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iSociety: AutoGate LightTrack

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Abstract: ***This project presents the development of an Automatic Pole Gate System integrated with a Smart Street Light System, aimed at enhancing transportation infrastructure through automation and energy efficiency. The automatic toll gate system utilizes technologies such as sensors and Arduino UNO microcontrollers to enable seamless. This minimizes human intervention, reduces traffic congestion, and will let us know how many car passes in a day. Simultaneously, the smart street light system operates based on ambient light sensors or motion detectors, ensuring that street lights are only active when necessary—either at night or when vehicles/pedestrians are detected. This significantly reduces energy consumption and maintenance costs. The integration of these two systems creates a smart, automated environment that enhances traffic flow, safety, and sustainability in urban and highway settings. Together, these systems contribute to the realization of intelligent transport infrastructure by combining automation, energy efficiency, and real-time monitoring.***
Keywords: Enhancing Transportation, Automation and Energy efficiency, Sensors and Arduino UNO, Reduces Traffic Congestion, Ambient light Sensors or Motion Detectors, Real-Time Monitoring.

I. INTRODUCTION

This project aims to design and implement an Automatic Pole Gate system integrated with a Street Light, using the Arduino UNO microcontroller. The goal is to automate access control and illumination in restricted or residential areas such as parking lots, society gates, toll booths, and private roads. The system uses IR sensors or ultrasonic sensors to detect the presence of vehicles or pedestrians. When an authorized vehicle approaches, the gate arm (pole) automatically lifts using a servo or motor mechanism, allowing passage. Once the vehicle crosses, the gate closes after a short delay. Simultaneously, the street light automatically turns on during low-light conditions, improving visibility and safety. The street light will store or recharge its energy during the day and will utilize the saved energy during night when needed. The automatic pole gate system is also installed with the function for counting how many cars or vehicles pass in a day. This automation not only enhances security and efficiency but also conserves energy by enabling the lights only when necessary.

II. THEORY

A Poll Gate System (sometimes also called an Automatic Gate System for societies) is designed to control vehicle entry and exit at the main gate of a residential building or gated community. Unlike a toll gate, this system does not collect any fee or charge; its main purpose is to improve security, convenience, and monitoring for residents and visitors. In support with that The Automatic Street Light System is designed to switch street lights ON and OFF automatically depending on the surrounding conditions such as daylight, darkness, or vehicle movement. The main aim is to save energy, reduce human effort, and provide safety for pedestrians and vehicles during night time.

A. Automatic Pole Gate

Working Principle: -

1) Vehicle Detection- Sensors (ultrasonic) detect a vehicle when it approaches the society gate.
2) Gate Operation- If the vehicle is approached, the automatic boom barrier or sliding gate opens. After the vehicle passes, the gate closes securely.
3) Monitoring & Logging- Every entry/exit of a vehicle will get counted.

Components: -

- Ultrasonic Sensors → to detect cars approaching/leaving.
- Database System (MySql)→ maintains records of number of vehicles entered
- Server Motor (Automatic Barrier / Gate) → opens/closes automatically.
- Arduino UNO(Microcontroller) → processes input and controls gate operation.

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B. Automatic Street Light

Working Principle: -

1. Light Sensing (LDR):

A Light Dependent Resistor (LDR) senses the surrounding light intensity.

During the daytime, the light intensity is high, so the system keeps the lights OFF.

During the night or low-light condition, the intensity is low, so the system automatically turns ON the street lights.

2. Vehicle/Movement Detection:

In advanced systems, Ultrasonic sensors detect vehicle or human movement.

Lights turn ON only when movement is detected, and turn OFF after some time of inactivity (further energy saving).

3. Controller Operation:

Arduino processes sensor signals.

Based on input, it switches the street lights ON/OFF through a relay circuit.

Components: -

- Light Dependent Resistor (LDR): Detects day/night based on light intensity.
- Ardunio UNO: Processes sensor inputs and controls the lights.
- Ultrasonic Sensors: Detect motion for smart lighting.
- Relay Module: Switches ON/OFF the AC supply to lights.
- Street Lights (LEDs): The output load controlled by the system.
- Power Supply (220ohm Resistor): Provides required power to the controller and lights.

C. Algorithm

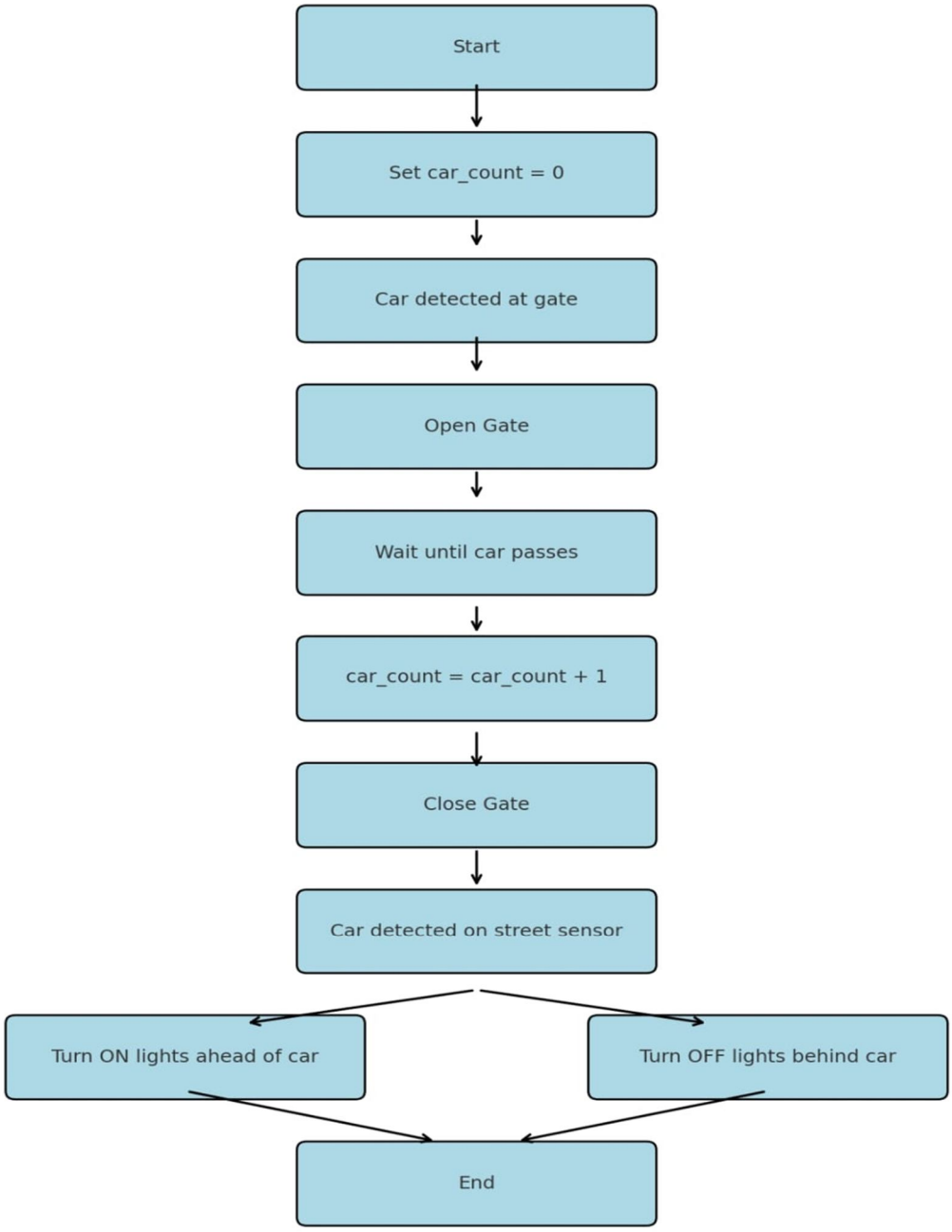
1) Start
2) Initialize car_count = 0
3) Detect car at the society gate using a sensor
4) Open the gate
5) Wait until the car passes through
6) Increment car_count = car_count + 1
7) Close the gate automatically
8) Detect car on the street using sensors placed at intervals
9) Turn ON street lights ahead of the car
10) Turn OFF street lights behind the car
11) End

D. Pseudocode

```
Start
Set car_count = 0
If car detected at gate:
   Open gate
   Wait until car passes
   car_count = car_count + 1
   Close gate
If car detected on street sensor:
   Turn ON lights ahead of car
   Turn OFF lights behind car
En
```

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E. Flowchart



III. FUTURE SCOPE

1) This model or project can be further developed by using AI. We can add the feature of reading the car number plate whenever the any vehicle gets near the pole gate and we will get to know the car owner information.

2) This project can also be installed in the traffic light signal where some vehicles disobey the traffic rules. By adding more features like real time number plate reading or face reorganization this project will be useful in security and safety of the citizens.

3) The street lights can be further developed for recharging electrical devices as its save's energy during day, so this energy will be used when needed.

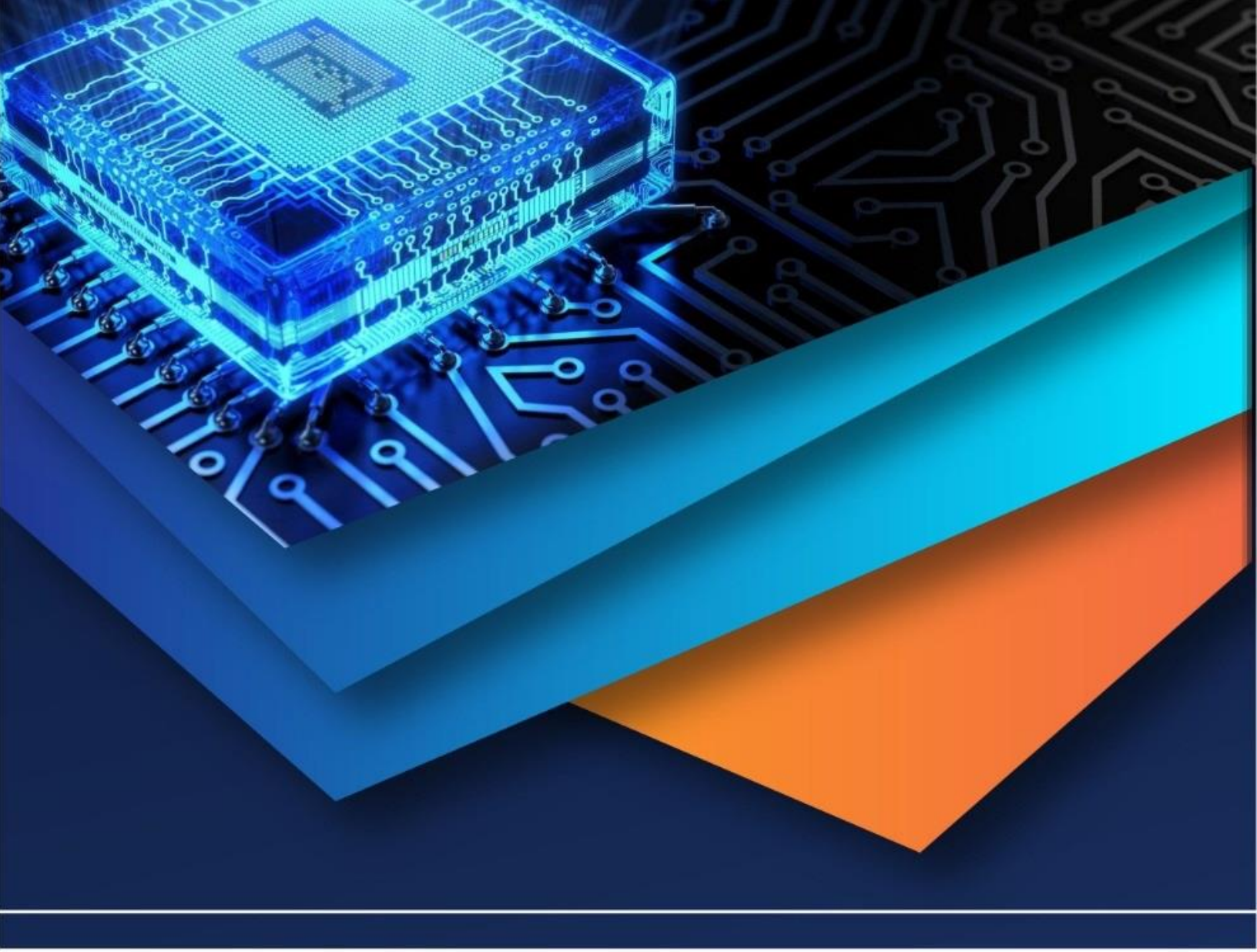
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IV. CONCLUSION

The project iSociety: AutoGate LightTrack successfully demonstrates the use of IoT for creating a smart and automated society. The system detects the presence of a vehicle at the gate and automatically opens and closes the gate, thereby reducing the need for manual intervention. Additionally, street lights are intelligently controlled by turning ON ahead of the moving vehicle and turning OFF behind it, ensuring both safety and energy efficiency. A car counting feature is also implemented to keep track of the number of vehicles passing through the society gate. Overall, the project highlights how IoT can be effectively applied for automation, security, energy saving, and convenience in modern smart societies.

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