter counts the number of things that enter the belt. The non-metallic objects on the conveyor belt are detected by a capacitive proximity sensor. The inductive sensor installed on the conveyor belt detects metallic objects and sends a signal to the motor of the separator arm. This arm separates non-metallic things from the conveyor belt.

The TCS-3200 color sensor is used for color-based sorting on the second conveyor belt. This color sensor has a microcontroller interface. Depending on the colour of the object, the colour sensor will detect R (Red), G (Green), and B (Blue) hues. The robotic arm may move in a 30°, 60°, or 90° angle. The robotic arm will then select and position the thing specifically in accordance with its colour before finally separating all items on the conveyor belt into separate containers.

5 Ladder Diagram

Below figure shows the ladder diagram of a system. We have used ladder diagram as it is simple and easy to understand.

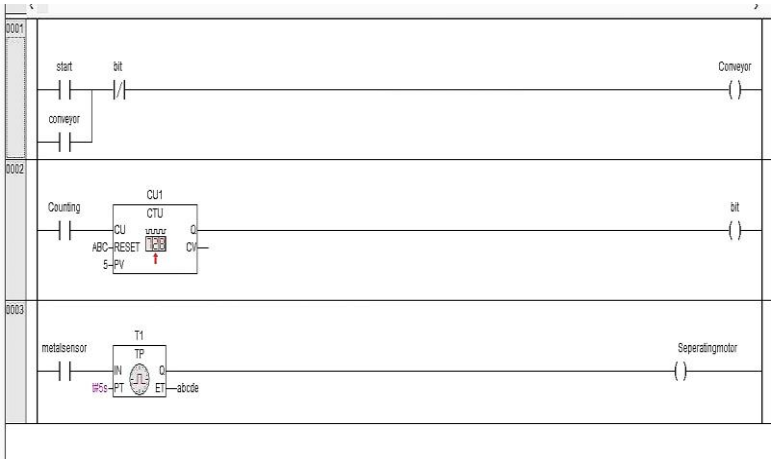

Figure 2. Ladder Diagram of a system

As shown in fig 2, First rung contains push button which is used to start or stop the conveyor belt. Pressing the push button results in rotation of conveyor belt. After that counter starts counting the objects. In third rung metal sensor senses the presence of metal and motor turns on.

6 Final Model

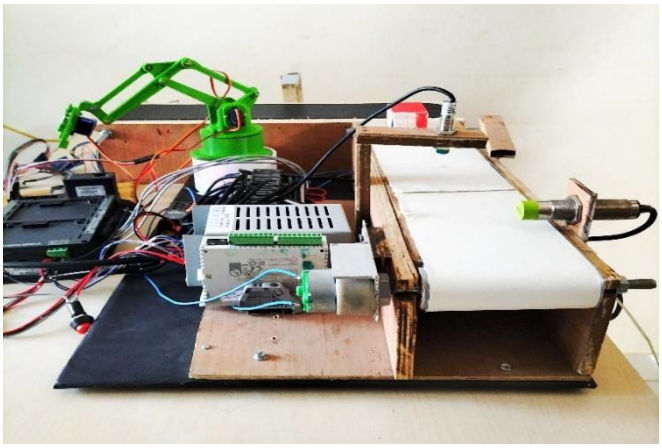

Figure 3. Final model of system

7 Flowchart

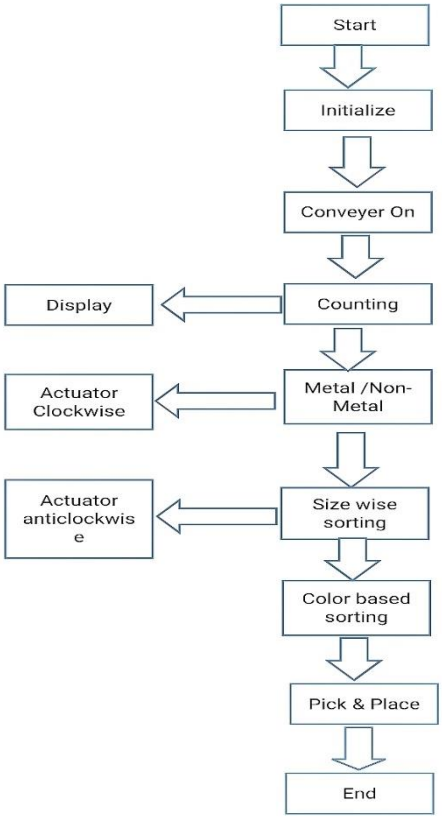

Figure 4. Block Diagram of System

Above figure contains flow chart. It shows simple working of the system

8 Result

We used a Programmable Logic Controller to create a straightforward sorting system (PLC). The categories used for this categorization are metal, non-metal, and color. The entering objects on the conveyor belt are counted by counter. The objects coming through conveyor belt will be detected on basis of metal and non-metal sorting. Objects will be sensed by inductive and capacitive sensor fitted on conveyor belt. Mmetallic objects will be removed by using separator arm. Later objects will be sorted according to the color on the conveyor belt by color sensor.

9 Future Extension

Object detection technology of the future, like the first Industrial Revolution, is still in the early stages of development, but it has the potential to free people from mundane tasks that robots can perform more effectively and efficiently. lays the groundwork for a variety of later computer vision tasks such as object tracking, image labelling, and segmentation Number-plate recognition, face recognition, text detection, pedestrian detection, people counting, and face and text detection are all applications for specific object detection.

10 Conclusion

We tried to provide a setup in our project report that would need minimal human labour using the low-cost automation method to reduce expenses Cycle time, production speed, and risk reductions have all insome ways helped human labour. There will be constraints since it is difficult to organise the project such that the resources and components are available. This arrangement can be improved further by incorporating a sorting system that organises the pieces based on additional physical criteria. One might use one of the many sensors to do this. It may be used to automatically and correctly sort a variety of tools and items in an industrial setting.

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