22CSL51-IOT & Cloud

Computing

AUTOMATED RAILWAY GATE CONTROL SYSTEM

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# Problem:

Manual railway gate operations are prone to human errors, delays, and limited visibility, which can lead to serious accidents, injuries, and fatalities at level crossings. There is a critical need for a reliable, automated system that can efficiently detect approaching trains and control gate operations to ensure public safety.

# Idea:

Design an IoT-based automated railway gate control system that detects approaching trains using sensors and manages the opening and closing of gates automatically, while providing real-time alerts and updates.

# Proposed Solution:

* Use IR or Ultrasonic Sensors to detect the presence of a train at a specific distance.
* When a train is detected, the NodeMCU/ESP32 microcontroller processes the signal.
* The system:
* Activates buzzers and flashing LEDs to alert the public.
* Closes the gate automatically using a servo or DC motor.
* Once the train has passed and is detected by the exit sensor the gate is reopened.
* The status is sent to a cloud platform like ThingSpeak or Firebase for real-time monitoring.
* The system functions without manual input, enhancing reliability and safety.

# Components Used:

* + NodeMCU / ESP32 – Microcontroller with built-in Wi-Fi
  + IR / Ultrasonic Sensors – Train detection
  + Servo / DC Motor – Gate operation
  + LEDs & Buzzers – Alerts for public safety
  + Power Source – Battery / Adapter / Solar Backup
  + Internet Module – Inbuilt in NodeMCU
  + Cloud Platform (ThingSpeak/Firebase) – Real-time data monitoring and visualization

# Connections (Tinker cad Simulation):

* **IR Sensor:**

VCC → 3.3/5V

GND → GND

OUT → Digital Pin 2

* **Buzzer:**

Positive terminal → Digital Pin 9

Negative terminal → GND

* **LCD Display :**

Positive → Digital Pins (e.g., D6, D7)

Negative → GND (through resistor)

* **Servo Motor:**

VCC → 5V

GND → GND

Signal → Digital Pin (e.g., D8)

# Code Summary:

* Continuously monitor IR sensor signals..
* If a train is detected (PIR sensor output = high)

Trigger buzzer and LED alerts.

Close the gate using servo motor.

* After train exits (detected by second sensor):

Stop alerts and reopen the gate.

* Send all status updates to the cloud platform.

# Working:

When a train approaches the crossing, IR sensors detect its presence. The NodeMCU/ESP32 receives this signal and triggers alerts via buzzer and LEDs. Simultaneously, the gate is closed automatically. After the train passes and the exit sensor detects it, the gate reopens. Real-time updates are sent to a cloud dashboard for monitoring. This automated system minimizes human errors and ensures safety at railway crossings.

# Result:

* Provides a contactless and automated railway gate control system.
* Ensures public safety by timely gate operations and alerts.
* Reduces accidents caused by human error or manual delay.
* Demonstartes effective real time IOT integration using NodeMCU and sensors.
* Cloud updates offer remote monitoring for authorities.

# Conclusion:

The proposed system delivers a smart and hygienic solution for railway gate control using IoT technologies. It effectively reduces the need for manual operations, improves safety, and minimizes risks of accidents at level crossings by automating gate operations and alert mechanisms.