

# IoT and Cloud Based Smart Parking and Automation Billing

Kandimalla Mallikarjuna Rao<sup>1</sup>, Kothari Naresh<sup>2\*</sup>, Kolla Hari Prasad<sup>3</sup>, Jorige Venu<sup>4</sup>, Konduru Suresh<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Electronics & Communication Engineering, KKR & KSR Institute of Technology and Sciences, Guntur, India

<sup>2,3,4,5</sup>Student, Department of Electronics & Communication Engineering, KKR & KSR Institute of Technology and Sciences, Guntur, India

**Abstract:** The smart car parking project aims at providing confusion-free and easy and safe parking. This project helps the drivers of vehicles to park their vehicles without wastage of time & with accurate information on the availability of the space to park over. This can collect parking charges efficiently. It includes an ESP32 as the microcontroller unit to update the information regarding the parking slots, and IR sensors are interfaced. The android app keeps the check on the number of cars entering and exiting the parking space, and the servo motor is used as a gate, for the entry and exit of the cars. The IR sensors detect the availability of the parking space and update the information to Arduino and Blynk software is used for cloud services. The aim of this project is to provide a simple automatic car parking allocation system with basic components like a microcontroller that provides solutions to the problems in car parking allocation. Parking allocations in shopping malls and movie theatres are very complex there must be a person to check space availability and keep vehicles safe. This project simplifies the parking allocation problem.

**Keywords:** Push button, Blynk app, Mobile phone, ESP32, IR sensor, Servo motor.

## 1. Introduction

A Smart parking and automatic billing include ESP32s, IR sensor, servo-motor, push button, mobile phone connected to Blynk cloud through an IoT application. Using a mobile phone consisting of IoT application Blynk which is connected to the cloud and to the Esp32s microcontroller we send commands regarding the operation to be performed. When gate open button in mobile application, it sends request to the Esp32s whereas it respond with the corresponding command such as to rotate 90 degrees anti clockwise direction. By the parking slots availability that are viewed in mobile application, the cars will be parked. After the complete utilization of parking slot. The parking bill will be paid by pressing the push button that is placed at exit stage. Through this the command in mobile application gets refreshed, such that by typing valid username and password the successful payment would be done. Then the exit servo motor will gets rotated by 90 degrees anti clockwise direction. Hence the car will exit from that place.

The main advantage of these system is we can reduce some amount of pollution and time is also saved, and main advantage less fuel is consumed.

Mohammed Ahamed, Wangguangwei “Study on automated

car parking system based on microcontroller”. [1] Proposed a method for smart parking with a LCD display. The advantage is cost is less for this method but it doesn’t provide automatic billing so it requires human interruption

### A. Advantages

- Time saving, avoids lot of time for the search of parking area
- It ensures security
- It reduces the employee work in the parking station
- Optimize parking

### B. Applications

- It is useful at regular parking stations
- Cashless bill payment
- EV charging spots
- Malls

In Section I, we have discussed about Introduction, and in Section-II about Components, and in Section III about Methodology, Result and Discussions are in Section IV, Future Scope in Section V and Conclusion in Section VI.

## 2. Components

### A. IR Sensors

The IR sensor or infrared sensor is a kind of electronic component, used to detect specific characteristics or objects in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or to measure the heat of a target and its motion. In most of the electronic devices, the IR sensor circuit is a very essential module. This type of sensor is similar to human’s visionary senses to detect obstacles.



Fig. 1. IR sensor

\*Corresponding author: nareshkothari789@gmail.com

Below shows pins description of IR sensor:

- V<sub>CC</sub> Pin is power supply input.
- GND Pin is power supply ground.
- OUT is an active-high o/p.

Table 1  
IR sensor specifications

Specification	Range
Operating Voltage (V)	5 V DC
I/O Pins	3.3V & 5V
Range	20cm
Supply current	20 mA

**B. Servo Motor**

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It can rotate 90 degrees in either direction from its neutral position. It has torque of 2.5 kg- cm and operating speed of 0.1sec/60 degrees. It consists of three pins (V<sub>CC</sub>, GND, Out)



Fig. 2. Servo motor

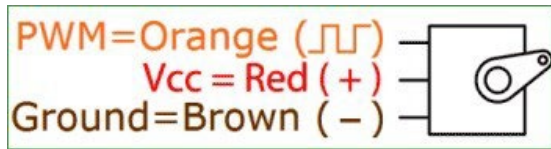


Fig. 3. Pin description of servo motor

**C. ESP32**

ESP32 is a low-cost System on Chip Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC & comes in both single-core and dual-core variations of the Tensilica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth

The good thing about ESP32, like ESP8266 is its integrated RF components like Power Amplifier, Low-Noise Receive Amplifier, and Antenna Switch, and Filters and RF Balun. This makes designing hardware around ESP32 easy as you require very few external components.

The fact that ESP32 is produced utilising TSMC's ultra- low-power 40 nm technology is another crucial information to be aware of. Hence, employing ESP32 should make it very simple to create battery-powered applications like as wearables, audio equipment, baby monitors, smart watches, etc.

**D. Power Supply**

For the entire circuit for micro controller and for sensor in order to work we need current flow in them so we can connect power through adaptor or we can connect rechargeable

batteries, because more amount power is needed so it is better to use rechargeable batteries.

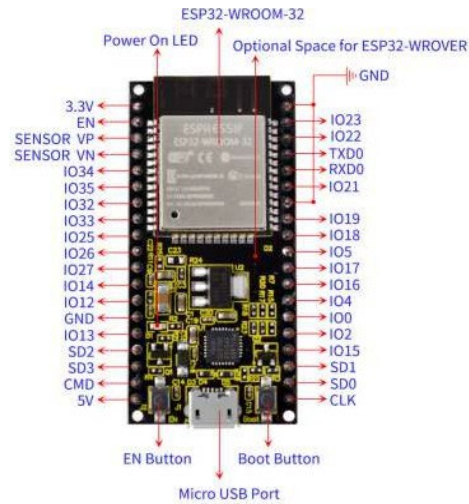


Fig. 4. ESP32s

Table 2  
Specifications of ESP32

Specification	Value
Number of cores	2
Architecture	32 bit
CPU Frequency	
Wi-Fi	YES
Bluetooth	YES
RAM	512 KB
FLASH	16 MB
GPIO Pins	36
Communication Protocols	SPI, IIC, I2S, UART, CAN
ADC channels	18 channels
ADC Resolution	12-bit
DAC channels	2

**3. Methodology**

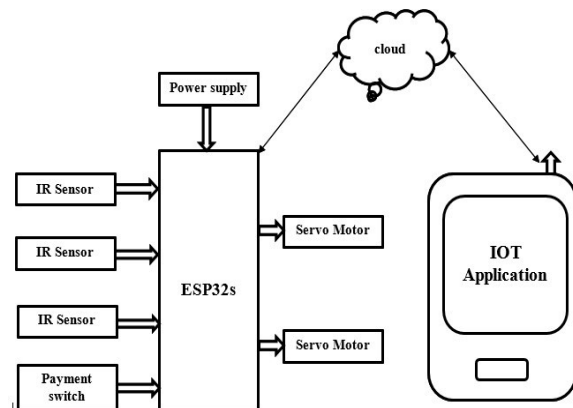


Fig. 5. Block diagram of smart parking and automatic billing

ESP32s is a microcontroller with built in Wi-Fi and Bluetooth which is connected to cloud for data transfer.

IR Sensor are placed in parking slots of parking area and connected to esp32 when a car is parked in a parking slot the IR sensor detect that and sends the data to ESP32 and it stores in a cloud with the help of cloud the data can be seen in Blynk that parking slots are filled or empty.

Servo Motor are used at entry and exit points as doors when there is empty space in parking area then only entry door open and at exit door that means at exit servo motor after payment done push button is pressed. So that the data in cloud can be erased and in Blynk app it shows parking slot as Empty.

#### 4. Blynk App

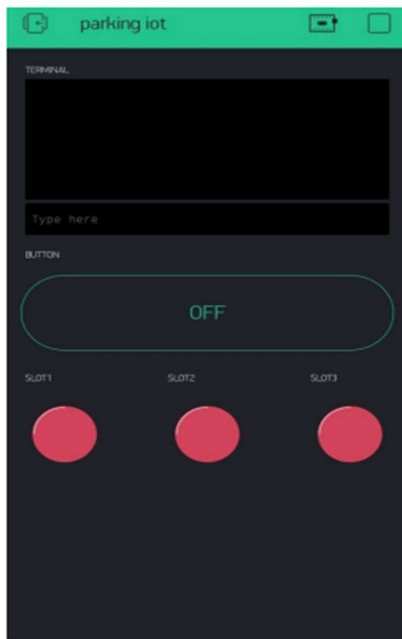


Fig. 6. Slots availability and bill payment in Blynk app

If the caretaker is outside then also, he gets a message. If there is an emergency purpose then he bends a small finger. Then the caretaker knows that he is in danger. Like that for 5 fingers 5 flex sensors are used for each finger there is a command and the respective finger command output is observed as message and listened as voice.

#### 5. Future Enhancement and Future Scope

This prototype can include auto detection and allow of vehicle at the entrances by pre-booking facility. Replacing push button at exit gate by placing simple payment button mobile

application. Making collection of parking charges through some secure digitalized platforms. Application of IoTs in this field will open many channels and address many short comes. Pre-booking of slots using mobile applications of the specific malls, offices will be helpful in parking and it will be helpful for the persons with EVs since they require charging spots. Making utilization of website as well to book the parking slots in various places like shopping malls, regular parking places, EV stations etc.

#### 6. Conclusion

This system gives solution to the problem of traffic congestion in front of the parking garage. Conventionally there is no such automated system for allocating spaces for parking vehicles. So, this will make parking allocation simple and well organized with systematic first come first serve basis. Directing people to empty parking slots and indicating exact locations adds more credibility to this system. Users from remote locations could book a parking slot for them with mobile application.

Using Cloud makes it easier to store data and fetch it simultaneously. This proposed architecture for a smart parking system would decrease the searching time for parking space and reduce instances of improper parking of the car. It also reduces labor cost and manual efforts by which investment in man Power is not needed, and a large amount of money could be saved.

The efforts made in this project are intended to Improve the parking facility of the city and there by aiming to enhance the quality of life.

#### References

- [1] Noor N.M, Z Razak and Mohd Yamani, "Car Parking System: A Review of Smart Parking System and its Technology," Information Technology Journal, 2009.
- [2] Mohammed Ahamed, Wangguangwei "Study on Automated Car Parking System Based on Microcontroller". International journal of engineering research and technology, vol. 3, no. 1, January 2014.
- [3] Wuhongwang "Metropolis Parking Problems and Management Planning Solutions for Traffic Operation Effectiveness" Hindawi, volume 2012.
- [4] M. J. J. Gumasing and C. A. V. Atienza, "A design of automated parking system for shopping centers in Metro Manila," 2018 5th International Conference on Industrial Engineering and Applications (ICIEA), Singapore, 2018, pp. 415-419.
- [5] D. Kanteti, D. V. S. Srikar and T. K. Ramesh, "Intelligent smart parking algorithm," 2017 International Conference on Smart Technologies for Smart Nation (Smart Tech Con), Bengaluru, India, 2017, pp. 1018-1022.
- [6] A. Sungheetha and R. R. Sharma. "Cost Effective Energy-Saving System in Parking Spots," in Journal of Electronics and Informatics, vol. 2, no. 1, pp. 18-29, 2020.