Automatic Movable Railway Platform with Train Arrival detection

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ABSTRACT: The objective of this project is to provide an automatic railway gate at a level crossing replacing the gates operated by the gatekeeper. It deals with two things. Firstly, it deals with the reduction of time for which the gate is being kept closed. And secondly, to provide safety to the road users by reducing the accidents. By the presently existing system once the train leaves the station, the stationmaster informs the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information, he closes the gate depending on the timing at which the train arrives. Hence, if the train is late due to certain reasons, then gate remain closed for a long time causing traffic near the gates. By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also reduces the human labour. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since, the operation is automatic; error due to manual operation is prevented Automatic railway gate control is highly economical microcontroller based arrangement, designed for use in almost all the unmanned level crossings in the country.

Keywords: IR Sensors, ATMega16 Micro controller, Servomotor

I.INTRODUCTION

In the developing countries like India accidents at the railway crossing are increasing day by day. The main reason of these accidents is negligence of train drivers and platform keepers. So this system is mostly designed to help railway. This system is also useful for various industries for safety purpose. After all security matters more. It includes opening and closing of platform by the use of Arduino Bluetooth app in our mobile. The projects designed to control over the railway level crossing platform using Android mobile phone by the platform keeper. Opening and closing of railway level crossing platform involves man power, which could be often causes incorrect leading to accidents. This system prevents the need of any human involvement at the railway level crossing.

The project is designed to achieve control on the railway level crossing platform through Android Application by the platform keeper. Opening and closing of railway level crossing platform involves manpower, which could be often incorrect Automatic Movable Railway Platform 3 leading to the accidents. The proposed system prevent any human involvement at the railway level crossing. This system consists opening and closing of the level crossing platform with help of an Android Application Device.

1. BLOCK DIAGRAM:

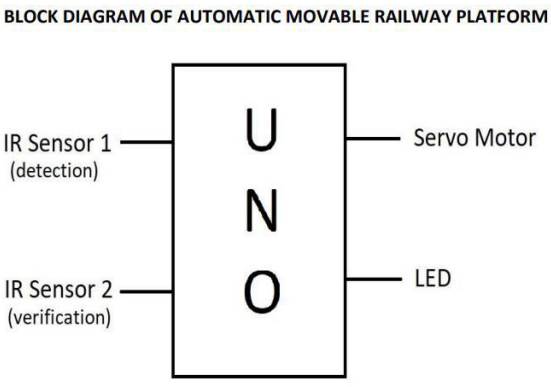

Fig 1.1 Block Diagram of Automatic Movable Platform

In this project to lift the time taken to cross the railway platforms and time taken for the railway crossing gate are reduced using D.C.

series motor. Gear arrangement is used. The IR sensor at two points on the either side of railway crossing gate is used. The IR sensor transmitter transmit the signal which placed in engine and gard, and IR receiver is placed on track which received a data and complete the circuit when railway will pass through it and the gate will be closed and similarly when the rail will pass through the another receiver which is mounted on the other side of gate, the receiver take a signal to controller and get operated. Hence the motor will operate and with help of gear, and the gate will open. The project is designed to control over the railway level crossing platform using Android mobile phone by the platform keeper. Opening and closing of railway level crossing platform involves manpower, which could be often causes incorrect leading to accidents. This system prevents the need of any human involvement at the railway level crossing.

2. EXISTING SYSTEM

The modern railway structures in India aren't device managed which are absolutely synthetic. In railroad track station usually we use bridges. It's a long way very hard for the senior residents or handicapped humans to use the bridge. Automatic Movable Railway Platform 4 In the Indian Railways system, foot over bridges (FOBs) are important infrastructure elements designed to provide safe passage for pedestrians over railway tracks at stations. They are crucial for ensuring the safety and convenience of passengers. The existing system of foot over bridges in Indian Railways varies across different stations and depends on factors such as the station's size, passenger footfall, and infrastructure. Different types of foot over bridges include:

1) Conventional FOB's
2) Sky Walks
3) Subways

3. PROBLEM STATEMENT

It is a time taking process to cross the platform using the traditional method of foot over bridges. Its is very difficult for the handicapped persons to cross the platforms using this bridges. These bridges are very difficult to access in the peak hours as lot of crowd will be present in the railway stations. There is a chance that these bridges may fall down if not constructed properly. Overcrowding: Foot over bridges, particularly in busy railway stations, may experience overcrowding during peak hours. When there are too many pedestrians on the FOB, it can lead to congestion and potential accidents such as falls or stampedes. Lack of proper signage: Inadequate or unclear signage on foot over bridges can cause confusion among pedestrians. Without clear instructions or directions, people may inadvertently take incorrect paths, increasing the chances of accidents or collisions.

II. LITERATURE SURVEY

Krishnapriya K B1 et.al (International Journal of Innovative Research in Science, Engineering and Technology (An International Organization for Standardization 3297: 2007 Certified Organization) Vol. 5, Issue 9, September 2016) describes thepaper "Railway Level Crossing Platform Control & Measurement System for Railway Track Condition Monitoring"

Pranav Sharma et.al Journal of Network Communication and Emerging Technologies (JNCET) Volume 5, Special Issue 2, December (2015)) describes "Automatic Railway Platform Control System Based on RFID, pressure sensor and servo motor"

Rohini Jadhav et.al (International Research Journal of Engineering and Technology (IRJET) e 0056 Volume: 04 Issue: 04 | Apr p-ISSN: 2395-0072) describes "Automatic Railway Platform Control System Using RFID with High Alerting System"

III.METHODOLOGY

We use two IR sensors in the project. First IR sensor is placed nearly 1KM before the platform. Second IR sensor is placed at the end of the platform. Initially the IR sensors will be in low conditions and the bridge will be open for the passengers to pass through it.

If the train is arriving toward the railway station, the first IR sensor will sense the arrival of the train and turns high. The servo motor receives the input and rotates itself by 180 degrees which results in the rotation of the bridge and the bridge will be closed. When the bridge is closed the LCD display will be displayed as "CLOSED" and the users cannot access the bridge until the train leaves the platform. When the train leaves from the platform , the second IR sensor which is placed at the end of the platform will be turned high. The input from the second IR sensor is sent to Arduino board. The Atmega328p micro controller will process this input and send the command to the servo motor and the LCD. The servo motor receives the input and rotates itself by 180 degrees which results in the rotation of the bridge and the bridge will be opened. When the bridge is opened the LCD display will be displayed as "OPENED" and the users can access the bridge onto the other platform.

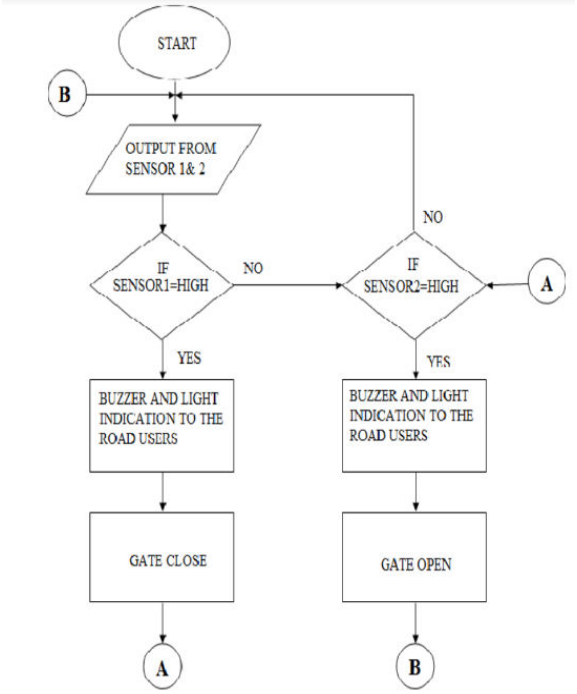

Fig 3.1 Flow chart

An automatic movable railway platform is an innovative system designed to enhance passenger safety and convenience in railway stations. It consists of a platform structure that can move horizontally along the tracks, synchronized with the arrival and departure of trains. Here is a description of its key features and functionality. The platform is equipped with a set of wheels and a propulsion system that allows it to move horizontally along the tracks. It can be controlled remotely or through an automated system that operates based on train schedules. The platform is designed to synchronize its movement with the arrival and departure of trains. When a train approaches the station, the platform moves towards the train to align itself with the train doors. This ensures a seamless transition for passengers boarding and alighting from the train. The platform has the ability to adjust its length based on the size of the train. It can extend or retract as needed to match the train's dimensions, providing a level boarding experience for passengers and eliminating the gap between the train and platform.

IV. SOFTWARE IMPLEMENTATION

Here's a high-level overview of how the software implementation could be approached:

Sensors: Install sensors along the tracks to detect approaching trains. This could be done using technologies like infrared sensors, ultrasonic sensors, or even cameras with computer vision capabilities.

Data Processing: The sensor data needs to be processed and analyzed to determine the train's arrival. This can be done using algorithms that monitor changes in sensor readings, such as the presence or movement of a train.

Communication: Once the arrival of a train is detected, the software system needs to communicate this information to the movable platform system. This can be achieved through a wired or wireless communication protocol.

Motor Control: The movable platform requires a motor control system to move it along the tracks. The software should have the ability to control the motors based on input signals.

Positioning: The software needs to calculate and control the position of the movable platform in real-time. This can be done by

integrating feedback from encoders or other positioning sensors on the platform.

Safety and Collision Avoidance:

Obstacle Detection: Implement sensors or cameras on the movable platform to detect any obstacles or obstructions on the tracks. The software should continuously monitor these inputs and take appropriate actions to avoid collisions.

Emergency Stop: Incorporate an emergency stop mechanism that can be triggered in case of any safety hazards or abnormalities detected by the software system.

Human-Machine Interface: Develop a user interface that allows operators or station personnel to monitor and control the movable platform system. This could be a graphical interface or a command-line interface depending on the complexity of the system.

Automated Control: Implement algorithms that automate the platform's movement based on train schedules and arrival information, reducing the need for manual intervention.

System Integration: Integration with Existing **Systems:** Integrate the software system with other existing railway station systems, such as train scheduling systems, station management systems, and passenger information systems. This enables seamless coordination between the movable platform system and other station operations.

V. HARDWARE REQUIREMENTS

Arduino: The Arduino ATmega328P is a microcontroller chip commonly used in Arduino boards, including the popular Arduino Uno. It is based on the AVR (Advanced Virtual RISC) architecture and offers a range of features that make it suitable for various electronic projects. Here's a description of the ATmega328P microcontroller

Architecture: The ATmega328P is an 8-bit microcontroller that operates at a clock speed of up to 20 MHz. It is based on the Harvard architecture, which separates program and data memory spaces, allowing simultaneous access to instructions and data.

CPU: The microcontroller features a single-cycle 8-bit RISC CPU (Central Processing Unit). It is capable of executing a wide range of instructions with minimal clock cycles, enabling efficient and fast execution of programs.

Memory: The ATmega328P has 32KB of Flash memory for program storage. It also includes 2KB of SRAM (Static Random Access Memory) for data storage and 1KB of EEPROM (Electrically Erasable Programmable Read-Only Memory) for non-volatile data storage.

Servo motor: A servo motor is a type of electric motor that is commonly used in robotics, automation, and various other applications that require precise control of angular position, speed, and acceleration. It consists of a motor, a gearbox, and a feedback control system. Here's a description of the key components and functionality of a servo motor:

Motor: The servo motor typically employs a DC motor as its primary driving mechanism. The motor is responsible for generating the rotational force required to move the output shaft.

Gearbox: A servo motor incorporates a gearbox that reduces the motor's high-speed rotation to a lower speed while increasing torque. The gearbox helps in achieving finer control and allows the motor to exert higher force.

Control System: The control system of a servo motor is what sets it apart from other electric motors. It typically consists of a control circuit, a position feedback device (such as a potentiometer or an encoder), and a closed-loop control algorithm.

Position Feedback: The servo motor's feedback device provides information about the current position of the output shaft. This feedback is essential for the control system to compare the desired position with the actual position and adjust the motor's operation accordingly.

Pulse Width Modulation (PWM) Signal: Servo motors are often controlled using a

PWM signal. The control circuit receives PWM signals that specify the desired position, speed, and direction of the motor. The duty cycle of the PWM signal determines the position of the motor shaft.

Control Algorithm: The control algorithm within the servo motor's control system compares the desired position from the PWM signal with the position feedback. It calculates the error (difference) between the two and adjusts the motor's speed and direction to minimize the error and bring the output shaft to the desired position.

IR sensors: IR (Infrared) sensors, also known as IR detectors or proximity sensors, are electronic devices that detect and measure infrared radiation in their surroundings. They are commonly used in various applications for object detection, motion sensing, distance measurement, and more. Here's a description of IR sensors and their functioning:

Working Principle: IR sensors utilize the property of infrared radiation emitted or reflected by objects. They consist of an IR emitter and an IR receiver. The emitter emits infrared radiation, which may be in the form of IR light or IR pulses. The receiver detects the infrared radiation and converts it into an electrical signal for further processing.

Types of IR Sensors: a. Reflective IR Sensors: These sensors consist of an emitter and receiver placed side by side. They detect the presence of an object by measuring the amount of reflected infrared radiation. When an object comes within the detection range, the reflected IR signal changes, indicating the presence of the object.

b. Proximity IR Sensors: Proximity sensors emit a focused beam of infrared radiation and measure the amount of reflected or interrupted IR signal. They can detect the presence or absence of an object within a specified distance range.

c. Break-beam IR Sensors: In break-beam sensors, an emitter and receiver are placed facing each other, with an air gap in between. When an object interrupts the infrared beam, the receiver detects the reduction or absence of the IR signal, indicating the presence of an object.

Detection Range: The detection range of an IR sensor depends on factors such as the power of the IR emitter, sensitivity of the IR receiver, and the reflective

VI. RESULTS

At idle state: When the output of the IR sensor 1 and IR sensor 2 is LOW i.e when the train is not entering the platform nor any other train is leaving the platform then the bridge will be open for the crowd to access and the LCD display will display the output as follows:

Fig 5.1 Lcd Display When Gate Is Opened

Train Arriving: When the IR sensor 1 detects the train coming towards the station/platform the IR sensor 1 will turn high and the IR sensor 2 which is present at the other end of the platform will remain low as there is no train passing away from the platform. The gate will start to close as the train is arriving towards the platform. In that case where the IR sensor 1 is HIGH and the IR sensor is LOW the output will be as follows:

Fig 5.2 Display When Gate Is About To Close

Train at station: When the train is in the platform, then both the sensors IR sensor 1 and IR sensor 2 will both be HIGH and the bridge will be closed not allowing the people to cross from one platform to another platform. Then

the output of the LCD display will be as follows:

Fig 5.3 Display When Train Is on Platform

Train is leaving from the station: When the train is leaving from the station then the output of the IR sensor 1 will be LOW and the output of the IR sensor 2 will be HIGH as the train is leaving from the station. Then the gate will be about to open as the train is leaving from the platform and it would be accessed by the people. In this case the output of the kit is as follows:

Fig 5.4 Display When Gate Is About To Open

Train leaving from station: When the train leaves from the platform both the IR sensor 1 and IR sensor 2 which are situated at the starting and the ending of the platform respectively will be low as there is no train is detected. Then the bridge will be free to be used by the passengers.

Fig 5.5 Display When Gate Is Open

VII. CONCLUSION

Nearly thousand people being injured and or killed by suburban trains everyyear. In India, railway platform was manually operated by liver pulling method to open and close the platform. In India, city like Mumbai, Kolkata, Delhi will have train is most popular transport for middle class person and there will more railway platform in that place. For that place, our technique will helps to reduce the accident. We are improving technologically in various fields so we liked it to do the whole process automatically which reduce the human efforts and is very easy to operate. This technique helps to reduce the future accident rate occurring in many country. Thus in future we can reduce the accident rate to the countable numbers. Automatic railway platform control system is cantered on the idea of reducing human involvement for closing and opening the railway platform which allows and prevents cars and humans from crossing railway tracks. The railway platform is a cause of many deaths and accidents. Hence, automating the platform can bring about a ring of surety to controlling the platforms. Human may make errors or mistakes so automating this process will reduce the chances of platform failures. Automation of the closing and opening of the railway platform using the switch circuit reduces the accidents to a greater extend. So this technique is eco-friendly in nature. It will reduce man power in practical. Thus, by implementing this proposed method, most of the major accidents that occur in unmanned railway level crossing can be controlled. This method is highly secured and safe in which no human presence is needed. Maintenance and operation of the system is easy.

VIII. FUTURE SCOPE

The future scope of an automatic movable railway platform with train arrival detection holds significant potential in terms of enhancing railway operations, passenger convenience, and safety. Here are some potential advancements and benefits that can be expected: 1. Improved efficiency: The automatic movable platform can be synchronized with train arrival detection systems, enabling precise alignment with the

train doors. This eliminates the need for passengers to rush towards specific coaches, reducing boarding and alighting time and improving overall operational efficiency. 2. Enhanced accessibility: The platform can be designed to adjust its height to match the train's floor level, making it easier for passengers, including those with disabilities or mobility challenges, to board and disembark from the train. This would promote inclusivity and provide a seamless experience for all passengers. 3. Streamlined operations: With train arrival detection technology, the automatic movable platform can be triggered to position itself in advance, ready for the train's arrival. This automation eliminates manual intervention and ensures timely positioning of the platform, optimizing the overall operations of the railway station.

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