

Automated Rail Gate System

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I. ABSTRACT

Railway crossing accidents are a frequent concern, especially in regions where manual gate operation is still practiced. The **Automatic Railway Gate Control System** aims to solve this issue by designing a low-cost, reliable, and efficient method to automatically control railway gates using basic logic circuits and sensors.

The primary motivation behind this project is to enhance safety by minimizing human intervention in gate operation. By using sensors to detect the presence of a train and logic gates to control the gate mechanism, the system ensures timely gate closing and opening, reducing the risk of human error and improving traffic control around railway crossings.

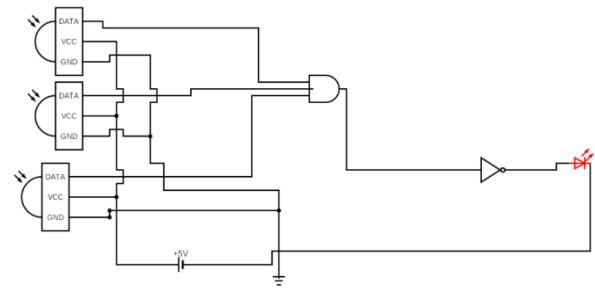
II. IMPLEMENTATION

The project is based on **digital logic circuit design** using basic gates such as **AND**, and **NOT**. The system is powered by three **IR sensors** which detect the position of the train—approaching, present (on track), and passing.

The logic of the system:

- If any sensor detects the train (logic LOW or 0V), the AND gate outputs LOW, AND through the NOT gate, the **red LED** lights get high voltage and turn ON (indicating gate closed).
- If all sensors show no detection (logic High or 5V), the AND gate outputs High, and through the NOT gate, the **RED LED** is turned OFF (indicating gate open).

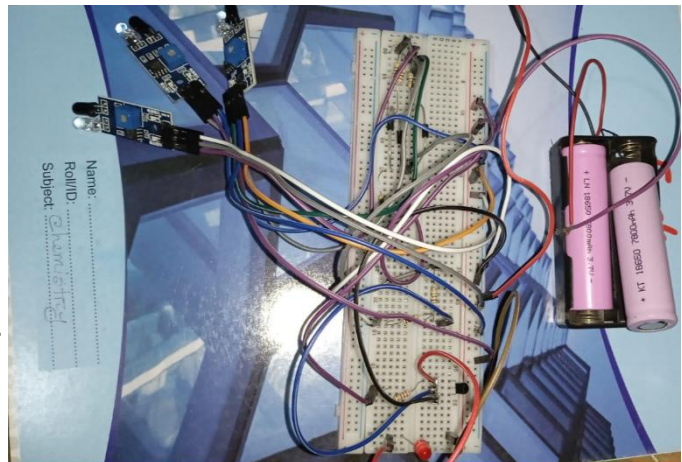
This binary logic ensures that the gate is closed only when necessary, maintaining safety while allowing normal vehicle flow at other times.

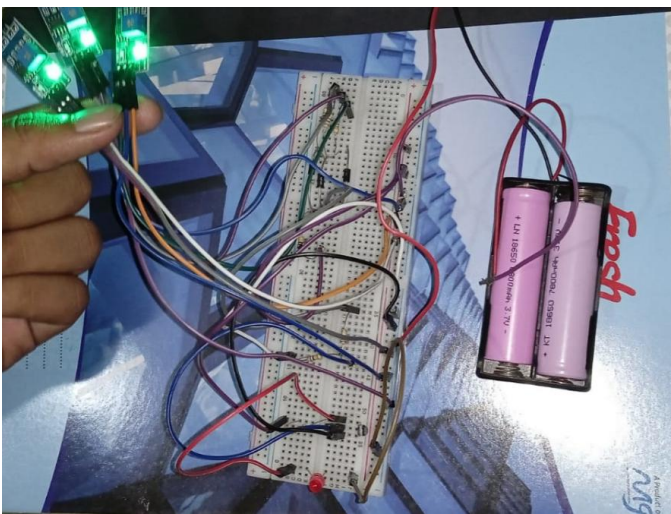
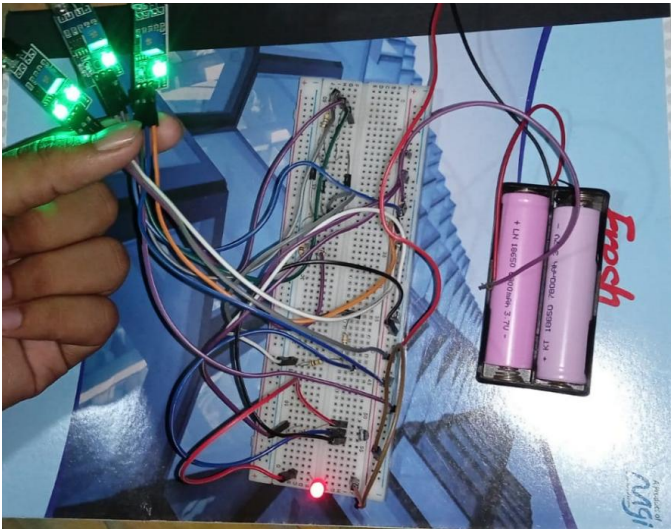


The diagram consists of:

1. Three sensor inputs
2. AND gate to detect any sensor trigger
3. NOT gate to toggle RED light
4. Output section simulating gate control using LEDs

We used diodes, transistors, resistors, ir sensors, leds, jumper wires, breadboard





If the train is detected:

- Output: Red LED ON

If no train is detected:

- Output: Red LED OFF

Challenges Faced and Solutions

Challenge	Solution
Sensor Calibration: IR sensors gave false readings due to ambient light. And get value high where we thought to get Low	Used casing around sensors and tested under controlled lighting. And change the circuit to adjust the output
Power fluctuations: Interruption in voltage affected logic output.	Recharge the battery and tried to keep a stable voltage though supply was not enough for the circuit

Conclusion
 This project successfully demonstrates an **Automatic Railway Gate Control System** using basic digital logic and sensor-based automation. The system ensures enhanced safety by responding accurately to the movement of trains and eliminating the need for human operators.

- Key outcomes:**
- Reliable detection of train movement
 - Automated control of LEDs simulating gate status
 - Demonstrated integration of hardware with digital logic

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- Future Improvements**
- Integrate servo motors to physically control miniature gates.
 - Use Arduino with a GSM module to send alerts.
 - Add solar panels for power autonomy.
 - Enhance sensor range for real-time train tracking over longer distances.