

6115 – MAHENDRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHASE : 5

SMART PARKING

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DECLARATION :

We, student of Computer Science
and Engineering,
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TECHNOLOGY ,TAMILNADU that the work entitled “ SMART
PARKING ” has been Successfully completed under the guidance of
Asst.prof.Mrs.ARUNA , Computer science and Engineering and
Technology ,Namakkal.This dissertation work is submitted in
partial fulfillment of the requirement for award of Degree of
Bachelor of Engineering in Computer Science and Engineering
during the academic year 2021-2025.

ABSTRACT :

Efficient and smart way to automate the management of
the parking system that allocates an efficient parking space using

internet of things technology. The IoT provides a wireless access to the system and the user can keep a track of the availability of the parking area. With increase in the population of the vehicles in metropolitan cities, road congestion is the major problem that is being faced. The aim of this paper is to resolve this issue. The user usually wastes his time and efforts in search of the availability of the free space in a specified parking area. The parking information is sent to the user via notification. Thus, the waiting time for the user in search of parking space is minimised. RFID technology is being used to avoid car theft.

KEYWORD :

RFID, Arduino, GSM Module, IR Sensor, cloud database.

INTRODUCTION :

Objective :

Internet of thing (IoT) has the ability to transfer data through network without involving human interactions. IoT allows user to use affordable wireless technology and also helps the user to transfer the data into the cloud. IoT helps the user to maintain transparency. The idea of IoT started with the identity of things for connecting various devices. These devices can be controlled or monitored through computers over internet. IoT contains two prominent words "Internet" and "Things", where Internet is a vast network for connecting servers with devices. Internet enables the information to be sent, receive or even communicate with the devices. The parking problem causes air pollution and traffic congestion. In today's scenario, parking space is hard to search in a day to day life for the people. According to the recent survey, there will be a rapid increase in the vehicle's population of over 1.6 billion around 2035. Around one million barrels of world's oil is being burnt everyday.

Arduino sends the signal to the servo motor along with GSM module which further gives instructions and notification to the user. When the user enters in the parking area, RFID card allotted to the registered user is scanned by the reader module thus ensuring the security of the user identity. This enables the user to get the information of the available parking space as well as SMS notification to the registered user's mobile number. It

consists of three parts where first part is the parking area which include Arduino devices along with IR Sensor. The user interacts with the parking area with the help of these devices. The second section of the paper includes the cloud web services which act as a mediator between the user and the car parking area. The cloud is updated according to the availability of parking area. The cloud service is administered by the admin but it can also be viewed by the user to check the availability. The third section of the paper is the user side. The user gets notified for the availability via SMS through GSM module. The user interacts with the cloud as well as parking area. The user gets the notification when the parking availability is full which saves the time for the user.

SMART PARKING SYSTEM USING IOT :

* A ticket key and id are given to the user and it is only known to the user which is used to retrieve the vehicle. The user need not carry any paper ticket since an Rfid card is given to the user. The technology used here is economical. Security features must be improved to protect the user's privacy. The author of smart parking system the survey has divided detector system and vehicle sensors into two math categories as intrusive sensors and non - intrusive sensors. Intrusive sensors are installed in holes on the road surface by tunnelling under the road. Non-intrusive sensors do not affect the surface of the road and it can be easily installed and maintained.

* Smart parking system helps us to resolve the grounding problems of the traffic congestion and it also reduces the emission from a car. Smart parking using IoT technology helps to designs and adevelops a real smart parking system which provides information for vacant spaces and also helps the user to locate the nearest availability. This paper uses a computer vision to detect vehicle number plate in order to enhance the security. The user can pay for the parking space prior to the entry of the car through mobile payment. Thus, insuring the reservation of the parking. The user is notified about the parking location, number of slots available and all other relevant information. The paper uses efficient algorithms and techniques for extracting license plate text.

*An algorithm operates on the ultrasonic sensor detection of the vehicle entering into the parking slot and calculates the minimum cost for the user. Smart parking system based on reservation allows the reservation of a vacant space which involves smart parking system based on reservation (SPSR). This consists of host parking database management which collects and stores data about the driver's identity and parking location. When the parking reservation time is about to expire a notification will be sent to the user through the web service that has been provided to the user by the admin. The main drawback is that some other user can occupy a reserved parking space to avoid this QR scanners are used to identify the user. It helps us to propose a way in which the user can reserve his parking space by mentioning the destination and the vehicle type with the help of mobile applications . The booking details will be stored in the cloud which finds the shortest path from the user to the parking space, the location of the user is updated regularly in the cloud with the help of GPS. This paper describes the implementation of wireless sensor networks (WSN) used in a car parking system with the help of a server

which is using xbee zigbee. The car parking system can detect the car which is parked in the parking slot. The aim of this project is to make it cost effective and user friendly. Car parking system helps the user to sustain the data with 90% of accuracy. An algorithm is designed to identify the nearest parking according to the size. The mobile application provided to the user is used to reserve and pay-as-you-go service.

SYSTEM ARCHITECTURE :

A. PROPOSED SYSTEM :

It consists of three sections: first section is the parking area which includes Arduino devices along with IR sensor. The user interacts with the parking area with the help of these devices. The user cannot enter the parking area without the help of RFID card. The second section contains the cloud-based web services which acts as a mediator between the user and parking area. The cloud is updated depending upon the availability of the parking area. The admin administers the cloud services and it can also be viewed by the user for checking the availability. The third section is the user side. The user gets notification on the basis of the availability via SMS through GSM module.

B. HARDWARE : The three main hardware components used are GSM module, RFID card, IR sensors. A user is allowed inside a parking space only if the user has a RFID card. RFID card contains the information of the registered user. As the car enters the parking slot, reader module scans the registered user's RFID tag. The data is sent to the Arduino for checking the availability of the car parking and simultaneously, the user is notified through SMS about the status of the parking area. The GSM module sends the message according to the availability. IR sensor sends the signals according to the presence of the vehicle.

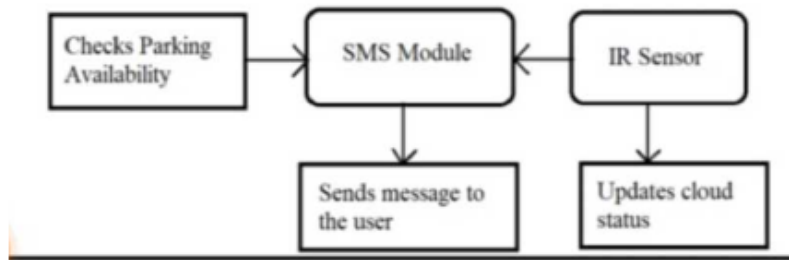
±


Detects the car

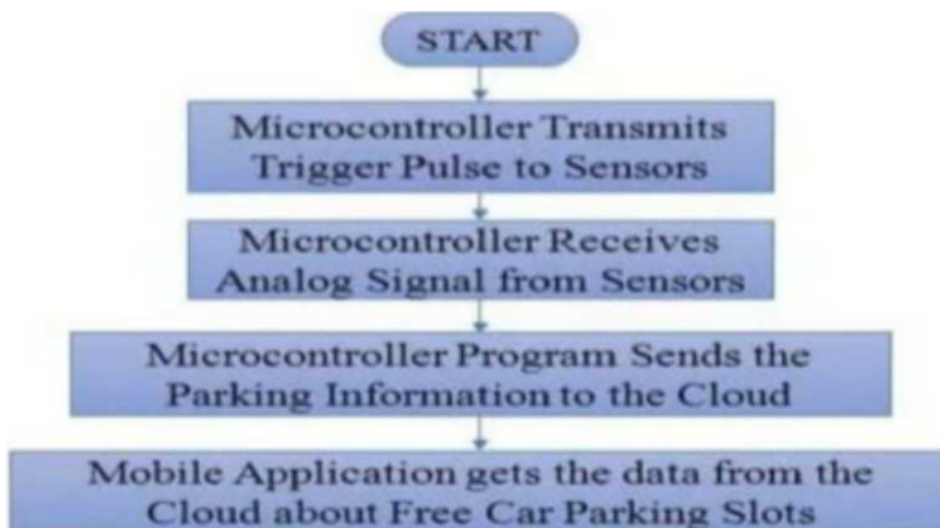
C. SOFTWARE : The cloud server acts as a mediator between the modules. The cloud server is connected to the Wi-Fi module. The user receives messages through the SMS module while the car enters and exits the parking area using RFID card. The messages sent by the SMS module are managed by the cloud. As soon as the IR sensor detects the car, the status of the cloud will be updated from 0 to 1 and when the car leaves the parking area the status of the car will be updated from 0 to 1.

		Scans the RFID (card of the user
RFID	/	
Scanner	\	

FLOWCHART :
Free



^	slot?	 Database
Yes		no
<>		£
Enter the parking		Find another
Area		parking area



APPLICATIONS :

The smart car parking system Can be implemented in,

- Shopping malls
- Restaurant
- Theaters

ADVANTAGES :

Use Smart Parking Protection Easily. Monitor Your Parking Lots. Manage Parking Lot Using Real-time Data. Minimize Carbon Footprint. Maximize Revenue. Save Time, Gas, And Money. Integrate Them Into Any Smart City System.

DISADVANTAGES :

Expensive Construction & Installation. A parking management system can cost a lot of money. Requires Regular Maintenance. The parking systems are usually automated, but they require regular maintenance to ensure everything is working smoothly. System Breakdown.

SMART PARKING :

Smart parking is an electronic tool that enables the user to find vacant, parking spaces through information technology and by using appropriate sensors.

INNOVATIONS SMART SYSTEM :

Parking (yes, parking) has never been more important to the world than it is today. 20 years ago, one would have considered it improbable that parking would be vital to accomplishing weighty goals like fighting climate change or achieving political equality.

Then the parking But with the capabilities that are increasingly being made available through smart parking innovations, it's looking more likely that smart parking may help save the world.

RESEARCH SYSTEM :

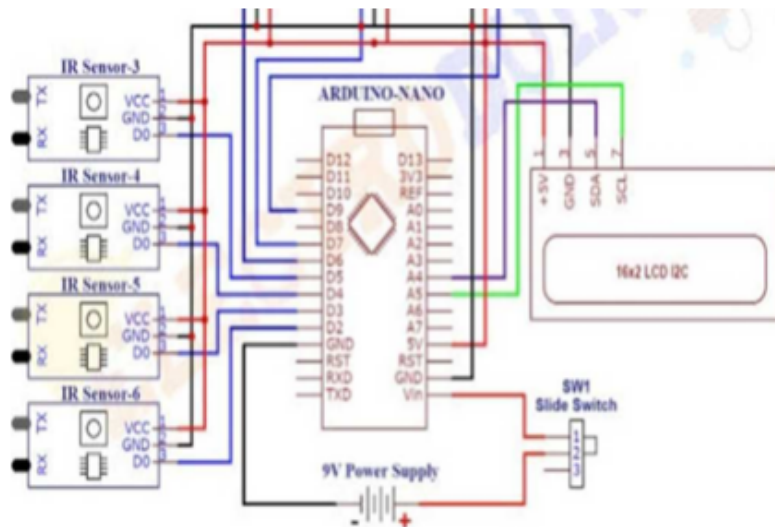
Research indicates that more than 1 million barrels of oil is consumed every day in the search for parking spaces. More than 44% of drivers find parking a stressful experience and the average driver spends 4 days every year looking for spaces to park. All of

this adds up to unnecessary congestion on roads and depletion of valuable real estate to construct more parking spaces. It also does nothing to stall the inexorable march towards global warming.

However, as we'll show in this article, recent innovations in smart parking may be changing that narrative. We may not know it yet, but parking may yet save the world. Here are 10 smart parking innovations to look out for in 2020.

DESIGNING OF SMART SYSTEM :The parking lot system should be able to park cars, bikes, and handicapped vehicles.The system should be able to calculate the cost of parking for each type of vehicle.The system should be able

to keep track of the time a vehicle is parked.



ARDUINO AND IR SENSOR MODEL :

PROPOSED
SYSTEM :

The proposed smart parking system consists of an onsite deployment of an slot module that is used to monitor and signalize the state of availability of each single parking space.

TYPES OF PROPOSED SYSTEM :

- ★ IOT System
- ★ Technical System
- ★ Scope of Future System
- ★ Design of Prking Functions
- ★ RFID Parking System
- ★ Digital Parking Sysytem
- ★ Purpose of Management System
- ★ Components of Smart Parking

1.IOT SYSTEM : IoT-based smart parking system transmits available and occupied parking spaces via a web/mobile application. Each parking space has an IoT gadget, which includes sensors and microcontrollers. The user gets real-time updates on the availability of all parking spaces and, therefore, an option to choose the best one. Smart parking development implies an IoT-based system that sends data about free and occupied parking places via web/ mobile application. The IoT-device, including sensors and microcontrollers, is located in each parking place.

2.TECHNICAL SYSTEM : Smart parking systems use a combination of sensors, data analytics and communication systems to provide real-time information about parking availability.

3.SCOPE OF FUTURE SYSTEM : Using the slot allocation method we can book our own cheapest parking slot. It is an efficient one for solving parking problems, which overcomes the traffic congestion also provides automated billing process. This work could be further extended as a fully automated system using

multilayer parking method.

4.DESIGN OF PARKING FUNCTIONS : The parking lot system should be able to park cars, bikes, and handicapped Vehicles. The system should be able to calculate the cost of parking for each type of vehicles. The system should be able to keep track of the time a vehicle is parked.

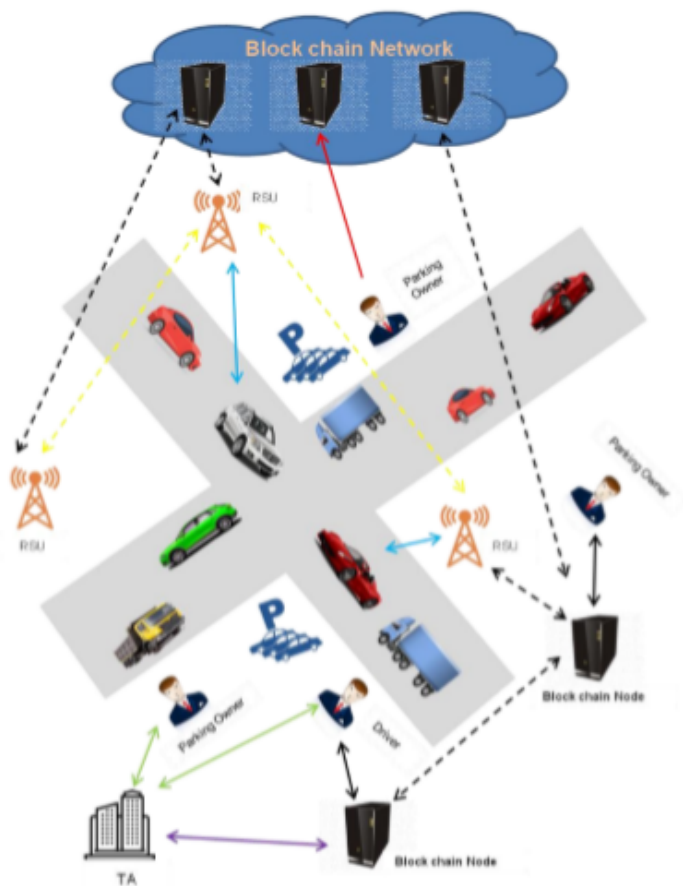
5.RFID PARKING SYSTEM : This is Paid Car Parking Using RFID, In this project whenever any car enters in the parking site, it scans the RFID tag and park at parking slot, after few minutes or hours when car come at exit it, it scan the RFID tag and amount will be deducted from the tag according to parking time Components Used In The Project.

6.DIGITAL PARKING SYSTEM : A digital parking system relays real-time data to motorists to spot vacant parking lots at their preferred locations.

7.PURPOSE OF MANAGEMENT SYSTEM : 1. Distant Area, 2. Reducing traffic congestion, 3.Advanced parking space

8.COMPONENTS OF SMART PARKING :

- Smart cameras
- Sensors and GPS system
- Control and access to the parking area and Wi-Fi.
- Control devices such as barriers, gates, ticket dispensers, license plate recognition systems, and payment kiosks.
- Issue tickets or digital passes, and facilitate payment transactions.

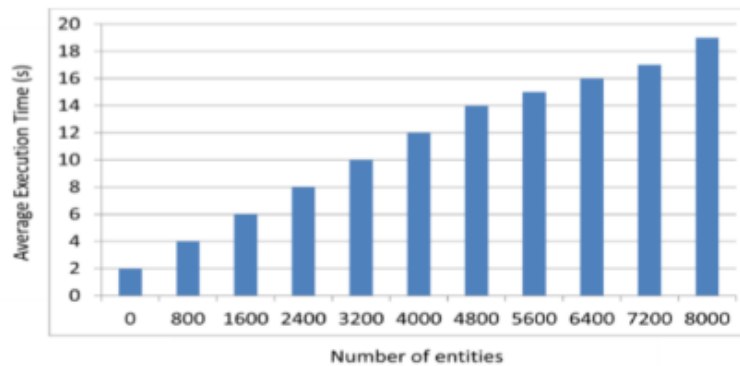


Smart Architecture for Proposed System

INITIALIZATION :

In this work, a fair and smart parking system is proposed such that it provides a secure means of parking and is also reliable. There are four major phases involved in this system: initialization, parking spot identification, request and allotment.

In this step, the shared keys are initially generated along with security parameters. Every parking lot owner is allowed keys sent by the TA using public-key cryptosystem using digital sign. In order to obtain the data, both the drivers and parking owners should submit their identity proof to the TA. This way the TA can also keep track of malicious and misbehaving users in case of disputes and mishaps.



Initialization

PLANNING :

The planning stage is the initial stage of the research. The stage initiates with the formulation of the questions, which pinpoints the main objective of the research. To formulate the objective-based question sets, a set of keywords needs to be selected to articulate search strings to find specific literature stored in scientific databases.

The following questions were at first established to locate the objective of this research

- What are the approaches or methods for building a smart parking system?
- What sort of sensors were used in developing a smart parking solution?
- What type of networking tools were implemented in developing a smart parking system?
- The questions are connected to the main objective of this paper, which is to review the existing smart parking solutions to find the adopted approaches, sensors, and network technologies used to develop the SPSs. The questions were also used to identify keywords such as; "smart," "parking", "system", "solution", "sensors", "networks", "methods". After that, primary search

strings are developed to identify the initial literature findings from the previously mentioned online scientific databases.

- The smart parking system processes each parking query immediately when it arrives, the problem to be solved is an on-line problem easily through greedy method. We can solve this on-line problem easily through greedy method. For instance, we guide the vehicle, which is querying parking space, to the nearest available parking space.



EXECUTION :

The four processes of the proposed FRP scheme is analysed and it has been found that in the initialization process, as the number of entities increases, the time taken for execution also increases subsequently as shown in similarly, represents the average execution time cost to publish and verify as well as the time taken for execution process.



Publishing the parking sport

When a parking spot needs to be identified by the driver, a parking request is initially generated which consists of an encrypted time vector and location search token.

EXECUTING CODE :

Command prompt after the execution code in shown,

```
Command Window
New to MATLAB? See resources for Getting Started.
Warning: Function filter has the same name as a MATLAB builtin. We suggest you
rename the function to avoid a potential name conflict.
>> parking
You can enter into the parking area
  Number of car present      25

Number of vacant space present present      11

PARKING AREA STRUCTURE with LANE:-
  LANE 1      LANE 2
  LANE 3      LANE4
  LANE 5      LANE 6

Go to Lane 3
  Number of car present      2
|
Number of vacant space present present      4
fx >>
```

CONTROLS :

- *RFID Controller system

- *Microcontroller system

RFID CONTROL :

The Radio Frequency Identification(RFID) reader **provides** authorization to enter the smart parking system. On the other hand, a mobile application is added to allows users to know about the empty spaces based via WiFi applications.

□ Parking Control allows you to determine which vehicle may enter your parking area. Vehicle drivers.

who are regular (not monthly) parkers may utilize parking control system with a credential to access the parking area.

Additionally, transient parkers may be or taking a parking ticket.

□ Upon entry, a barrier gate arm is in the down position, which requires the parker to present a valid credential at the Access Control Pedestal or at the Entry BOX prior to the gate arm opening. For example, a monthly parker with an RFID proximity would present their access credential to the card reader for approval.

□ Once the credential has been approved for the date, time and location, the card transaction data is

approved then the barrier gate arm opens.

□ The Pedestal, card reader, and parking control software are a key components of the parking BOX full featured ticketing system.

MICROCONTROLLER :

The micro-grid control system as the core of the system

controls the optimal operation of the entire smart park. In order to ensure the efficient operation of the entire system, the energy management system is needed for smart control and automatic scheduling.

TYPES OF MICRO :

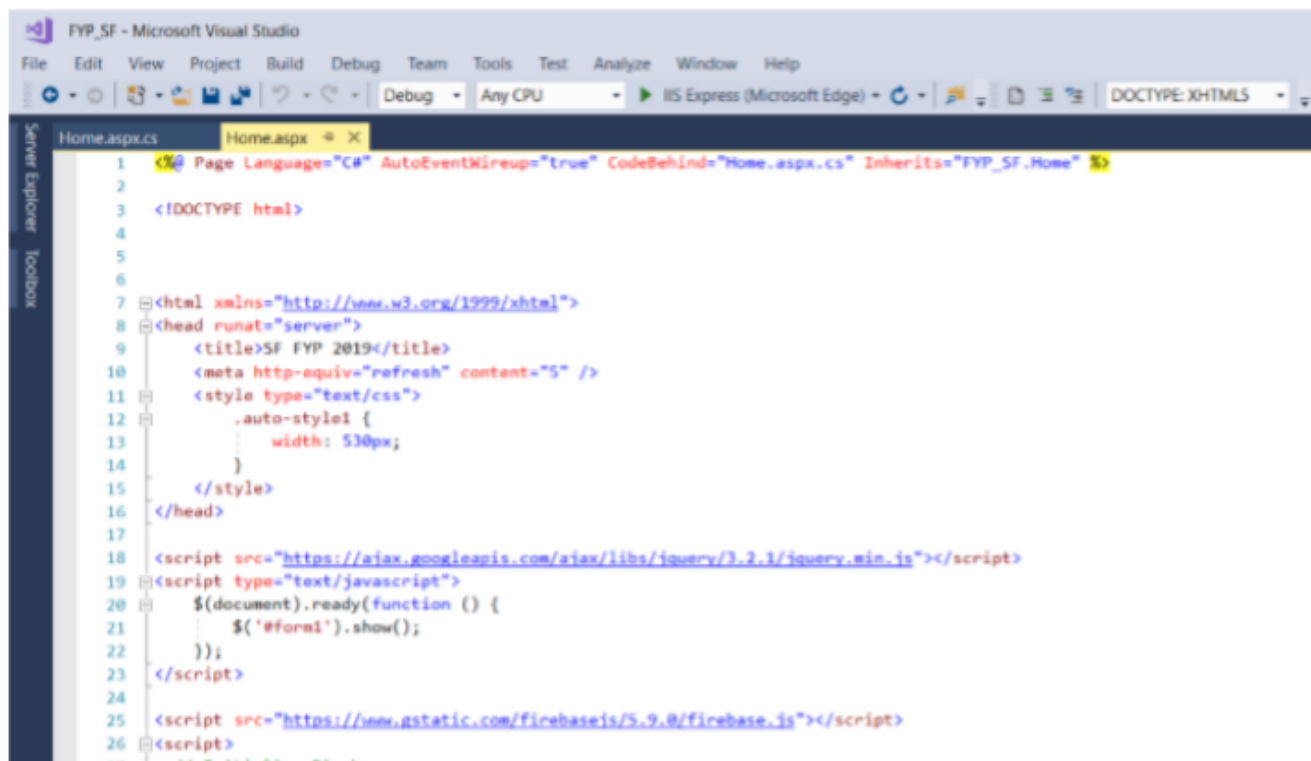
> 8-bit Microcontrollers: These

are the most basic type of microcontroller, typically used in simple applications such as toys, small appliances, and remote controls.

> 6-bit Microcontroller: These are more advanced than 8-bit microcontrollers and are capable of performing more complex tasks.

Microsoft Visual Studio

In Microsoft Visual Studio, HTML programming language is used. Visual Studio is a combination of the powerful developer tooling with a source code editor. Hypertext Markup Language (HTML) is the standard markup language for generating web application and web pages. The HTML code on Microsoft Visual Studio. After that, the webpage needs to be published (as demonstrated in Figure) before users can use it.



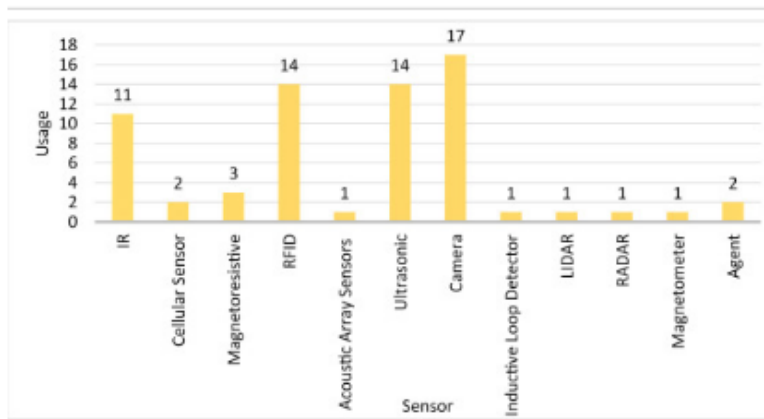
```
1 <% Page Language="C#" AutoEventWireup="true" CodeBehind="Home.aspx.cs" Inherits="FYP_SF.Home" %>
2
3 <!DOCTYPE html>
4
5
6
7 <html xmlns="http://www.w3.org/1999/xhtml">
8 <head runat="server">
9 <title>SF FYP 2019</title>
10 <meta http-equiv="refresh" content="5" />
11 <style type="text/css">
12 .auto-style1 {
13     width: 530px;
14 }
15 </style>
16 </head>
17
18 <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.2.1/jquery.min.js"></script>
19 <script type="text/javascript">
20 $(document).ready(function () {
21     $('#form1').show();
22 });
23 </script>
24
25 <script src="https://www.gstatic.com/firebasejs/5.9.0/firebase.js"></script>
26 <script>
```

HTML Code on Microsoft Visual Studio

CLOSING :

The usage data of different sensors by various SPSs are represented. From the figure, it can be seen that the Camera is the highest used sensors. Although the camera network has a high deployment cost, it

can provide a wide coverage area, reducing the number of sensors.



*Many of the systems that used cameras deployed different computational techniques (Such as ML, DL, etc.) to detect parking lot occupancy. As a result, the necessity of vehicle detection sensors (such as IR sensors, ultrasonic sensors, etc.) becomes low to almost zero.

* Camera networks also provide surveillance facilities and license plate detection, which improves overall security. On the other hand, ultrasonic and RFID sensors are the second most used sensors.

* The Ultrasonic sensors are mainly used for vehicle detection to provide real-time parking lot occupancy status. But this type of sensor is prone to environmental changes. That is why this type of sensor is more suitable for closed parking facilities. RFID sensor is another frequently used sensor.



(a)



(b)

SMART PARKING

CONTENS :

- ★ *Implementation*
- ★ *Applications*
- ★ *Reviews*
- ★ *Output*
- ★ *Conclutions*

IMPLEMENTATION :

* The availability of parking slots will be displayed to the drivers at the entrance. It also captures the number plate of vehicles by using camera and recognises the number using image processing and stores it in the server at the entrance and also at the exit of parking area for ease of payment purposes.

* IoT-based smart parking system deployment requires integrating various devices, sensors, and microcontrollers. For example, it can be a microcontroller transmitting data to the cloud environment or a Bluetooth beacon. With its help, consumers can control parking locally.

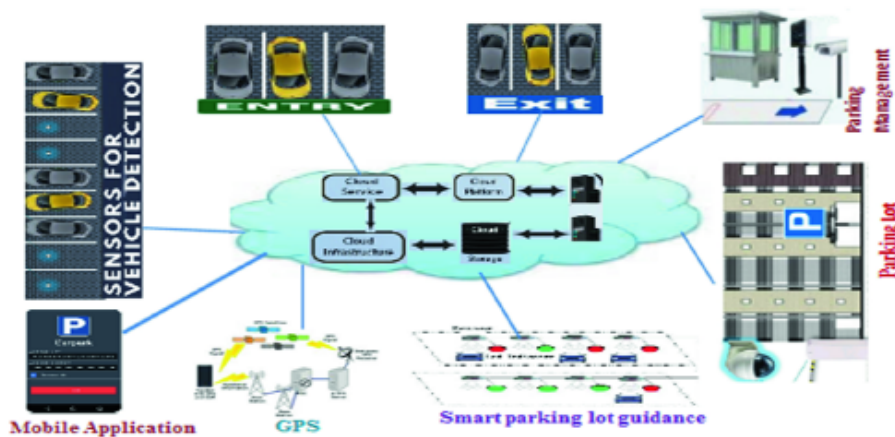
The following steps should be followed to embed the code into the PIC microcontroller,

STEP 1: Download and install the PIC C Compiler

STEP 2: Open the software and select File->New->Source File

STEP 3: Write the code, compile it and run.

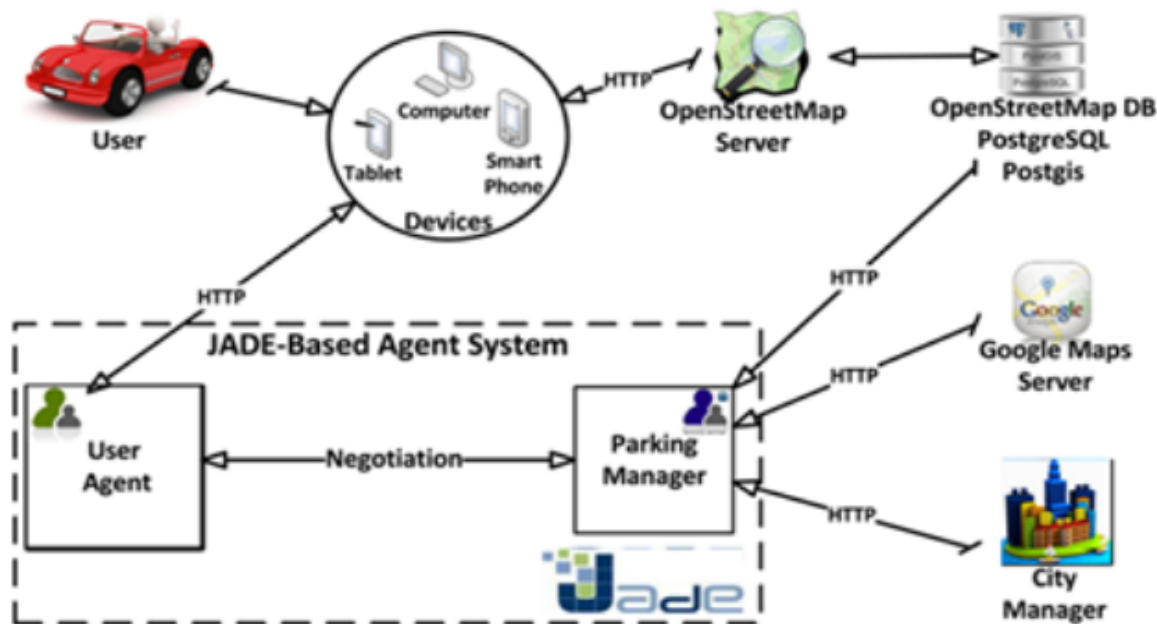
STEP 4: Then dump the code into pic microcontroller using pic kit loader.



APPLICATIONS :

There are already many free smart parking applications available online in web and mobile stores of Android or iOS. Previously, reservation of parking space was done by calling to the service provider and now with the current usage of internet and smartphones, these services are provided online using mobile and web applications. These applications serve as decision support systems for the driver in occupying a vacant parking space.

- Guide the driver to parking lot using display boards.
- Reserve and authorise the driver to a parking lot.
- Reserve and guide the driver to a specific parking space using navigational information.



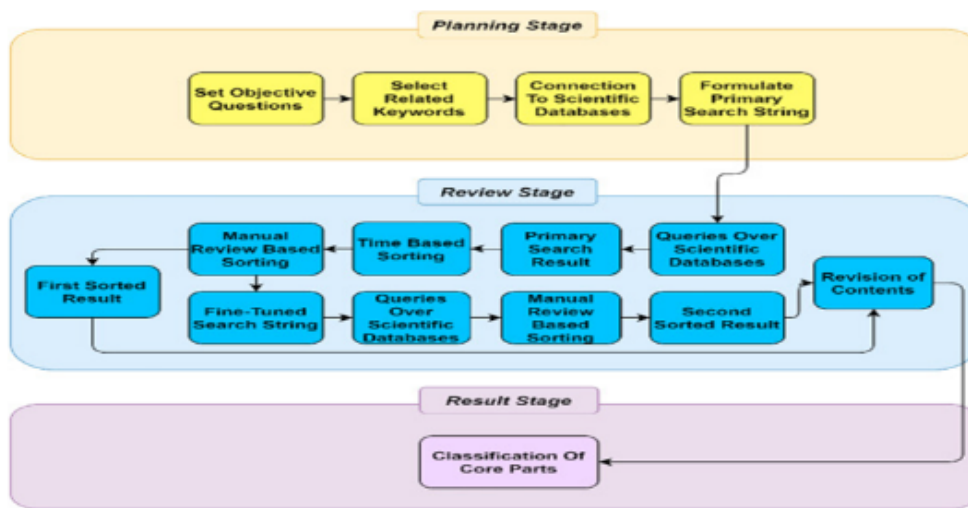
REVIEWS :

> In the planning stage, numerous pieces of literature came out as findings from which only the papers published within the last twenty years were selected. Although in this selection, papers published within the twenty years were chosen, but the main focus was given to the papers published within the last ten years period.

> After the first sorting, the chosen papers from different online repositories were manually sorted by reviewing the title, abstract, and conclusion. In this stage of sorting, a paper is selected if it included the keywords and could provide the details that might answer the set of questions regarding the objective of the paper. A paper is disregarded if it fails to portray any topic related to the aim of the paper.

> In the third stage, the primary search strings, which were based on the keywords, were modified by adding some additional keywords such as: "intelligent sensors", "multiagent system", "cloud", "wireless", "autonomous", "IoT". After that, another search was made through the scientific databases using the fine-tuned search strings.

> This search's findings were again sent through the manual review process of the title, abstract, and conclusion. Later, all the selected contents were thoroughly revised for the result stage. The overall process of search string formulation to querying scientific databases and their search results are illustrated.



The Planning Stage For Reviewing Stage Methodology

CODING AND OUTPUT :

```

#include<stdio.h>
#include<conio.h>
#include<process.h>

main()
{
clrscr();

int ParkingCharges,cartype,entry,exit;

int charge,charge1,charge2;

char model[20],car[6];

charge=40;

charge1=50;

charge2=60;

printf("\n\n*****CAR PARKING*****\n\n");

printf("*****PARKING CHARGES*****\n\n");

printf("Charges for Sedan Cars: Rs 40 per hour.\n\n");

printf("Charges for Hatchback Cars: Rs 50 per hour.\n\n");

printf("Charges for SUV Cars: Rs 60 per hour.\n\n");

printf("-----\n\n");

printf("Enter car type [1:Sedan/2:Hatchback/3:SUV] \n\n");

scanf("%d", &cartype);

switch (cartype)
  
```

```

{
case 1: printf("\nSedan\n");
break;
case 2: printf("\nHatchback\n");
break;
case 3: printf("\nSUV\n");
break;
default: printf("This is not a car type");
exit();
}

printf("\nEnter car model: ");
scanf("%s", model);
printf("\nEnter car number: ");
scanf("%s", car);
printf("\nEnter time(24 hour format): ");
scanf("%d", &entry);
printf("\nExit Time(24 hour format): ");
scanf("%d", &exit);
if (cartype==1)
ParkingCharges=(exit-entry)/100*charge;
if (cartype==2)
ParkingCharges=(exit-entry)/100*charge1;
if (cartype==3)
ParkingCharges=(exit-entry)/100*charge2;
printf("Parking Fee: Rs %d \n\n", ParkingCharges);
printf("*****THANK YOU*****");
getch();
return(0);
}

```

OUTPUT :


```

Press 1 for Rickshaw
Press 2 for Car
Press 3 for Bus
Press 4 to show the record
Press 5 to delete all record
1
Amount to paid by customer Rs 100/-

Press 1 for Rickshaw
Press 2 for Car
Press 3 for Bus
Press 4 to show the record
Press 5 to delete all record
2
Amount to paid by customer Rs 200/-

Press 1 for Rickshaw
Press 2 for Car
Press 3 for Bus
Press 4 to show the record
Press 5 to delete all record
3
Amount to paid by customer Rs 300/-

Press 1 for Rickshaw
Press 2 for Car
Press 3 for Bus
Press 4 to show the record
Press 5 to delete all record
4
Number of vehicle parked in parking area is 3
Number of rickshaw parked 1
Number of car parked 1
Number of bus parked 1
Total Amount 600

Press 1 for Rickshaw
Press 2 for Car
Press 3 for Bus
Press 4 to show the record
Press 5 to delete all record

```

CONCLUTIONS :

- The concepts of smart cities have always been a dream. There have been advancements made from the past couple of years to make smart city dream to reality.
- The advancement of internet of things and cloud technologies has given rise to the new possibilities in terms of smart cities.
- Smart parking facilities have always been the core of constructing smart cities. The system provides a real time process and information of the parking slots.
- This paper enhances the performance of saving users time to locate an appropriate parking space.
- It helps to resolve the growing problem of traffic congestion.

As for the future work the users can book a parking space from a remote location.

- GPS, reservation facilities and license plate scanner can be included in the futures.

* In conclusion, parking management systems can help to improve the parking experience for drivers, reduce congestion on the roads, and generate revenue for the area.

* In this study, the various types of smart parking system and has been presented. From the various examples of the implementation of the smart parking system being presented, its efficiency in alleviating the traffic problem that arises especially in the city area where traffic congestion and the insufficient parking spaces are undeniable. It does so by directing patrons and optimizing the use of parking spaces.

* It with the study on all the sensor technologies used in detecting vehicles, which are one of the most crucial parts of the smart parking system, the pros and cons of each sensor technologies can be analyzed. Although, there are certain disadvantages in the implementation of visual based system in vehicle detection as described earlier, the advantages far outweighs its disadvantages.

* This project focuses on implementation of car parking place detection using Internet of Things.

* The system benefits of smart parking go well beyond avoiding time wasting.

* Developing a smart parking solutions with in a city solves the pollution problem.

* There are a number of improvements and modifications that can be made to my design to increase real world practicality and functionality. The symbols used need to have the ability to differentiate between pedestrians and cars. My Development of Smart Parking System garage is so simple that adding more interfaces was unnecessary. With only twelve parking spots in my system, more than five cars moving through the garage at one time would simply produce congestion.

* This system has been developed to provide parking attendance with parking information on how to get to. The parking attendance is committed to working towards a sustainable parking floors and the range of parking choices. The parking plan brings together existing and new initiatives which offer a better choice in the way car's owner can parking. This system also easy to use guide providing parking attendance with high quality parking information.

* This system also is a new service that tracks cars in real time throughout the mall. It means parking attendance can now find out the arrival time of the next car at every parking spot. She/ He can access this system information via database. The ticket parking is available to the entire car that had been parking in that time. Costing just RM1.00 per hour for one car gives unlimited parking spots parking throughout the mall.

* Proper planning needs to be done carefully and suspiciously in order to make sure the business that has been planned will be a profitable and long lived business. The opportunity to develop and implement a well-defined business strategy is very valuable to the business owner, their customer and as well as the community. Business plan reviews 60 visions and strategic focus as adding value to the target market segments, the small business and also the system users in the local.

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*THANK YOU !!!****