



# HIGH-TECH ARCHITECTURAL SMART RAILWAY STATION IN NEW TECHNOLOGY

<sup>1</sup>Madhavi Gahule, <sup>2</sup> Ar. Rashi Shrigadiwar,

<sup>4</sup>th year student, Kavikulguru institute of technology and science, Ramtek, Nagpur 441106, India.

<sup>2</sup> Assistant professor, Ramtek Nagpur 441106, India.

<sup>1</sup>Department of Architecture,

**Abstract :** This paper suggests a way to prevent train collisions by using automated control systems within trains. We've integrated technologies like RFID sensors and ultrasonic sensors to detect potential collisions. These sensors help the system decide on a set of actions by following a predefined algorithm in a small computer (microcontroller). Additionally, we've added an Electronic Speed Control (EPM) to slow down the train when needed. This system is efficient and cost-effective because it's entirely automated.

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## 1. INTRODUCTION

Railway transport in Slovakia has been around for more than 150 years, and it has been crucial for the country's growth in many ways. Trains are environmentally friendly, and they can move lots of people and goods. But for it to work best, people should think of trains as a choice over other ways of getting around, like cars. This way, it can be a great option for everyone.

This project finds a good solution. Mainly the tracking of a train is sensed by sensor, this is used for automatically close/open the mobile platform. Sensors are placed on two sides of track to sense the motion of train. The microcontroller will sense the presence of trains by using infrared sensors. So, on recognized the train on one way, the manage will give vibration to the stepper motor to shut down mobile platform automatically. Railway system is the most dependent transportation medium in our country. Thousands of people daily depend on railway transportation. And also, a large number of human beings' losses their lives due to carelessness and unawareness about railway system. Most of the people do not uses the over bridges and directly crosses the railway track. This leads to the major number of accidents. When there's no one keeping an eye on railroad crossings, accidents can happen. To make these accidents less common, we need to do some things to improve safety. We're suggesting an automated railway system to make things safer.

fig no.1

## 2. EXISTING

Most of the public transportation infrastructure in European cities is easily accessible. Most tram and train stations are open and don't have gates, so anyone can get in. This can cause problems in the system because some people might not pay for their fare, which is why fare dodging happens. In the beginning, they're using a special tool that scans RFID cards and counts people to find and keep an eye on passengers. As a case study this paper uses the ticketing system in The Netherlands. It is a RFID-based ticketing system which uses a smartcard called OV-Chip card. It talks about how things work now in The Netherlands, what tools and plans they use, and points out where things might go wrong or where they can make things better. An experiment is done to measure certain basic distance read ranges in different situations and locations.

Fig no. 2

### 3. SMART RAILWAY STATION

smart transportation is a crucial part. It's all about making transportation efficient, convenient, and eco-friendly. This includes smart mobility (how people and goods move), smart connectivity (how everything is connected), and smart energy use. Instead of just building new roads and structures, the future of transportation focuses on using intelligent transportation systems (ITS). These systems use computers, microchips, electronics, and communication tech to provide travelers and transport users with all the info they need. This makes transportation more reliable and sustainable. By using ITS, we can change how people travel and improve life in modern cities. It offers a smarter, safer, and faster way to get around, making life better for everyone

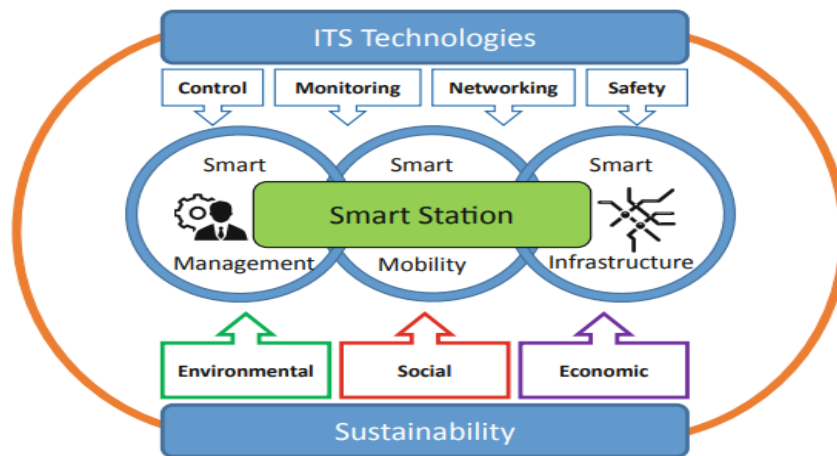


Fig no. 1

<https://www.researchgate.net>

### COMPONENTS OF SMART RAILWAY STATION

It generally consists of at least one platform, one track, and a station building providing such ancillary services as ticket sales, waiting rooms, and baggage/freight service. When a train track has only one line, sometimes there's a special part called a "passing loop" that helps trains pass each other more easily.

**Ticket (Magnetic and IC ticket):** This refers to the physical tickets used by passengers for access to the metro system. Magnetic tickets typically have a magnetic stripe with encoded information, while IC (Integrated Circuit) tickets have a chip embedded for storing data.

**Ticket Office Machine (TOM) with Card Initialization and Personalization Function (CIPF):** The TOM is a machine used at ticket offices for issuing and personalizing tickets. CIPF likely refers to the process of initializing and customizing smart cards or tickets with passenger-specific information.

**Ticket Vending Machine (TVM):** This is a self-service machine that allows passengers to purchase tickets or load value onto smart cards.

**Ticket Reader (TR):** Ticket readers are used at access points like station gates to validate and read the information on the tickets or smart cards to grant access.

**Portable Verifying Unit (PVU):** These are handheld devices used by transit staff to verify tickets or smart cards and ensure that passengers have valid access.

**Automatic Gate (AG):** Automatic gates are physical barriers at station entrances and exits that open when a valid ticket or card is presented, allowing passengers to pass through.

**Station Control Unit (SCU):** SCUs are responsible for managing various station-specific functions, including access control, monitoring ticketing systems, and potentially communicating with a central control system.

**Line Control Unit (LCU):** LCUs manage and coordinate operations across an entire metro line, ensuring the seamless functioning of all stations and associated equipment.

**Network facilities including cable, hub, switch, router:** These are the network infrastructure components that connect all the various elements in the metro system. Cables are used for physical connections, hubs and switches are used to create local area networks (LANs), and routers are used to manage data traffic and potentially connect the metro network to external systems.

### 5. RAILWAY PLATFORM CONTROL

The project comprises three major parts namely,

- a. Detection system
- b. Controlling system

### c. Alerting system

a. Detection System: This part uses two IR sensors placed on both sides of the station. One sensor detects when the train is arriving, and the other one, located at the end of the station, detects when the train is departing.

b. Controlling System: When the train passes the first IR sensor, which is located near the tracks a certain distance from the platform, a microcontroller sends a signal to a motor, which opens or removes the platform. When the train passes the second IR sensor, the microcontroller sends a signal to the motor to close the platform.

c. Alerting System: To alert passengers, two components are used: signal LEDs and a buzzer. There are two LEDs, one red and one green. The red LED lights up when the train is approaching the platform, providing a warning to passengers. The green LED likely indicates when it's safe to use the platform. A buzzer may also sound to get people's attention during these events.

## 6. SOLUTIONS FOR RAILWAY AND TRAIN STATION FACILITIES

### Security and life safety

Safety rules for buildings and structures are getting stricter all around the world. The goal: People and values are protected as much as possible. Trust the Bosch long-standing expertise in consulting, planning, implementing and operating your individual

security and life safety solution.

#### Benefits

Bosch has you covered when it comes to safety. No matter what kind of security job you have, they have the right solution for every building to make it as safe as possible. Bosch offers comprehensive services and consultancy for monitoring, maintenance, modernization, and operation as well as attractive and flexible rental and operator models.

Bosch assists in all project phases and finds therefore the best solution for you: Planning, realization and operation complement each other perfectly, creating maximum security

### Fire alarm and voice evacuation systems

Bosch offers really dependable stuff, like fire detectors, voice systems to guide people, and special computer programs. These help find fires fast, make sure they're real, and stop them from spreading. The systems are comprehensive, tailor-made solutions for almost any project. They not only meet but also go beyond what's expected in terms of looks and what people want. Superior fire protection with intelligent solutions Advanced public address and voice evacuation systems Solutions range from simple installations to highly complex applications

#### Benefits

Superior fire protection with intelligent solutions

Advanced public address and voice evacuation systems

Solutions range from simple installations to highly complex application

### Public address

With more than 60 years' experience in designing and developing communications products, Bosch has established unrivalled leadership in the field of public address and voice alarm systems.

- Solutions range from simple installations to highly complex applications
- Advanced public address and voice evacuation systems are complex communication tools designed to convey critical information and ensure people's safety during emergencies
- Compliant to evacuation standards

### Management software

#### Intrusion alarm systems

#### **Platform Screed Door (Psd)**

#### Opening and Closing Operation

1. When a train is in the right position at the platform, a signal from the train tells the platform doors to open or close. This makes sure that the train doors and the platform doors open and close together.

2. The platform doors should open a little before the train doors, and they should close a little after the train doors. This way, passengers can safely get on and off the train.

3. If there's a problem with the signal from the train, there should be a way for authorized staff to manually open or close the platform doors using a special control. If they do this, a message should be sent to let people know.

4. If there's a problem with the platform doors or there's an emergency, passengers should be able to open the platform doors themselves. This is for safety reasons.

### Monitoring and Control

This panel will be set up in the equipment room to do two important tasks

Manage and control all the functions.

Connect and work as a bridge between the signaling system and the PSD system.

Output of alarm and monitoring signal

Maintenance status indication

Interface with other systems Monitoring and Control PC This panel will be installed in the station office with following functions

- You can control the sliding screen door either by yourself or as a group.
- Individual and group monitoring, including alarm
- All closed status
- Manual open/close control status
- Fault conditions, etc.

### Crew Operation Panel (COP)

This panel will be installed trackside near the driver's cabin. If there is a malfunction in the automatic operation mode, authorized individuals can manually open and close the sliding screens after selecting the manual mode.

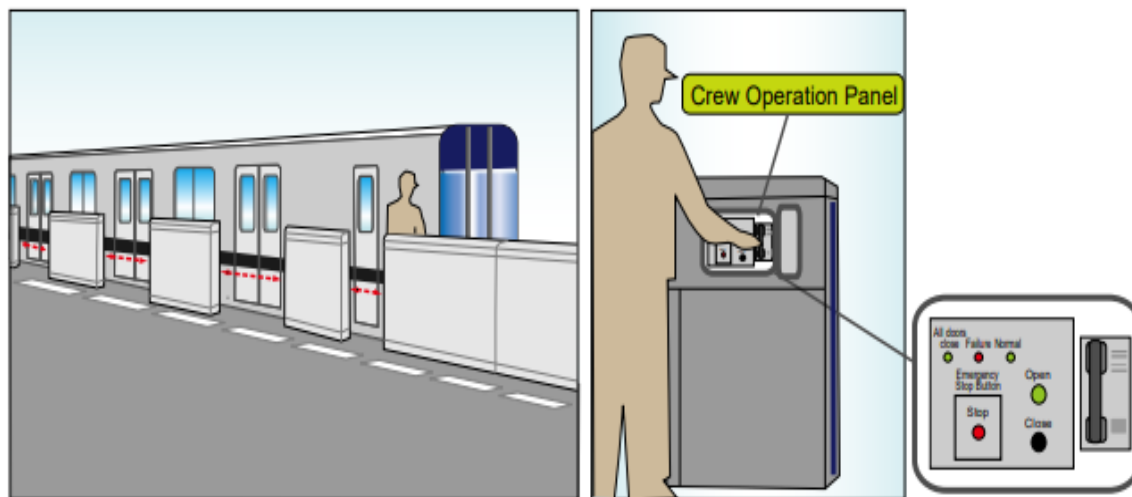


Fig no.2

<https://openjicareport.jica.go.jp/>

### Station Staff Operation Panel (SSOP)

This panel will be placed on the platform side of the PSD at the right spot. If there's a problem with the automatic system, station staff who are authorized can use this panel to open and close the sliding screen door.

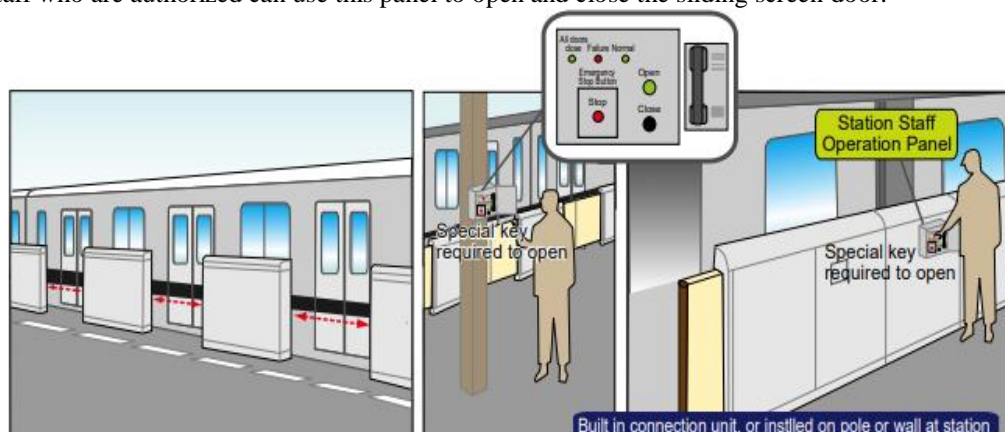


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### Manual Control Switch (MCS)

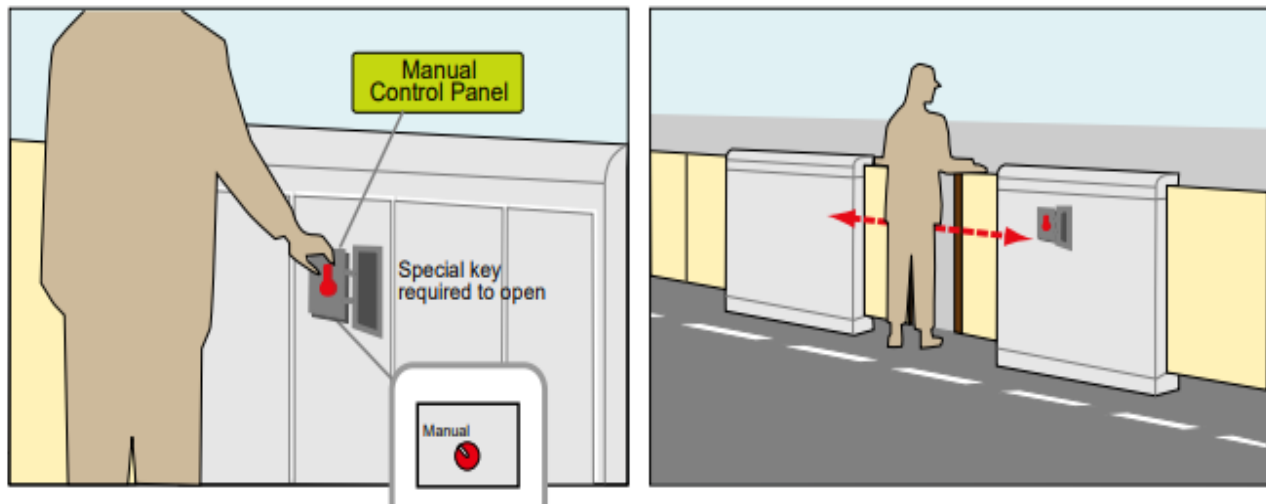


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#### Manual Door Opening Button (MDB)

If there's an issue with the system, like a power failure or the automatic mode not working, station staff need to control the sliding screens manually. To do this, there should be a switch installed for each pair of sliding screens on the platform side. This switch can be set to either manual or automatic mode.

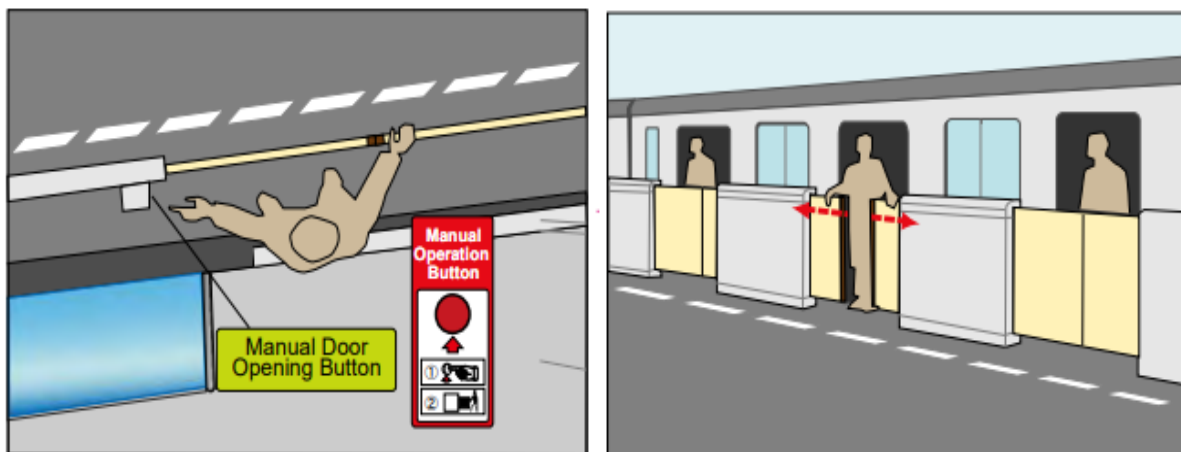


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#### Hindrance Sensor (HS)

To keep accidents from happening, we're putting two hindrance sensors on each pair of sliding screens. These sensors can tell if there's something blocking the screens from closing, like an object between the screens or in the way of the train. If the sensor notices something blocking the screens while they're closing, it makes the doors stop closing. Once the blockage is gone, the screens start closing again.

#### Indicator and Alarms

Each sliding screen door should have a special light above it that's amber in color. This light should be on when the door is open and should turn off when the door is fully closed and latched. When the door is moving, the light should flash. This light should be easy to see for station personnel standing at the end of the platform.

Additionally, there should be another red indicator light to show if a sliding screen door is not working properly or is "out of service." This red light should be in a location where it won't be confused with the amber "door open" indicator.

If a sliding screen door is "out of service," the station office should get a remote signal to know about this condition.

To get passengers' attention, there should be a chime or sound that goes off when the sliding screen doors are opening and closing.

## 7. ADVANTAGES

- It saves the time for passengers to cross the next platform.
- Helps the passengers to cross easily without using stairs.
- Handicapped and those with wheel chairs can rely on this.
- Time Efficiency: The use of a DC motor to slide the platform can save time for passengers. It allows for quicker transitions between trains, which is particularly valuable in busy railway stations and during tight connections.
- Improved Accessibility: This system enhances the convenience of crossing the platform for all passengers, as they don't have to use stairs or ramps. It's especially beneficial for those with heavy luggage or mobility issues.
- Enhanced Accessibility for Disabled Individuals: People with disabilities, including those using wheelchairs, can rely on this system to access trains more easily, fostering inclusivity in public transportation.

## 8. Disadvantages

- Detecting whether there is any passenger on the mobile track even after alarm is not possible, which may lead to accidents
- Passenger detection challenge-The system's drawback is the inability to detect whether passengers are still on the sliding platform even after the alarm has been activated. This limitation could lead to accidents or injuries if passengers do not clear the platform before it starts moving

## 9. CONCLUSION

Hence, by implementing this project it is easy for tracks for elder or handicapped people to cross the railway track without using staircase. By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact To prevent train accidents to a very large extent means taking significant measures to stop train accidents from happening as much as possible. In simple terms, it means doing everything we can to make sure that train journeys are as safe as they can be and that train accidents are rare and unlikely to occur .

## Acknowledgment

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## 11. REFERENCES

<https://www.mdpi.com/2412-3811/3/3/24>

<https://www.mdpi.com/2412-3811/3/3/24>

[https://www.ejrcf.or.jp/jrtr/jrtr63/pdf/54-60\\_web.pdf](https://www.ejrcf.or.jp/jrtr/jrtr63/pdf/54-60_web.pdf)

[https://www.researchgate.net/publication/348731882\\_Key\\_Challenges\\_of\\_Smart\\_Railway\\_Station](https://www.researchgate.net/publication/348731882_Key_Challenges_of_Smart_Railway_Station)

[https://uic.org/IMG/pdf/smart\\_stations\\_in\\_smart\\_cities.pdf](https://uic.org/IMG/pdf/smart_stations_in_smart_cities.pdf)

<https://iopscience.iop.org/article/10.1088/1742-6596/1187/5/052053/pdf>

<https://www.unescap.org/sites/default/files/Smart%20railway%20solutions%20to%20support%20railways.pdf>

G. Prabhavathi, B. Sanjana, Ms. S.P. Dhivya(Ap/Ece) "Railway Track Pedestrian Crossing between Platforms" IOSR Journal of Electronics and Communication Engineering (IOSRJECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 9, Issue 2, Ver. III (Mar - Apr. 2014), PP 87-91

[https://www.researchgate.net/publication/332944253\\_Research\\_and\\_Analysis\\_on\\_the\\_Top\\_Design\\_of\\_Smart\\_Railway](https://www.researchgate.net/publication/332944253_Research_and_Analysis_on_the_Top_Design_of_Smart_Railway)

<https://ijcrt.org/papers/IJCRT2004360.pdf>

<https://www.unescap.org/sites/default/files/Smart%20railway%20solutions%20to%20support%20railways.pdf>

[https://indianrailways.gov.in/railwayboard/uploads/directorate/secretary\\_branches/IR\\_Reforms/Innovation%20in%20Indian%20Railways%20.pdf](https://indianrailways.gov.in/railwayboard/uploads/directorate/secretary_branches/IR_Reforms/Innovation%20in%20Indian%20Railways%20.pdf)

<https://iritm.indianrailways.gov.in/uploads/files/1680252282408-PDF%20Year%20Book%202021-22-English.pdf>