# SMART PARKING SYSTEM IN MALLS

A COURSE PROJECT REPORT

Submitted by

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# BONAFIDE CERTIFICATE

Certified that this project report titled "SMART PARKING SYSTEM IN MALLS " is the bonafide work of G.Saiteja-[RA2011029010042], K.Jahnavi-[RA2011029010045], R.V.V. Krishna -[RA2011029010063] who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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# ABSTRACT

Smart Parking makes use of sensing devices such as vehicle counting equipment, cameras, sensors installed in pavements, etc. to discover occupancy of the parking lot. The strong sensing systems are being built to examine and transfer the data to the database in real time. The system increases the accessibility of parking with the use of sensors. The sensors placed in the pavement of the selected parking spaces to recognise if parking slot is occupied or vacant. Sensors communicates with gateway and that data will be push to the cloud. Sensors then immediately show the availability of parking slots. This can be viewed on the APP or the sensors placed on the parking slots so drives can easily identify the space. Smart Parking is one of the most acquired and developing Smart City Solutions across the world. Airports, shopping malls, universities and city garages etc are just a few establishments that have started to realise the remarkable benefits of automated parking technology. Some solutions will enclose a complete suite of services such as parking time notifications, online payments and even car searching functionalities for very huge lots.

# ACKNOWLEDGEMENTS

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# CHAPTER 1

# INTRODUCTION

## 1.1 The objective of the Project

The smart parking management system makes parking management ease in a shopping mall. This system will make availability of parking during weekends/rushing hours in shopping malls. This system ncludes two steps. One is the pre-the reservation of parking for vehicle owners, and t ıe other is a parking management system for a vehicle smart parking system that will provide the current parking availability status for vehicle owners.

If available, they can reserve the parking after making an online payment, or else they can find another parking area. The application used by parking management will manage all parking areas and will be used for making reservations on entry of a vehicle. This will be very helpful in saving the time and a lot of efforts for finding a space to park the vehicle, especially during the weekends. User can connect to the smart parking system from anywhere with their smart phones in any browser. And this information is also available to the parking operators to determine the free parking areas, and statistics can be measured at different times in a day on each parking space.

## 1.2 Purpose

Smart parking solutions enable the municipalities to manage and reduce parking search traffic on the streets. This technology also ensures parking safety, but its major contribution to traffic congestion are the factors of making the parking experience faster, more convenient and hassle-free.

The basic objective of a smart parking solution is to identify a vehicle's presence or absence in a particular parking space with a high degree of accuracy, and to pass on this data into a system for visualization and analysis – to be available for parking asset managers and/or enforcement officers.

# CHAPTER 2
# 2. LITERATURE SURVEY
## 2.1Literature Survey Review of Smart Parking System

**Awad Alharbi1 • George Halikias1 • Mohammad Yamin2** Published online: 29 June 2021 Bharati Vidyapeeth's Institute of Computer Applications and Management 2021 Usually, the development of smart parking systemsrequires the integration of several basic components, whichare: the infrastructure, the software system, data sensors for vacant positions, and finally, studying of parking and driverbehavior. In addition, it requires the availability of manytasks, the most important of which are: directin drivers to vacant positions, organizing parking, the reservation process, dynamic pricing and the payment process, reporting,forecasting, and others

**Marco Zennaro** In the recent past, several models for smart parking are reported. Optimal allocation of resources andreservation-based smart parking scheme [4] allocate parkingspace by considering the objective function of the user basedon the destination and cost. Mixed-integer linear optimization is used in sequential time for the number of wireless sensor network (WSN) nodes in the parking lot. Mono parking management system uses one sensor per parking lot.Extension of mono parking to the multi-parking for larger-scale parking navigates the users to the appropriate parking lot within the area. It may necessitate alliance among all the parking service providers in that area. Parking regulation system based on intelligent WSN proposes equipping each parking lot with virtual coordination system and display units with the aim of proper guidance to the user for occupying nearest parking spot.

**Rahman Atiqur** Article Accepted Oct 20,2020 The sensors utilized in IoT based smart parking system stores and gets information from remote areas with the assistance of the cloud these variables offer raise to cloud of things (COT). The hubs could be observed and controlled from any area the framework that we propose gives data in regards to the accessibility of the parking slots with the assistance of the versatile application the clients from the remote area can book the parking slots [6]. A calculation is utilized to build effectiveness of cloud-based parking framework and system engineering innovation is utilized. This calculation is utilized to locate the least cost parking spot. Considering the quantity of parking spots accessible and furthermore considering the separation of the parking spot from the client. The client can legitimately get to the cloud-based server and discover the data on the parking spot

**Jhonattan J. Barriga 1,20, Juan Sulca 120, José Luis León 12** One of the most popular use cases in smart cities is the implementation of smartparking solutions, as they allow people to optimize time, reduce fuel consumption, and carbon there are dioxideemissions. Smart parking solutions have a defined architecture with particular components (sensors,communication protocols, and software solutions). Althouth are only three components thatcompose a smart parking solution, it is important to mention that each component has many typesthat can be used in the deployment of these solutions.

**Ahmed Shah, Dev Shah, Ajit Satpute, Mihir Shinde** http://www.ijert.org/ The main reason for parking systems is there is a lack of parking spaces in metropolitan cities. This due to the cities was developed a long time back when cars were considered a luxury. But due to various factors, cars have moved from a luxury owned by 1% to a necessity that the medium class owns, which is around 40% to 60%. Hence traditional parking solutions would not hold today. In this paper, the various types of parking systems are discussed, in which some are automated whereas others are manual. The advantages and limitations of the different types of parking systems were also discussed. The selection of the parking system depends on the cost of the system, the maintenance cost, and the area available for implementing the system

## 2.2 Scope of the Project

The system benefits of smart parking go well beyond avoiding the needless circling of mall blocks. It also enables malls to develop fully integrated multimodel intelligent transportation systems that do not rely on cars in the first place. In the future, the system can be extended which is not only specifical to a private parking like Malls, Company parking, etc. but also can be implemented over various multiple platforms such as public parking altending the feature by giving parking information based on the costreal-timetime. This will make the management of the parking spaces more efficient, by purging the need for humanlaborr.

# CHAPTER 3

# REQUIREMENT ANALYSIS

## 3.1 Software Requirements

1) Tinker CAD
2) Cisco Packet Tracer

### 3.1.1 Tinker CAD

Tinker CAD is an excellent tool that allows users to simulate Arduino-based systems. For our project, the hardware setup for the gas detector can be easily coded using Arduino in the Tinker CAD Platform. The setup is simple and enables us to test codes without actual physical implementation.

### 3.1.2 Cisco Packet Tracer

Cisco packet tracer enables developers to view the flow of data packets and carry out analysis on the data packets transmitted in the IoT network. All the IoT devices on Cisco Packet Tracer can be run on standard programs or can be customized by programming.

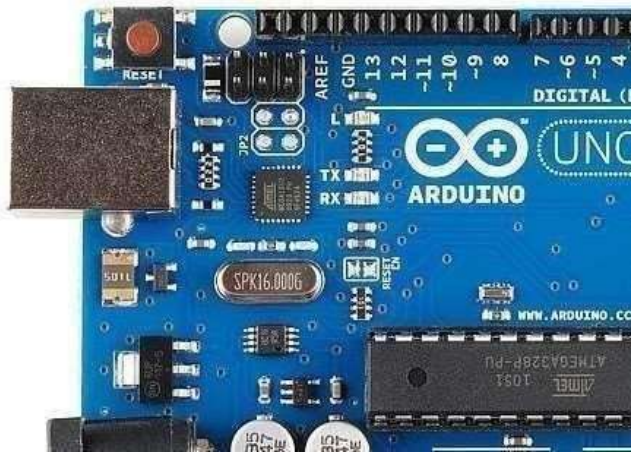
For our project we will use a Cisco Packet tracer to simulate the IoT network so that an abstract view of the deployment can be obtained without the use of physical sensors Cisco Packet Tracer provides users with an array of sensors to work with such as temperature, humidity, smoke, etc. it also has a variety of actuators which covers our project's requirements sufficiently.

## 3.2 Virtual Hardware

Since this project uses an array of sensors, virtual versions of them have been deployed and used in the implementation.

### 3.2.1 Arduino

This system is capable of finding the empty slots that are available for parking automatically. If the slot is empty in the automated car parking the new vehicles are allowed to enter the parking else the entrance is blocked by using the servo barrier in case no empty slot is found by the system.




### 3.2.2 IR sensor

The IR sensor is used to detect the absence or presence of a car when it enters the parking slot, and the LCD screen is then used to display the vacant parking slot to the driver. The parking slots are continuously monitored, and the data is continuously updated on the LCD screen. Two IR sensors are used at the entry and exit gates to detect vehicle entry and exit in the parking area. And other four IR sensors are used to detect the parking slot availability.

### 3.2.3 RFID

Sensors and RFID System. RFID is short for “radio-frequency identification” and points to a technology whereby a reader catches digital information encoded in RFID tags or smart labels via radio waves. Like barcode technology, RFID Scanner recognizes locations and identification of tagged items — but instead of reading laser light reflections from printed barcode labels, it leverages low-power radio frequencies to collect and store data.

### 3.2.4LoraWAN


LoRaWAN is commonly deployed in smart parking solutions to transmit accurate information about vehicle activity and collect parking occupancy data to notify drivers about available parking spaces. Bosch is assisting in the development of smart cities by paving the path for fully connected and automated mobility.
The LoRa sensors are installed at various parking slots as shown. They are referred to as LoRa End devices in the LoRaWAN network. These LoRa sensors are interfaced with LoRa Gateway. It is similar to the base station of a cellular system. It supports long-range and is utilized in star architecture-based networks.

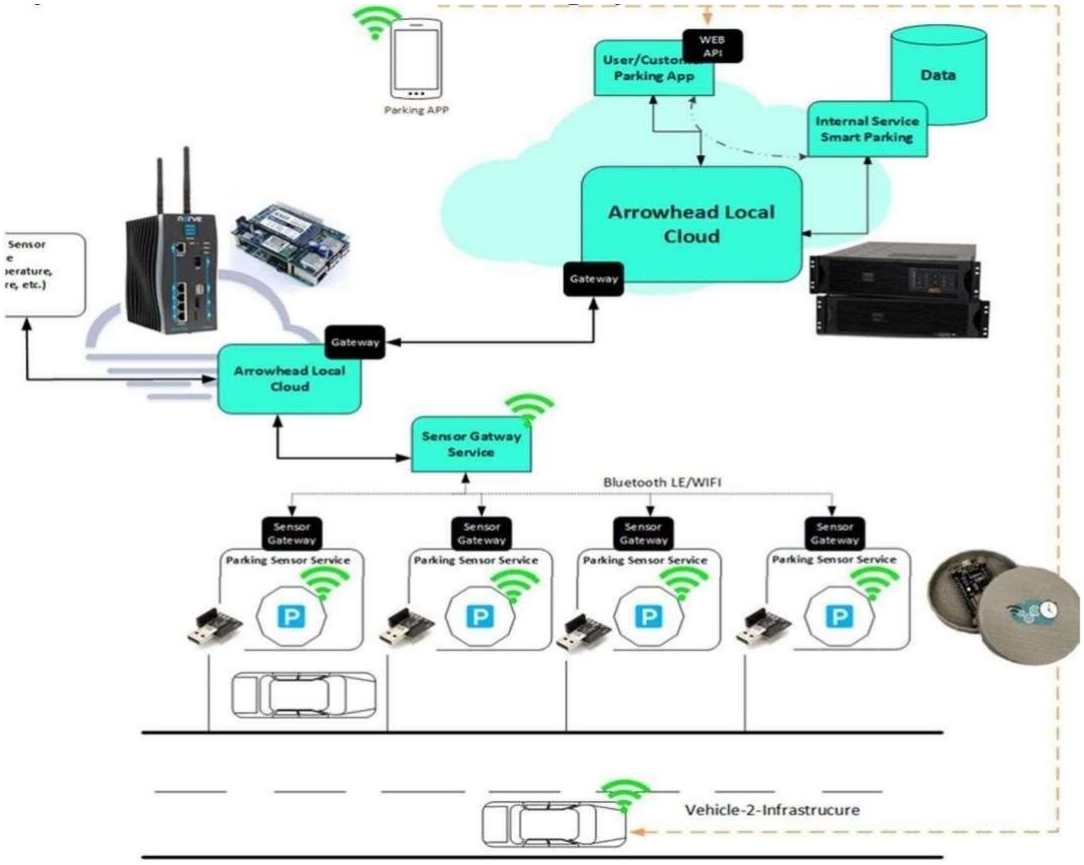
### 3.2.5 Ultrasonic Sensor

Ultrasonic sensors, commonly referred to as “parking sensors,” have been used in cars for years to help drivers avoid bumping into objects when parking. These sensors project sound waves to detect the proximity of objects and alert drivers when they are getting too close Sensors and RFID System. An ultrasonic sensor is placed after the gate ramp to determine whether the vehicle has passed. The ultrasonic sensor alerts the system to close the gate ramp once more and change the RGB led color to red when the car passes through it.

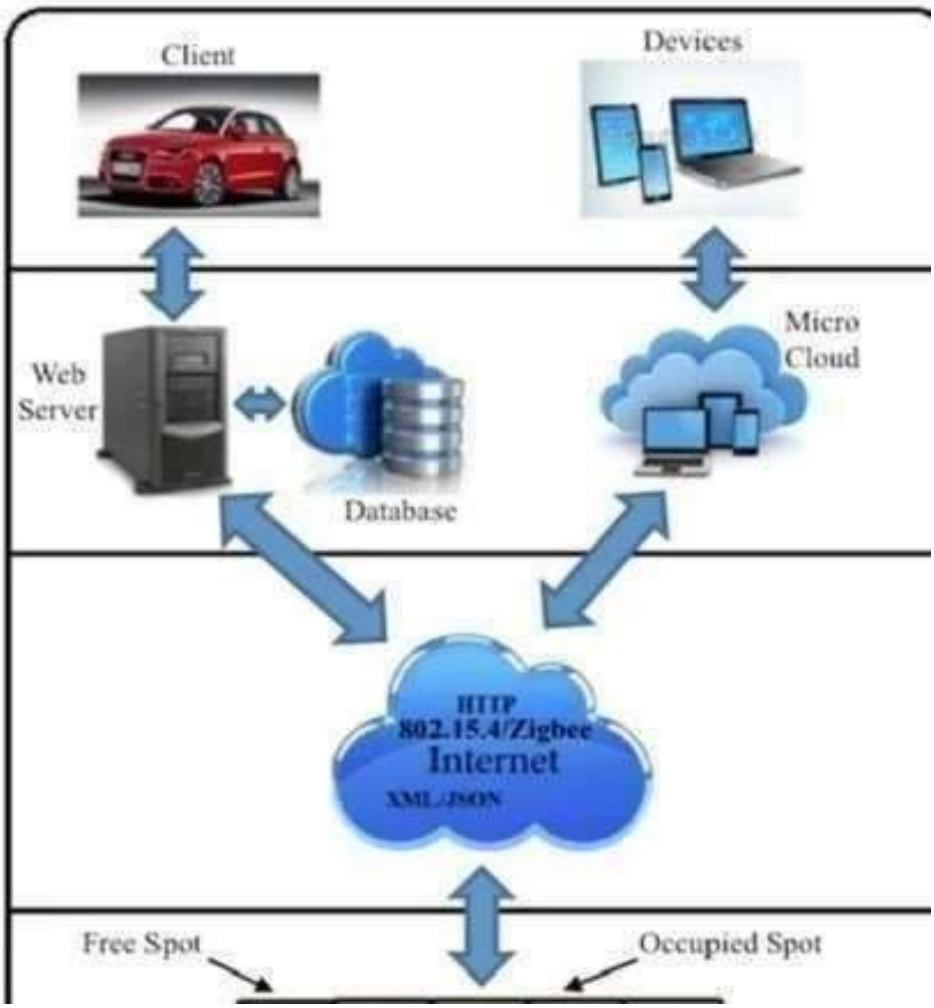
# CHAPTER 4

# SYSTEM DESIGN

## 4.1 System Architecture of Smart Parking System




In our project, the raw data generated by sensors is passed to the Cloud layer through the gateway where it can be processed and analyzed for appropriate decision-making. For instance, reserved parking spaces allow users to request the application layer, wherein the request will immediately be processed through a network layer o As a way of handling the user request, parking providers are expected to utilize the network layer to process the interaction with the transaction layer.

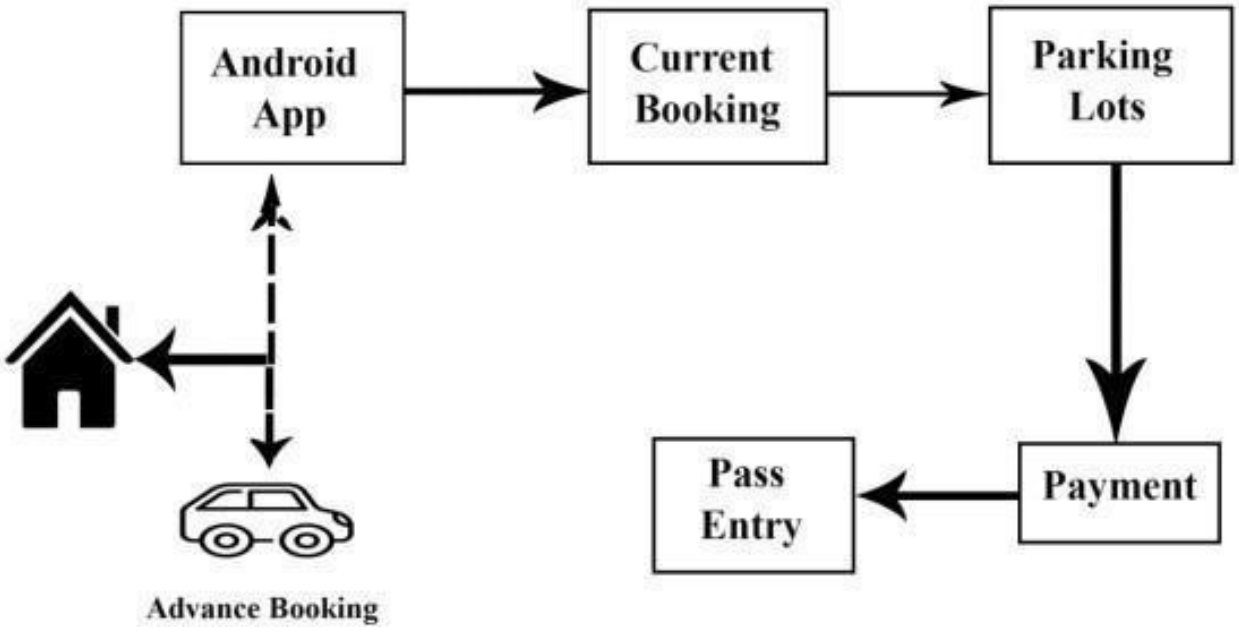



This parking system is proposed with the architecture consisting of mainly three Layers

- The Sensor layer
- The communication layer
- An application layer

## 4.2 Data Flow Diagram of Smart Parking System

A Parking System Data flow diagram is often used as a preliminary step to create an overview of the Parking without going into great detail, which can later be elaborated. it normally consists of overall application dataflow and processes of the Parking process




Technologies such as sensors and cameras detect free parking

spaces and direct drivers to the most convenient spot via digital signage such as LED-displays drive the user to the selected parking for the vehicle and, at the destination, all them ows to pay or activate and end the parking stop at departure. The whole process will be seen in the web application of the smart parking system. The S ystem can be realized by using various networks and communication protocols such as LoRaWAN®. It optimizes parking space and makes processes efficient

# CHAPTER 5

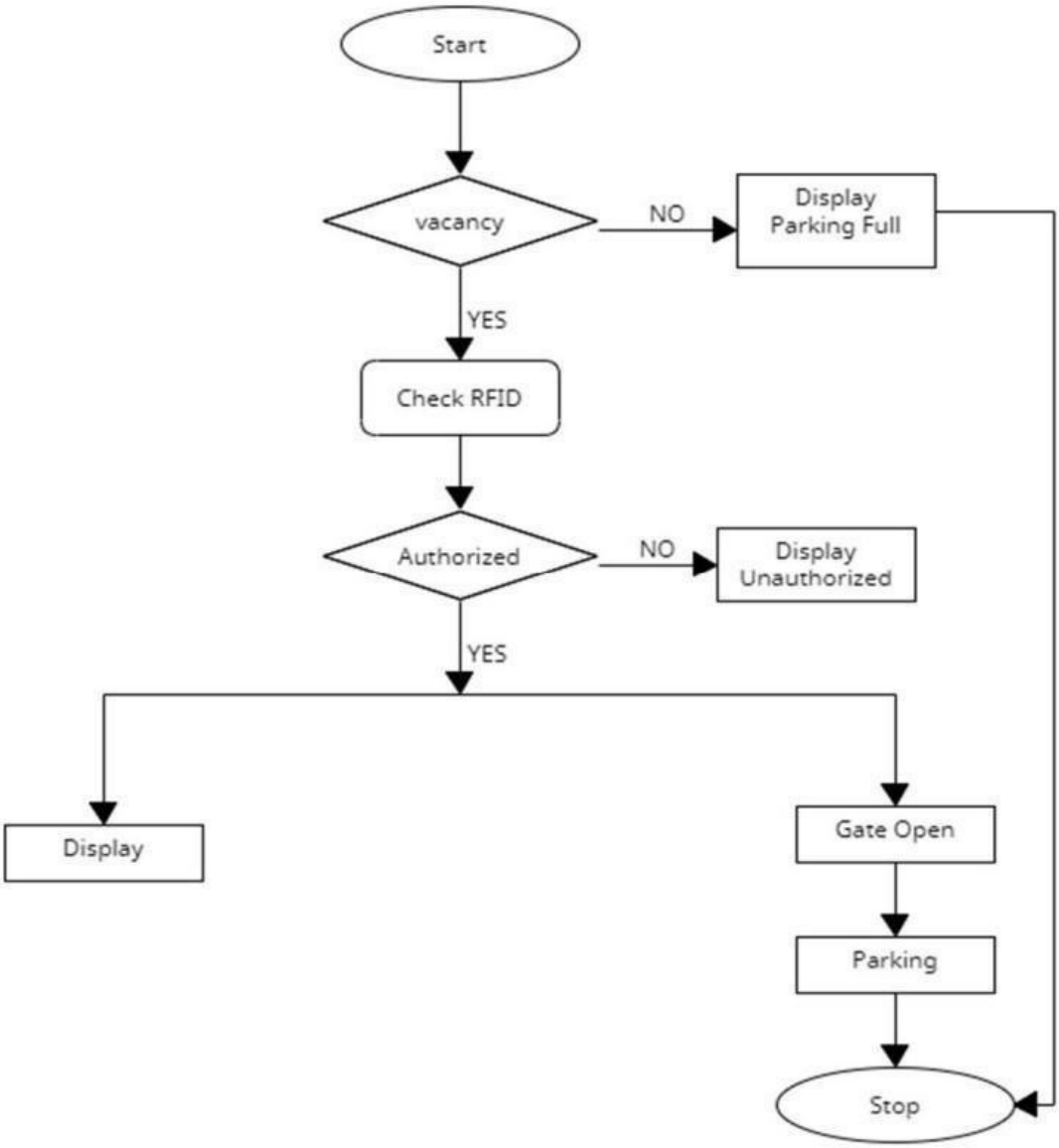
# WORKING

## 5.1 . Methodology of Smart Parking System

Smart parking systems can use various devices such as vehicle counting equipment, cameras, and sensors installed in malls and pavements to gather data about the occupancy of different parking lots. This data is then transmitted in real time via the internet to a database where it's aggregated and analyzed. The information can then be fed into a mobile app. Such an app then guides the driver with a GPS, providing directions to the nearest available parking space. By the duration of the time of parking, the payment will be generated.

## 5.2 Structure of Smart Parking System

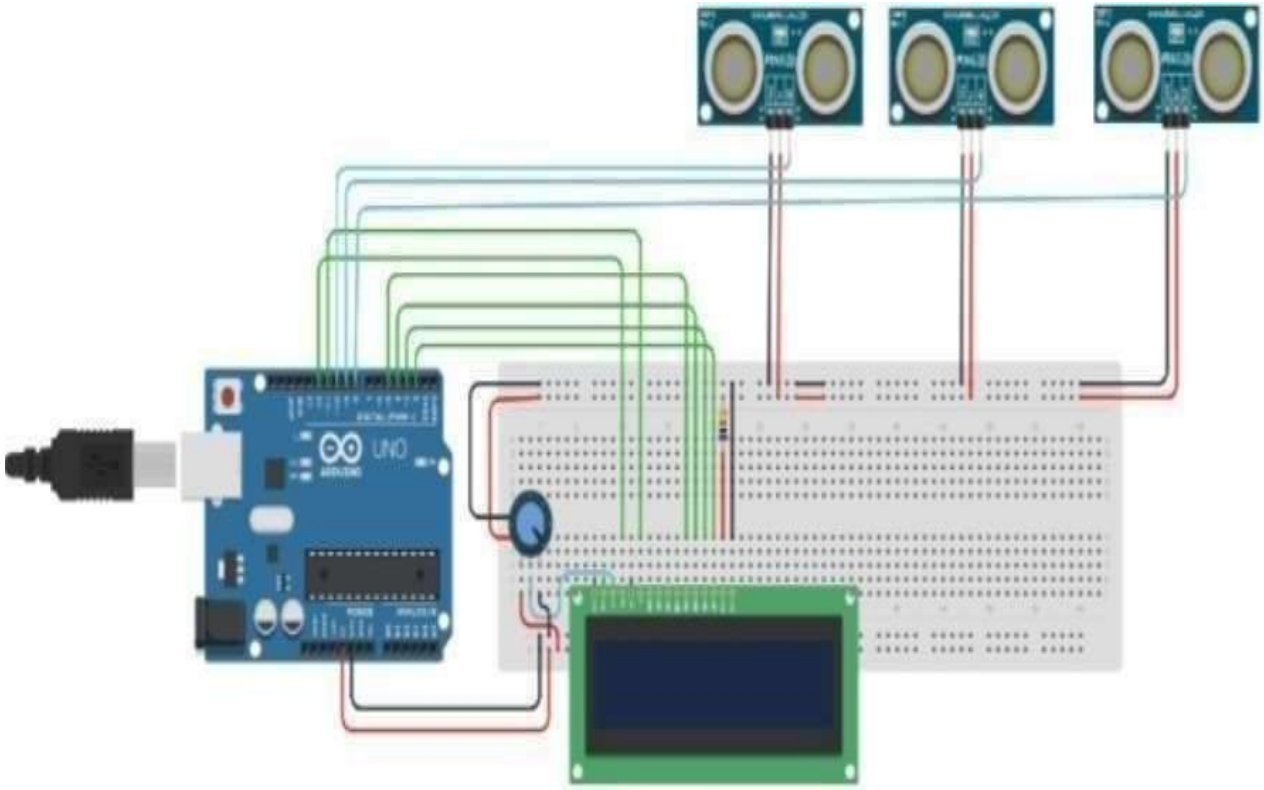
## 5.3 Operation of Smart Parking System



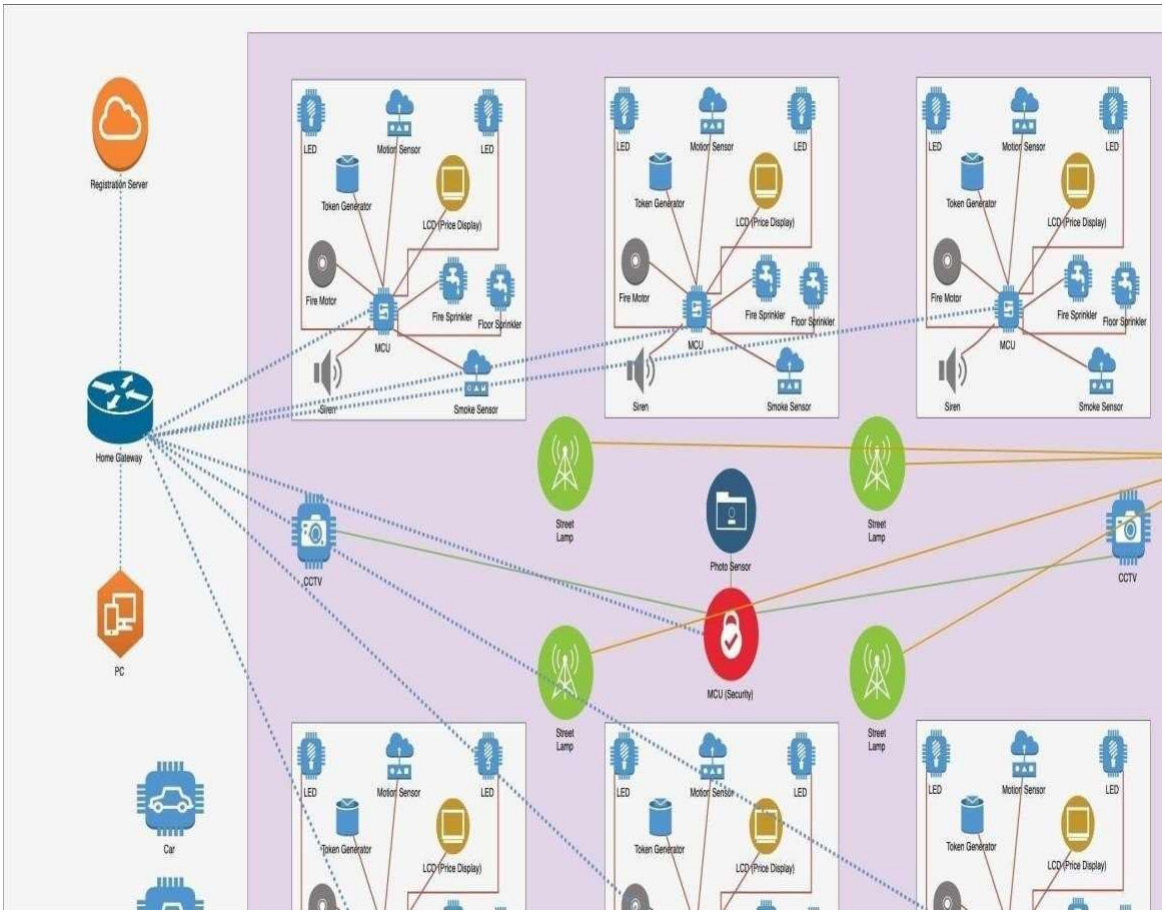
# CHAPTER 6

# DEPLOYMENT

## 6.1 Tinker CAD of Smart Parking System



## 6.2 Cisco Packet Tracer for Smart Parking System



# CHAPTER 7

# CODE

## 7.1 Sample Code for Smart Parking System

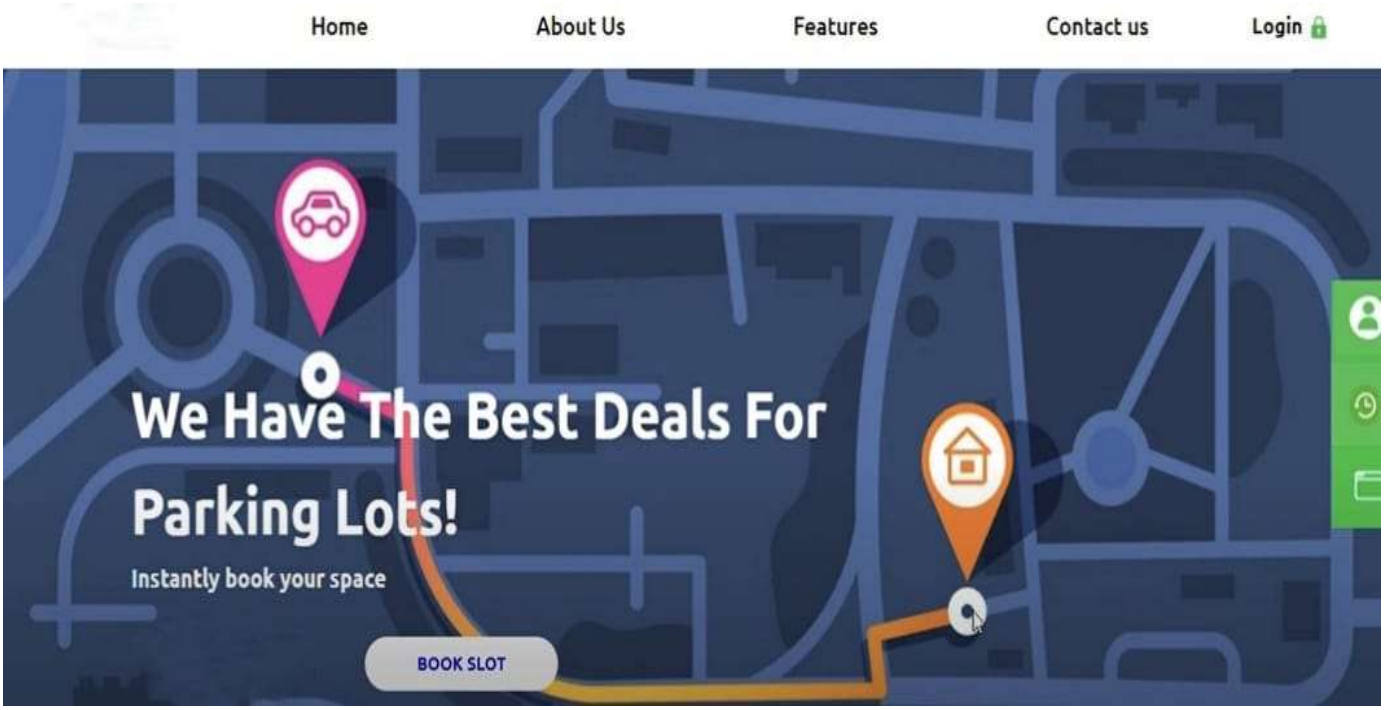
```
#include <Servo.h> //includes the servo library
#include <Wire.h>
#include <LiquidCrystal_I2C.h> //includes LiquidCrystal_I2C library
LiquidCrystal_I2C lcd(0x27, 20, 4);

Servo myservo;

#define ir_enter 2
#define ir_back  4

#define ir_car1 5
#define ir_car2 6
#define ir_car3 7
#define ir_car4 8

int S1=0, S2=0, S3=0, S4=0 ; int
flag1=0, flag2=0;
int slot = 6;

void setup(){
Serial.begin(9600);
// initialize digital pins as input.
pinMode(ir_car1, INPUT);
pinMode(ir_car2, INPUT);
pinMode(ir_car3, INPUT);
pinMode(ir_car4, INPUT);

pinMode(ir_enter, INPUT);
pinMode(ir_back, INPUT);

myservo.attach(9); // Servo motor pin connected to D9
myservo.write(90); // sets the servo at 0 degree position

// Print text on display
lcd.begin(20, 4);
lcd.setCursor (0,1);
```

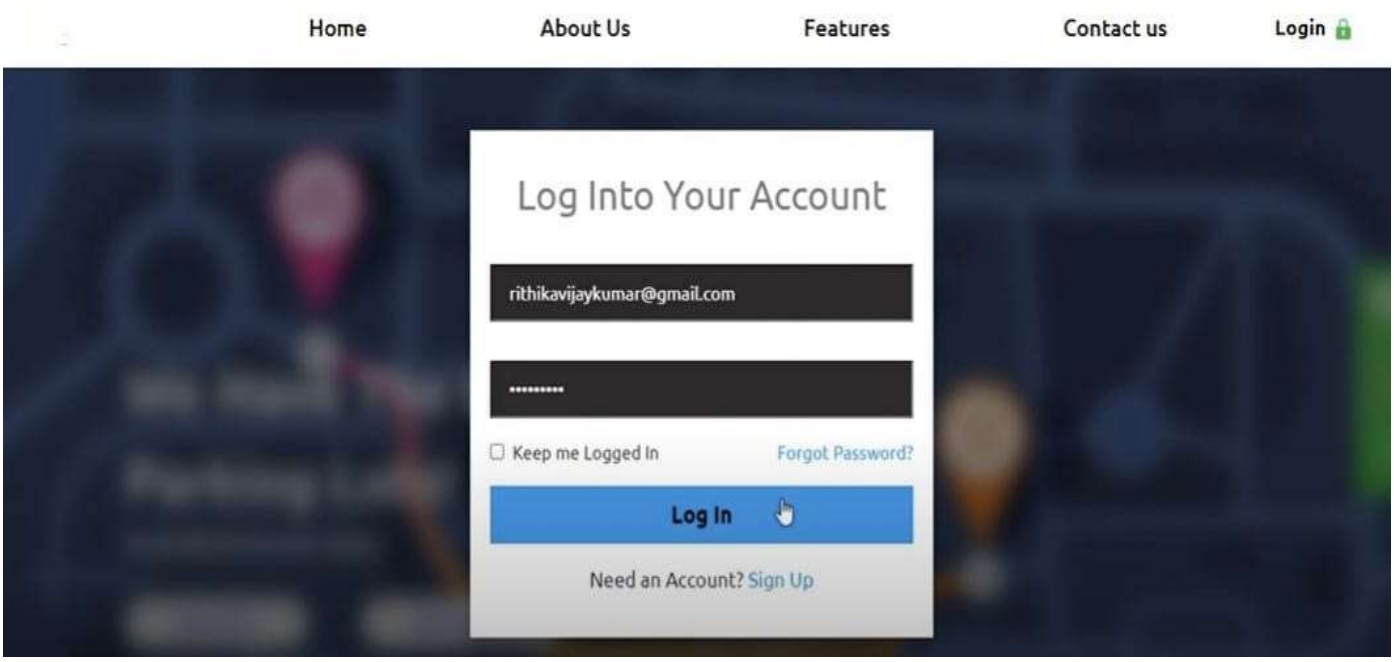
```
lcd.print("  Smart  Car  ");
lcd.setCursor              (0,2);
lcd.print(" Parking System ");
delay (2000);
lcd.clear();

Read_Sensor();

int total = S1+S2+S3+S4;
slot = slot-total;
}

void loop() {

 Read_Sensor();

 lcd.setCursor (0,0);
lcd.print("  Have Slot: ");
lcd.print(slot);
lcd.print("    ");

 lcd.setCursor              (0,1);
if(S1==1)
   {
lcd.print("S1:Fill ");
}  else
   {
    lcd.print("S1:Empty");
   }

 lcd.setCursor (10,1);
  if(S2==1)
   {
lcd.print("S2:Fill ");
}  else
   {
    lcd.print("S2:Empty");
    }

 lcd.setCursor (0,2);
  if(S3==1)
   {
lcd.print("S3:Fill ");
}  else
   {
    lcd.print("S3:Empty");
    }
```

```
 lcd.setCursor (10,2);
  if(S4==1)
   {
lcd.print("S4:Fill ");
}  else
   {
    lcd.print("S4:Empty");
    }

/* Servo Motor Control
**********************/
  if(digitalRead (ir_enter) == 0 && flag1==0) // read degital data from IR sensor1
   {
if(slot>0)
{
flag1=1;
     if(flag2==0)
      {
       myservo.write(180);
slot = slot-1;
       }
}
else
    {
     lcd.setCursor (0,0);
lcd.print(" Sorry Parking Full ");
delay(1500);
     }
   }

  if(digitalRead (ir_back) == 0 && flag2==0) // read degital data from IR sensor2
   {     flag2=1;
if(flag1==0)
    {
     myservo.write(180); // sets the servo at 180 degree position
slot = slot+1;
     }
   }

  if(flag1==1 && flag2==1)
   {           delay
(1000);
   myservo.write(90); // sets the servo at 90 degree position
flag1=0, flag2=0;
   }
delay(1);
```

```
}

void Read_Sensor()
{
 S1=0, S2=0, S3=0, S4=0;
 if(digitalRead(ir_car1) == 0){S1=1;} // read degital data from IR sensor3
if(digitalRead(ir_car2) == 0){S2=1;} // read degital data from IR sensor4
if(digitalRead(ir_car3) == 0){S3=1;} // read degital data from IR sensor5
if(digitalRead(ir_car4) == 0){S4=1;} // read degital data from IR sensor6 }
```

## 7.2 Snapshots

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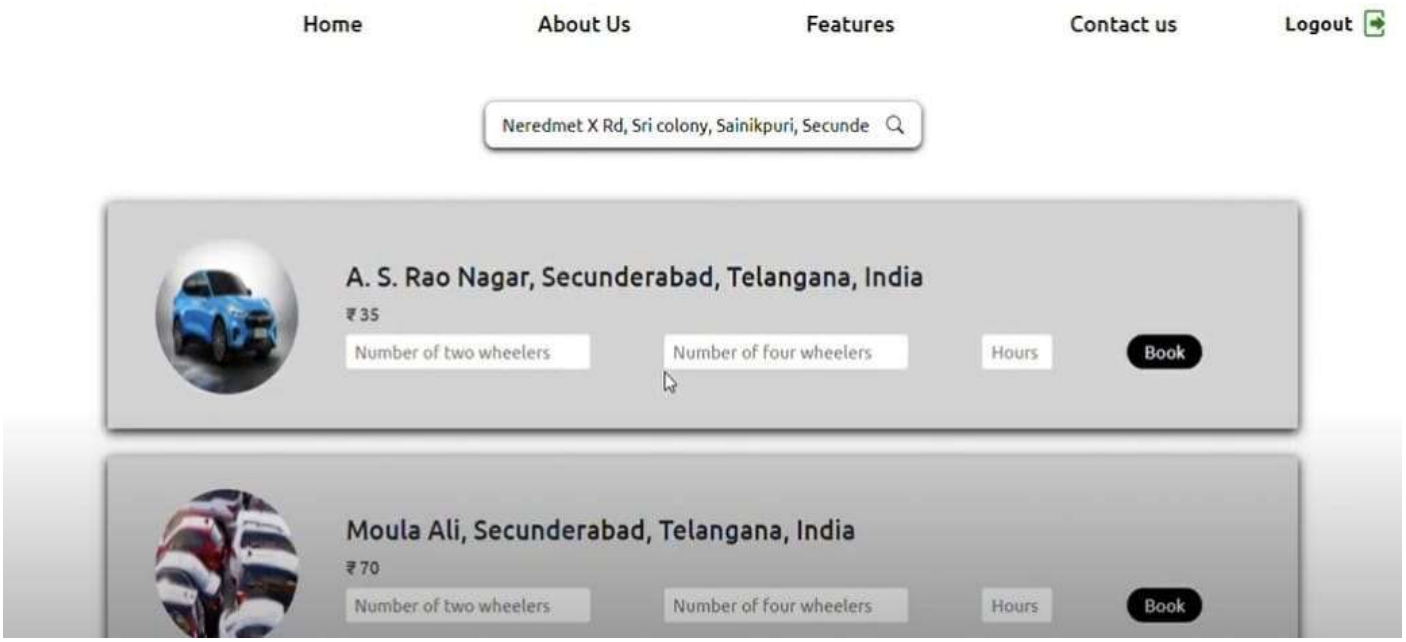
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A. S. Rao Nagar, Secunderabad, Telangana, India
₹ 35
Number of two wheelers
Number of four wheelers
Hours
Book
Moula Ali, Secunderabad, Telangana, India
₹ 70
Number of two wheelers
Number of four wheelers
Hours
Book

# 8. CONCLUSION AND FUTURE ENHANCEMENT

## 8.1 Conclusion

The development of the Internet of Things and cloud technology opens up new opportunities for smart cities. Smart parking has always been the backbone of building smart cities. IoT-based smart parking system offers real-time slots, parking procedures, and information and improves users' ability to save time on proper parking. The system benefits of smart parking go well beyond avoiding the needless circling of Shopping mall blocks. The designed system could be applied everywhere due to its ease of usage and effectiveness.

## 8.2 Future Enhancement

In the future, the system can be extended which is not only specifically to private parking like Malls, Company parking, etc. but also can be implemented over various multiple platforms such as public parking extending the feature by giving parking information based on the cost in real-time. This will make the management of the parking spaces more efficient, by purging the need for human labor.

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