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An IoT-Based Parking System to Prevent Unauthorized Vehicles

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Abstract: ***In India, a family needs at least two cars since traffic congestion has become a serious problem, therefore parking space is at a premium, which means the emptor is less of a need. Because all work nowadays has been done online, an IoT-based smart parking system is the only viable option. By utilizing IoT sensors to detect and monitor security, locate parking lots, and reserve spaces, the smart parking system can make parking easier and more convenient for all users, thereby showing how the IoT can be widely used by a wide range of people in their everyday lives to make life easier and more convenient. To lessen traffic and make parking simpler, low-cost technology is being used. By minimizing traffic congestion and requiring less time for parking. In the smart parking system, information about the parking area is gathered through a website, and parking spaces may be reserved and tagged. RFID Tag reader reads the tags on the cars in the parking lot's designated area, which are subsequently displayed on the LCD screen and the main gate. A specific parking lot has been reserved for the automobile. Programming an IoT product using the Arduino IDE software on an Arduino Nano based on automated parking system control using codes is made simple and powerful using the ESP8266. The most important benefit is that it saves time and money, and provides security control.***

Keywords: IoT, ESP8266, RFID, LCD, Automobile, Smart parking.

I. INTRODUCTION

The 'Rules of the Road Regulation,' as the Indian Road Rules are sometimes called, went into force in July 1989 and continues in operation to this day. Under the Indian Motor Vehicle Act, there are several specific offenses, as well as associated punishments, listed below. Drivers in India should abide by these guidelines while on the road to ensure a safe and orderly traffic flow. As per city-specific traffic, any violation, transgression, or disrespect of any of these regulations is considered a severe offense. Using Radio Frequency Identification (RFID) for vehicle tracking has grown in popularity in recent years owing to its widespread availability and inexpensive cost. It is common for the RFID tags to be put inside the vehicle, and RFID readers to be installed on the road. RFID tags may be used to gather traffic information. Criminals who break the law may be held accountable using this information. This paper's approach may be used in a city that is trying to implement RFID-based traffic and vehicle monitoring systems. Traffic police guidelines and the Indian Motor Vehicle Act may be automatically identified by radio waves using RFID, a contactless and wireless technology.

II. LITERATURE SURVEY

The idea of "smart cities" has grown in popularity in recent years. The concept of a "smart city" is becoming a reality because of the advancement of the Internet of Things. There is a constant attempt to improve the efficiency and dependability of urban infrastructure with IoT. New potential for smart cities has emerged as a result of the rapid development of the Internet of Things and Cloud technology. Building smart cities have always been at the heart of developing smart parking facilities and traffic management systems. A smart parking system based on the Internet of Things (IoT) and the cloud is presented in this study. Parking space availability in a parking lot may be monitored in real-time using the technology we suggest. Our smartphone app allowed users to reserve a parking space for themselves from any place. The goal of the work presented in this article is to increase the quality of life for residents by making improvements to the city's parking infrastructure. Shikha Bathla, Nidhi Gaur, and Anupama Mehra claimed that an increase in the number of cars on the road is a direct result of the rise in parking troubles, as did Archika Singh and Mumin Sajad Shawl. As the number of vehicles on the road has grown, congestion and a lack of parking spaces have developed, threatening the safety of vehicles via unlawful parking. The primary goal of this article is to examine several types of parking systems and develop an Intelligent Prepaid Car Parking system that handles parking space concerns, vacancy issues, and vehicle safety. VHDL is used to make use of the advantages of RFID (Radio Frequency Identification). It reduces the amount of manual effort and improves the efficiency of the system.

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III.EXISTING SYSTEM

All Parking in public spaces has grown more challenging due to the rapid expansion in both the population and the number of automobiles. To catch illegal parking, a significant number of officers are on the scene. Owners, on the other hand, use a variety of unlawful methods to avoid paying the punishment, such as bribing or intimidating employees. Towing vans must conduct a manual check for parked automobiles that are unlawfully parked. This method necessitates substantial outlays for personnel, fuel, and other forms of physical monitoring.

In the present system, there is no sensor-based unauthorized parking system, only a manpower-based unauthorized parking detection system.

IV.PROPOSED SYSTEM

Everywhere we look, we can see the impact of contemporary technology on our daily lives. To construct a future in which everything can be done more quickly and simply with the aid of technology, the correct use of technology is necessary. Vehicle traffic has become an everyday occurrence in our contemporary society due to the fast rise of the population. In addition, the number of unlicensed vehicles has risen as well. As a result, the system we've designed seeks to guarantee that automobiles in public spaces like schools and offices are properly managed to avoid illegal parking and traffic. Some features allow for the recognition of authorized and unauthorized cars at the main gate, as well as the detection of unlawful vehicle parking in the restricted zone and the assessment of a fee to the vehicle user. Here, we present a method for automatically detecting and warning to unlawful parking. Every car will have an RFID transmitter installed as part of the system. Parking spaces that do not have parking restrictions have RFID receivers installed. In an area where parking is permitted, the RFID transmitter and receiver circuits are nearby. This will trigger the RFID. Behalf of that, this parking system is used to check the parking slots before going to the parking area through IoT and it gives information of empty parking slots in the parking area in the LCD, it works under two modes server mode and normal mode, In server mode, the status of the parking lot is sent to the IoT cloud server(UBIDOTS), In normal mode, the status of parking slots is displayed on LCD, whether they are empty or full parking slots.

A. Block Diagram

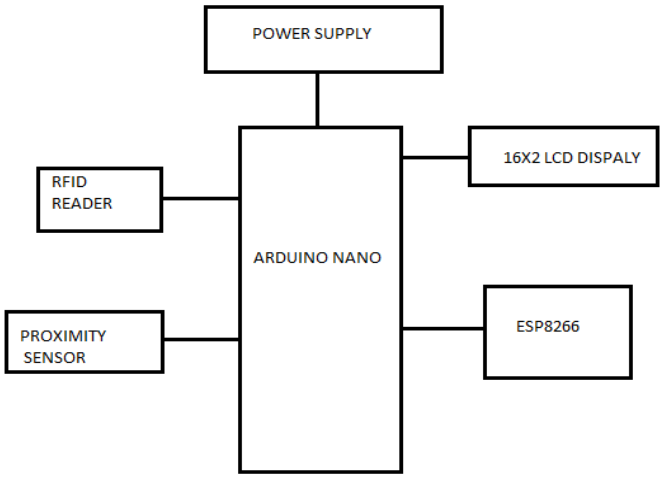


Fig.1; Block Diagram of IoT parking system

B. Flow Chart

When the parking system is turned ON, At the start it initializes all the sensors and connects the wifi module to the hotspot, if it gets connected to the wifi network checks for the availability of vehicles near the gate and shows the availability of Slots empty in the parking area, if the vehicle detected it checks for the availability of slots and reads the RFID data then in the next step if the vehicle is authorized it opens the gate and sends the data to IoT cloud service including slot status if the vehicle is unauthorized gate is not opened and sends the data to IoT webpage using WiFi network the whole algorithm is shown in the flow chart fig.2.

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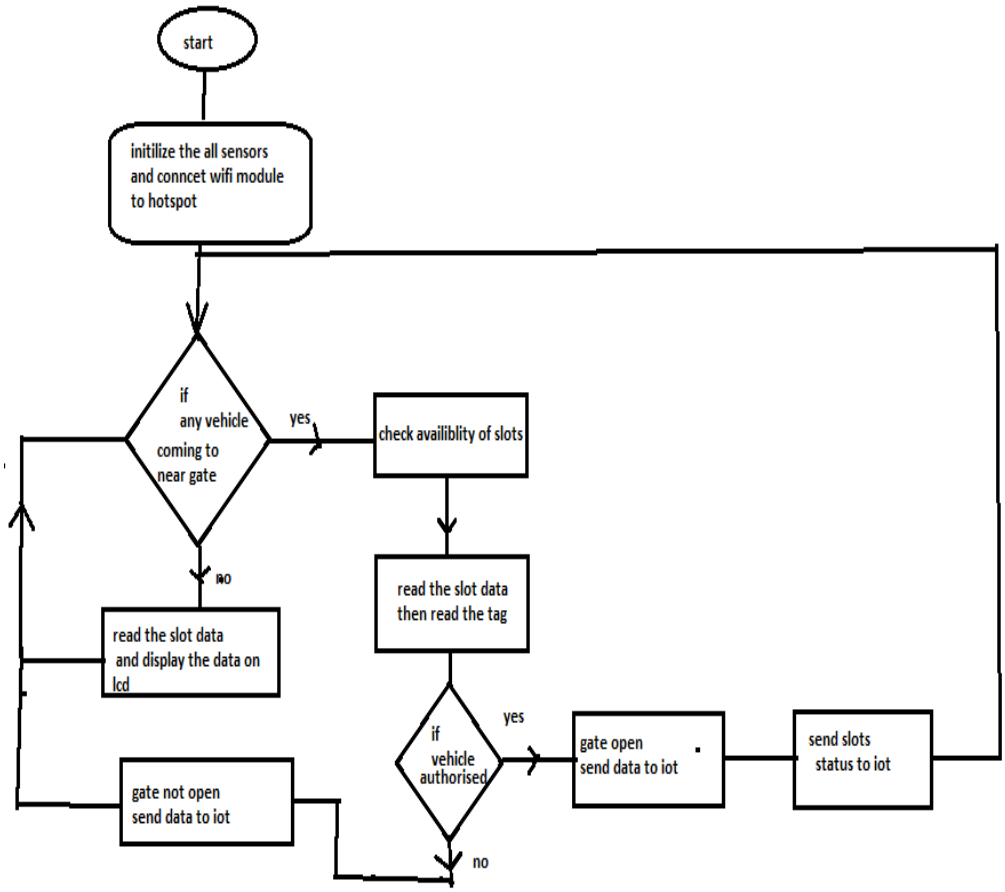


Fig.2; Flow chart of IoT parking system

C. Hardware Requirements

1) Arduino NANO(ATMEGA328)

ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR-enhance RISC architecture.

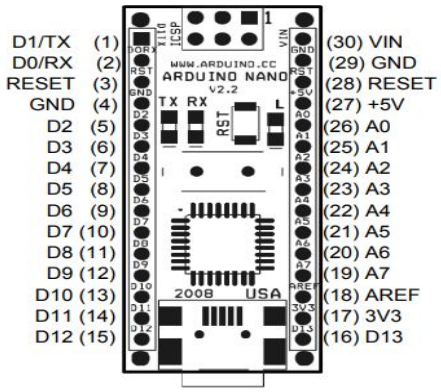


Fig.3; Arduino NANO Pin Diagram

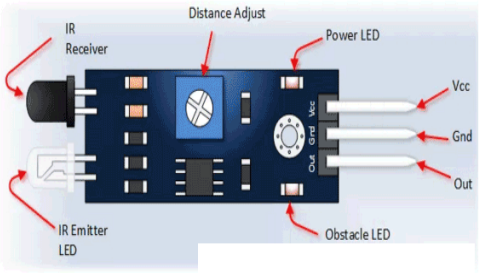
It is based on the ATmega328 and is tiny enough to use on a breadboard (Arduino Nano 3.0). The Arduino Duemilanove is essentially the same thing in a new form factor. A DC power connector is the only thing it lacks, and a Mini-B USB cable is used instead of a conventional one to power it.

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2) Proximity Sensor

Proximity An item or impediment in front of a sensor may be detected by a sensor's sensor. Whenever an item gets close, the sensor detects it by measuring the reflected light from the object and sending off infrared light. For example, it may be used in robots to avoid obstacles, for automated doors, for parking assist devices, or security alarm systems, or as a contactless tachometer by sensing the RPM of rotating objects such as fan blades.

Detection of things in front with a low digital output



Pin, Control Indicator	Description
Vcc	3.3 to 5 Vdc Supply Input
Gnd	Ground Input
Out	Output that goes low when obstacle is in range
Power LED	Illuminates when power is applied
Obstacle LED	Illuminates when obstacle is detected
Distance Adjust	Adjust detection distance. CCW decreases distance. CW increases distance.
IR Emitter	Infrared emitter LED
IR Receiver	Infrared receiver that receives signal transmitted by Infrared emitter.

Fig.4; IR Proxmity sensor

3) RFID Reader

Passive RFID transponder tags may be read up to 7 cm away from the card reader using RFID Card Readers, which are a low-cost alternative. Among the many uses for this RFID Card Reader are access control, automated identification, robotics navigation, inventory monitoring, payment systems, and vehicle immobilization, to name just a few of the more common ones. A baud rate of 9600 is used to generate a unique identifying code for each RFID tag that is within the range of the reader. A microcontroller or PC may read data from an RFID reader through an interface.

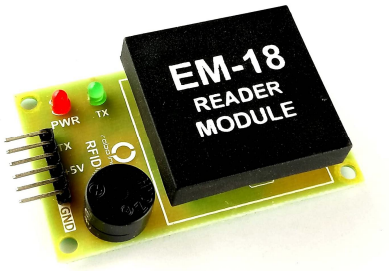


Fig.5; RFID Reader Module

4) Features

a) Analyzing RFID transponders using a passive technique at a low cost
b) 5 V TTL level 9600 bps serial interface for microcontrollers
c) Valid RFID Tag detection is indicated by a beep and an LED light.
d) For 125 Khz RFID Cards or Keychains, the range is up to 7 cm.

5) RFID Tag

An integrated circuit called the EM4102 (formerly known as the H4102) is used in electronic read-only RF transponders. Coils positioned in an electromagnetic field power the circuit, which derives its clock from one of the coil's terminals. The device will transmit back 64 bits of information stored in a factor-programmed memory array by modulating the modulation current. To store a unique code on each chip, laser fusing of polysilicon connections is used to program them.



Fig.6; RFID Reader Module and tag

6) ESP8266

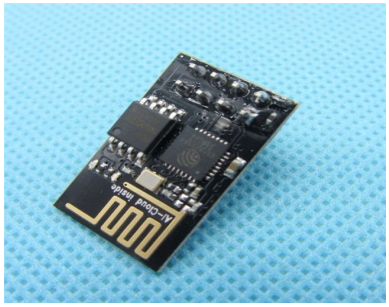


Fig.7; ESP8266 WiFi(IoT) Module

A high-integrity chip like the ESP8266 is a need in today's connected society. A complete Wi-Fi networking solution that allows it to host the program or offload all Wi-Fi networking tasks from another application processor.

Sensors and other application-specific devices may be connected to the ESP8266's GPIOs through its onboard processing and storage capabilities with low effort in advance and minimal burden during operation. Because of the high level of on-chip integration, the whole system is designed to take up as little PCB space as possible when it comes to front-end modules.

7) LCD

Liquid crystal displays (LCDs) are displays that make use of this technology (LCD). Cell phones, calculators, laptops, and TVs are all examples of electronic gadgets that use this kind of electronic display module. Light-emitting diodes with multiple segments and seven-segment displays are the most common applications for these screens. Among the benefits of using this module are its cheap cost, ease of programming, ability to display unique characters and animations, and so on.



Fig.8; 16x2 LCD display

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D Software Requirements

1) *Arduino IDE:* To create and upload code to the board, the open-source Arduino Software (IDE) makes it simple. A code editor, a message area, a text console, a toolbar with typical function buttons, and a series of menus are all part of the package. To upload programs and interact with the Arduino and authentic hardware, it connects to them.
2) *UBIDOTS:* IoT Analytics and visualization firm Ubidots specialize in the Internet of Things (IoT). Data from sensors are transformed into information that may be used to make corporate choices, improve machine-to-machine interactions, conduct educational research, and boost the efficiency of global resources. You may use Ubidots to easily and affordably incorporate IoT technology into your company or research projects.

E Working

Once a web or mobile application has control of the smart parking system, the system is fully automated. By employing the embedded c program, the Arduino IDE software performs the functionalities of the Arduino NANO(ATMEGA328P). Users may reserve parking spaces online and obtain a parking badge through email, then find the parking lot using the internet website and park there. With the Arduino IDE software, To create an IoT device, you may program the esp8266P WIFI with an embedded c software that controls IR sensors and DC motors in the kit. The main gate of the parking lot is equipped with an electric motor and an RFID tag reader for opening and closing. , which is used to verify that the user who reserved the parking space is the same person who has arrived. IR sensors are installed in the parking 3 lot to monitor the presence of any other vehicles. If another car is detected, a signal is delivered to the parking area's main gate and displayed on an LCD screen there. If the car parking space is vacant, it may be shown on LCD at the main gate in "normal" mode to identify the vehicles parked there. When using a server, For our project's homepage, the ESP8266 is our preferred choice. Because the ATMEGA328P lacks a WIFI module, we are unable to attach the web page to it, and Arduino NANO is used in smart parking to offer information about parking spots and to convey signals about parking availability through an IR sensor and a website powered by an ESP8266. nothing more than a cloud server is what we see on the web page. UBIDOTS, It's an Internet of Things (IoT) platform for turning gadgets on and off and keeping tabs on their status.

1) Advantages

a) Reduce Manpower
b) Take Immediate Action When Unauthorized Parking
c) Easy To Maintenance

2) Disadvantages

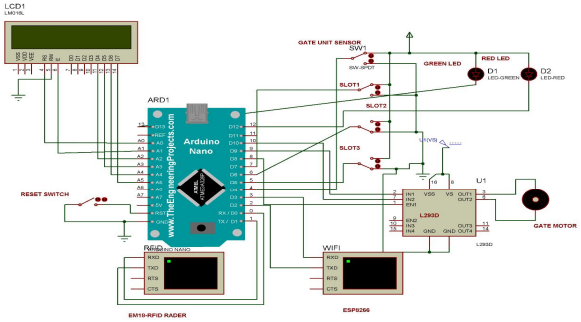
a) Wifi Is Mandatory.

3) Application Areas

a) Educational Institutions
b) Shopping Mall
c) Mnc Offices
d) Private Places

V. RESULTS AND DISCUSSION

The schematic diagram is shown in fig .



The whole prototype of the IoT parking system is designed and it is shown in fig.9

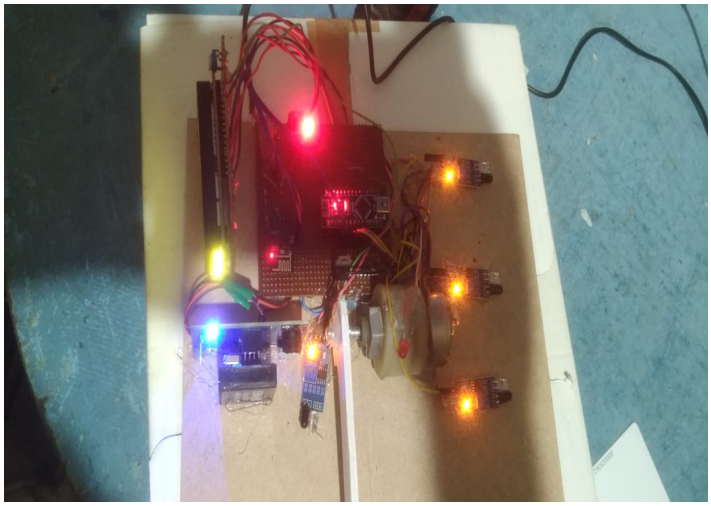
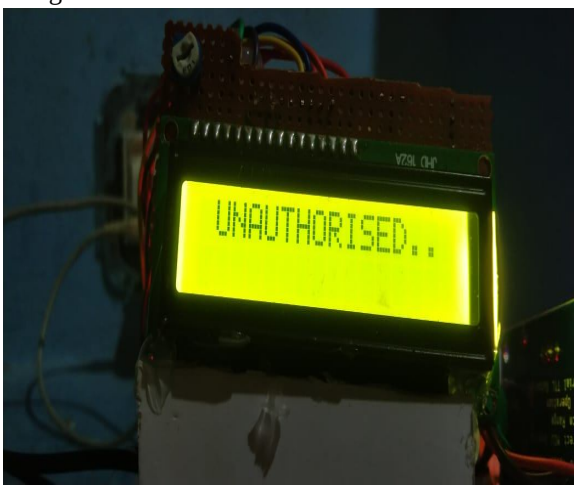


Fig.9; prototype of IoT parking system

At first, when the vehicle enters the parking area the IR proximity identifies the vehicle and then the RFID reader gets initiated and reads the RFID tag which was embedded into the vehicle and identifies the authorized and unauthorized vehicle, and sends the data to the web page and shows the status on the webpage and also it was shown in the LCD which is in front of the parking main gate is shown in fig.10.



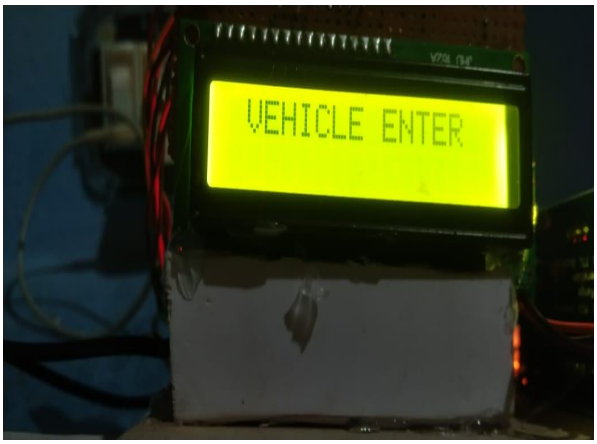


Fig.10; Display showing unauthorized personnel and Display showing authorized to enter the gate

If the person is authorized personnel the gate opens and sends the data to the UBIDOTS webpage, if the person is unauthorized the gate does not open and sends the data to the webpage as shown in fig 11. the UBIDOTS Webpage in server mode which is showing the status of the IoT Parking system and empty slots of vehicle parking is shown in fig.4

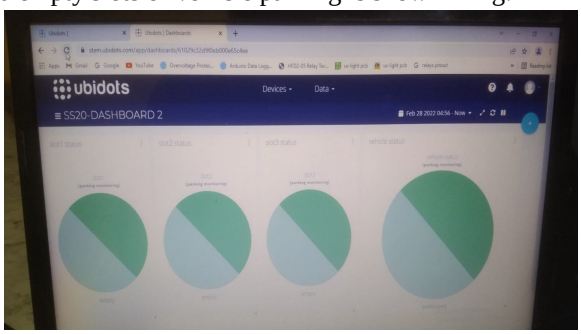


Fig.11; parking status showing on UBIDOTS webpage

The parking lots which are full and empty in the parking system are shown in LCD, Now it works in the normal mode it always sends the live data status to the IoT cloud UBIDOTS web page also shown in fig.12.

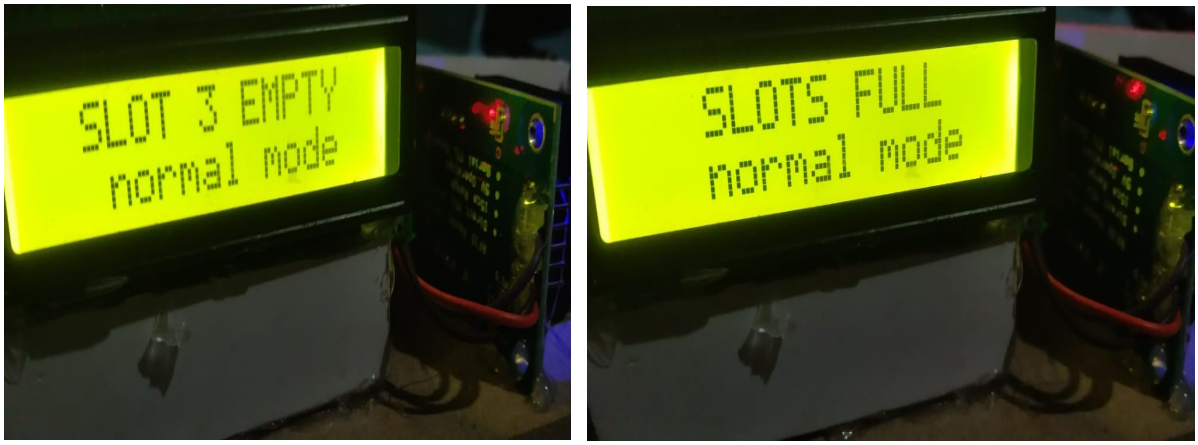


Fig.12; Parking Slot status on LCD showing empty and full in normal mode

The whole data transmission is done by the wifi network using ESP8266 IoT Module, which works with local wifi providers using SSID and password which is included in the program.

VI. CONCLUSIONS AND FUTURE SCOPE

Parking will gain greatly as a result of this system's implementation. There are several benefits to using this system to improve the economic, social, and safety-related elements of society, as well as conserving the environment. Aiming to improve the quality of life for the city's residents, efforts have been made to improve the city's parking infrastructure. For crowded regions, finding a parking spot may be time-consuming, thus the adoption of smart technology is important to aid drivers and decrease the time it takes to locate a spot. We can reduce road congestion and enhance parking options in this manner.

In the future scope, we add a camera for this project, based on the camera we will monitor the live streaming of that vehicle's movements. By using this method we will take/reserve permission for parking in that area.

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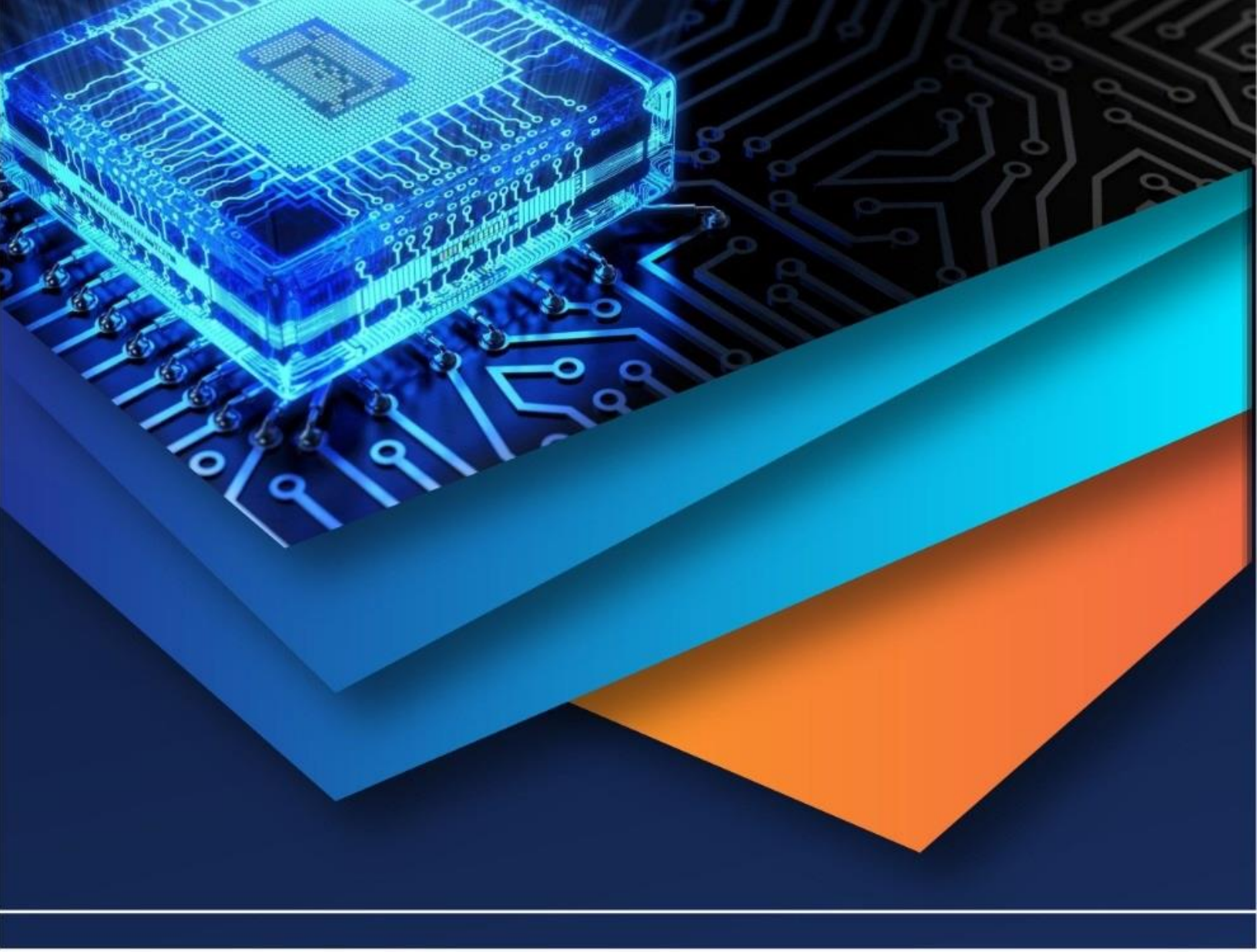
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