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IOT Smart and Traffic Congestion Control

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Abstract: This research paper explores the potential of the Internet of Things (IoT) in transportation. The paper proposes an algorithm that uses sensors and cameras to monitor traffic flow in real-time and suggests alternative routes to reduce congestion.
Additionally, the paper suggests a smart parking allocation system (SPAS) that allows vehicle owners to locate available parking spaces and reserve them in advance.
The use of IoT in transportation can lead to a more efficient and sustainable transportation system that enhances the travel experience for commuters.
Keywords: Iot, Congestion, Alerts, transportation, Experience.

I. INTRODUCTION

The Internet of Things (IoT) is a rapidly evolving technology that connects various devices and sensors to the internet, enabling them to communicate with each other and exchange data. This technology has found its way into nearly every aspect of our daily lives, from our homes to our workplaces, and even to our transportation systems. One of the areas where IoT has shown tremendous potential is transportation.

With the help of IoT, we can create smarter transportation systems that can reduce traffic congestion, improve road safety, and enhance the overall travel experience. One of the ways we can achieve this is by developing algorithms that can assist in reducing traffic congestion.

Our proposed algorithm can monitor traffic flow in real-time using sensors and cameras installed at strategic locations. The data collected by these sensors is analyzed to identify areas where traffic is congested, and then the algorithm suggests alternative routes that drivers can take to avoid traffic jams.

This can help to reduce travel times and improve overall traffic flow. In addition to traffic congestion, we also proposed a smart parking allocation system (SPAS). Finding a parking spot can be a daunting task, especially in busy urban areas. Our SPAS method can assist vehicle owners in finding available parking spaces quickly and easily, thus reducing the time and effort required to find a parking spot.

The SPAS system uses sensors to detect whether a parking space is vacant or occupied. This data is then relayed to a central server, which can be accessed by vehicle owners through a mobile app.

By using this app, vehicle owners can locate available parking spaces and reserve them in advance, eliminating the need to drive around searching for a parking spot.

Overall, the use of IoT in transportation can have a significant impact on improving the travel experience for commuters. By reducing traffic congestion and improving parking management, we can create a more efficient and sustainable transportation system that benefits everyone.

II. OBJECTIVE

Our goal is to develop a simulation model to effectively manage parking and reduce traffic congestion. Knowing in advance where to park a vehicle saves time and is costeffective. This can reduce congestion and accidents, benefitting all commuters, including students and office workers.

The model can be adapted to different urban areas, helping city planners and transportation authorities manage parking and traffic flow more efficiently, contributing to more sustainable transportation systems.

III. BLOCK DIAGRAM

The block diagram of the IoT Smart and Congestion control system which contains ESP32 microcontroller, Voltage regulator, LCD display, Parking IR Sensors, Traffic IR sensors and the mobile phone is as follows:

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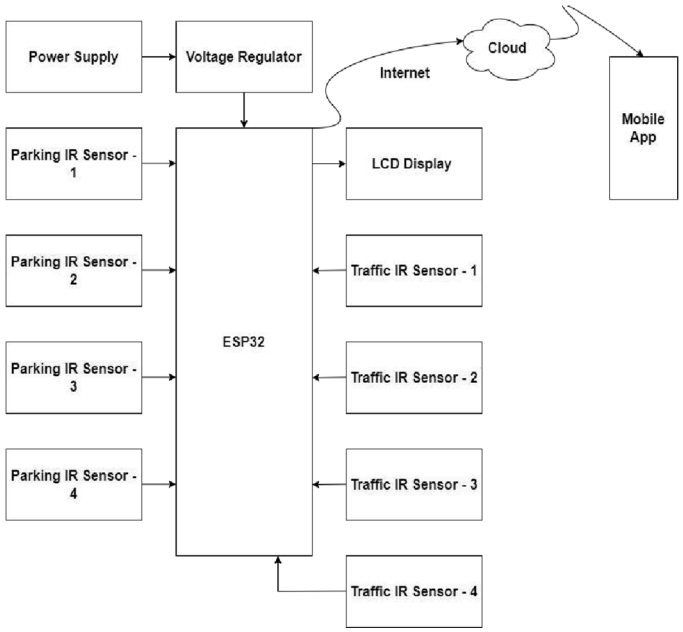


Figure 1: Block Diagram

IV. METHODOLOGY

The methodology used in the development of the simulation model involves two main methods: sensing and detecting. The first method involves the use of IR sensors to detect available parking spaces. The sensors are installed in strategic locations to detect the presence or absence of a parked vehicle. Once an available parking space is detected, the information is transmitted to the central server. The second method involves detecting traffic congestion in real-time. This is achieved through the use of sensors and cameras installed at strategic locations. The data collected by these sensors is analyzed to identify areas where traffic is congested, and then the algorithm suggests alternative routes that drivers can take to avoid traffic jams.

The information collected by both methods is then relayed to a central server that can be accessed by drivers through a mobile application or an LCD display. When a request for a

parking space is received, the system suggests available parking spaces nearby, and the driver can reserve the spot in advance.

The simulation model is designed to take into account the shortest route for reaching any destination without encountering traffic congestion. This ensures that the driver can reach the destination on time, without being delayed by traffic.

Overall, the methodology used in the development of the simulation model involves the use of sensing and detecting methods to manage parking and traffic congestion efficiently. The system is designed to be user-friendly, cost-effective, and delivered on time within the allotted budget, making it a valuable tool for transportation authorities and city planners.

Components	Specifications	Quantity
1) uC	ESP32	1
2) F2C	LCD I2C Module	1
3) IR Sensor	Proxy Sensor	1
4) Voltage Regulator	IC 7805	1
5) LCD Display	16x2 alphanumeric	1
6) PCB	Glassy poxy	1
7) Power Supply	12V/1Amp	1
8) Wire, capacitor, resistor etc.	-	1
9) Model	Working model	1

Table 1: Components List

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A. Microcontroller ESP32

The ESP32 module is an upgraded version of the ESP8266. In addition to the Wi-Fi module, this module also has a Bluetooth module of version 4. Having dual-core
CPU working in 80 to 240 MHz frequency, and containing two Wi–Fi and Bluetooth modules and various input and output pins, the ESP32 is an ideal choice to use in internet of things projects. (IOT).

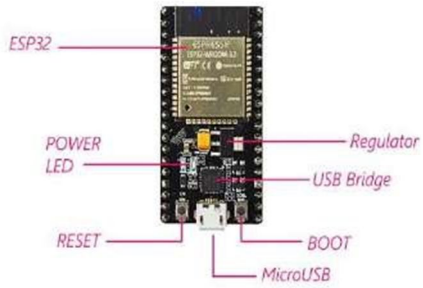


Figure 2: ESP32 Microcontroller

B. 16x2 LCD Display Module

16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. But the most used one is the 16*2 LCD, hence we are using it here. All the above mentioned LCD display will have 16 Pins and the programming approach is also the same and hence the choice is left to you.



Figure 3: LCD Display

C. Proxy Sensor

A proximity sensor is a non-contact sensor that detects the presence of an object (often referred to as the “target”) when the target enters the sensor's field. Depending on the type of proximity sensor, sound, light, infrared radiation (IR), or electromagnetic fields may be utilized by the sensor to detect a target.



Figure 4: Proxy Sensor

V. FLOWCHART

The flowchart of the IoT smart and Congestion control system is as follows;

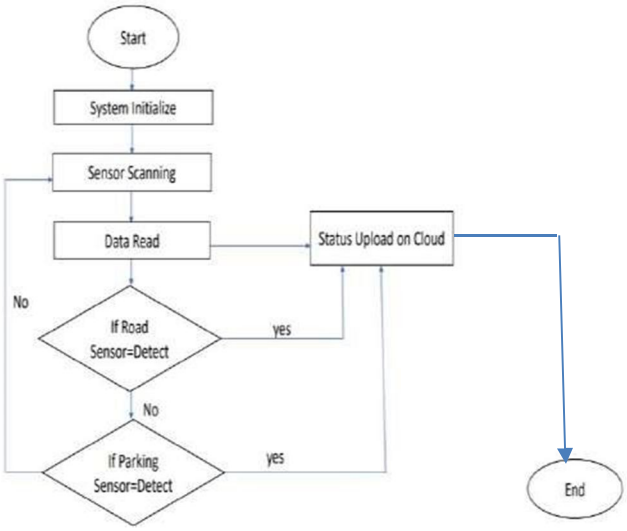


Figure 5: Flowchart

VI. CONCLUSION

The proposed parking and traffic congestion management system offers a cost-effective and time-saving solution for the common problem of parking congestion. The system can be further improved by integrating mobile phone applications to book parking spots and by enhancing the accuracy of the model. This system is relatively cheaper and easier to implement compared to existing solutions. By adopting this model, researchers can explore new ways to improve the transportation system instead of relying on traditional approaches. Overall, the proposed model can revolutionize the way we manage parking and traffic congestion in our cities.

VII. FUTURE SCOPE

The future scope of IoT-based smart and congestion control systems is vast, and there are several potential applications and advancements that can be made in this field. Here are some possible future developments:

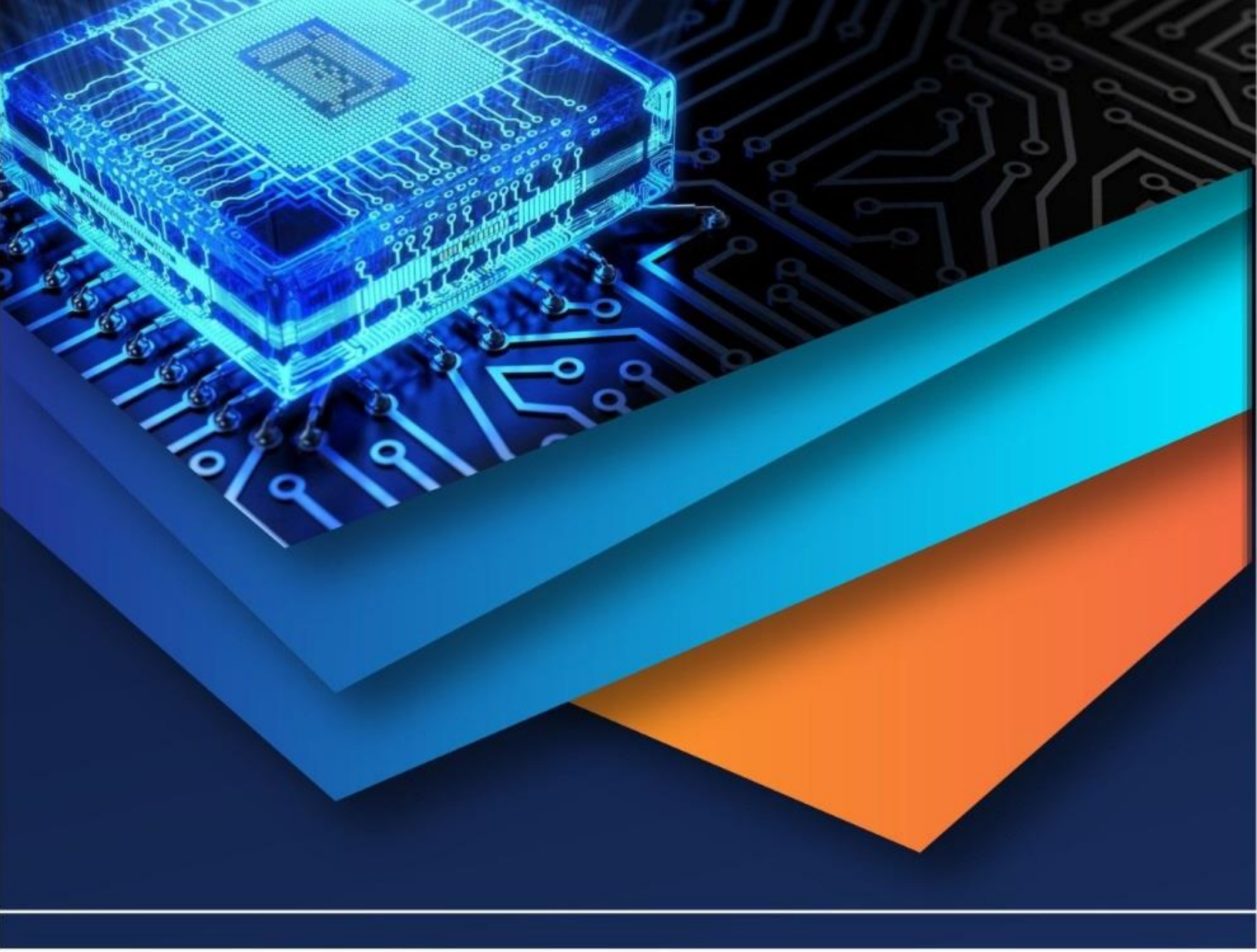
1) *Integration with Autonomous Vehicles:* As the development of autonomous vehicles continues to progress, IoT-based smart and congestion control systems can integrate with them to further optimize traffic flow and reduce congestion.
2) *Predictive Analytics:* By analyzing traffic patterns, weather conditions, and other factors, IoT-based smart and congestion control systems can predict traffic congestion and take proactive measures to mitigate it.
3) *Environmental Sustainability:* IoT-based smart and congestion control systems can be used to reduce greenhouse gas emissions by optimizing traffic flow, reducing the time spent idling in traffic, and promoting the use of public transportation.
4) *Smart Parking:* Smart parking systems can be further enhanced by using IoT-based technology to detect available parking spaces, optimize parking allocation, and provide real-time information to drivers.
5) *Collaboration with Smart City Initiatives:* IoTbased smart and congestion control systems can collaborate with smart city initiatives to create a more efficient, sustainable, and livable urban environment.

Overall, the future of IoT-based smart and congestion control systems is promising, and we can expect to see continued advancements and innovations in this field.

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