

SMART PARKING IN CITIES

A report On Social Relevant Project

BACHELOR OF TECHNOLOGY

in

**ELECTRONICS AND COMMUNICATION
ENGINEERING**

by

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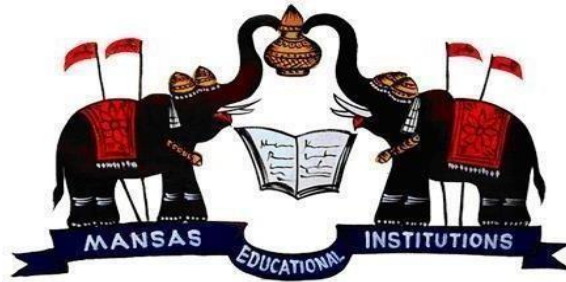
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING MAHARAJ VIJAYARAM GAJAPATHI RAJ
COLLEGE OF ENGINEERING (A)**

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Act1956Vizianagaram, Andhra Pradesh – 535005

2022-2023



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the social relevant project report entitled “**ARDUINO BASED SMART PARKING**” being submitted by **D.GRACY (20331A0451), D.RAGHAVA(20331A0452), D.GANESH (21335A0403), D.VYSHNAVI(21335A0404)** in partial fulfilment for the award of the degree of Bachelor of Technology in Electronics and communications Engineering is a record of Bona fide work done by them under my supervision during the academic year 2021-2022.

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We thank **Dr.K.V.L.Raju,** Principal, for extending his utmost support and cooperation in providing all the provisions for the successful completion of the project.

With great solemnity and sincerity, we offer our profuse thanks to our management, **MANSAS,** for providing all the resources to complete our project successfully.

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Mission and Vision of the Institute:

Institute Vision:

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

Institute Mission:

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity.

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To evolve as a center of excellence in Electronics and Communication Engineering in the country training students in contemporary technologies meeting the standards of global industry and to develop them into skillful engineers who are technologically superior and ethically strong with knowledge of core as well as inter disciplinary domains.

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The Department of Electronics and Communication Engineering focuses on imparting quality education for students to make them compete internationally, able to effectively address societal challenges, develop intellectual qualities and social responsibility.

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PEO1: Graduates will have the ability to formulate and solve problems in electronics and communication engineering domain with strong foundation in mathematics, science and engineering fundamentals.

PEO2: Graduates will have required knowledge for a successful career in the field of electronics and communication engineering.

PEO3: Graduates will have the ability to pursue higher studies and / or productively engage in research and to instill a passion and systematic approach for continuous learning so that they can adapt to the evolving knowledge in their chosen profession.

PEO4: Graduates will apply professional and communication skills to function as leaders and members of multidisciplinary teams with strong organizational skills and ethical responsibility.

Program outcomes (POs):

1. An ability to apply knowledge of mathematics, science and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulates, and solves engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context
9. A recognition of the need for and ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
12. An ability to design, simulate and test systems in a way that demonstrates comprehensive tradeoffs involved in design choices in RF & Microwave engineering, VLSI & Embedded systems and Signal/Image processing related to industry and research activities

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1. Engineering Knowledge.
2. Problem Analysis.
3. Design and development of solutions.
4. Conduct investigations of complex problems.
5. Modern tool usage.
6. The Engineer and society.
7. Environment and sustainability.
8. Ethics.
9. Individual and team work.
10. Communication.
11. Project management and finance.
12. Life – long learning.

PROJECT WORK COURSE OBJECTIVES :

1.	Students will acquire the ability to identify, describe the project, collect and analyze the data required to solve the problems using modern engineering tools and techniques.
2.	Students will acquire the skills to communicate the ideas clearly and effectively in both written and oral forms.
3.	Students will acquire collaborative skills through working in a team to achieve common goals.
4.	Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.

PROJECT OUTCOMES MAPPING WITH POS:

S.No	PROJECT OUTCOMES	PO MAPPING
1.	Have the ability to identify, describe the project, collect and analyze the data required to the problems using modern engineering tools and techniques	High-2,3,4,5,12 Medium-1,6,7,9,11 Low-8,10
2.	Have the ability to communicate the ideas clearly and effectively in both written and oral forms.	
3.	Have the ability to work in teams to achieve common goals through collaborative skills.	
4.	Have the ability to learn on their own, reflect on their learning and take appropriate actions to improve it.	

ABSTRACT

In the early times the concept of smart cities have gained great popularity. The proposed Smart Parking system consists of an on-site deployment of an IOT module that is used to monitor and signalize the state of availability of single parking space. This paper introduce an IOT based coordinated framework for efficient and easy way of parking the vehicles by checking the availability of slots. The proposed Smart Parking framework comprises of an IOT module that is utilized to screen and signalize the condition of accessibility of single parking spot. The paper additionally depicts an abnormal state perspective of the framework engineering. Towards the end, the paper examines the working of the framework in type of an utilization case that demonstrates the rightness of the proposed show. The Ultrasonic Range Detection Sensor is utilized with Arduino to indicate the empty slot .By measuring the distance using ultrasonic sensor drivers are able to find the empty slot in parking to park the car and help the driver to find the slot easily and reduce the searching time.As the parking place is found to be empty it is detected using ultrasonic sensors which report it further. We achieved this by programming the sensors and Arduino.

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1.1. INTRODUCTION

At the point when IoT is increased with sensors and actuators, the innovation turns into an occurrence of the more broad class of digital physical frameworks, which likewise incorporates advances. For Example, keen networks, virtual power plants, brilliant homes, astute transportation and shrewd urban communities. Among the difficulties that confront in everyday life one of most unavoidable test is parking the car wherever people go. As our need expands our setting out increments however because of extreme increment in utilization of vehicles and increment in populace this project confront the intense assignment of parking car especially amid busiest hours of the day. Amid pinnacle hours the majority of the saved parking zone gets full and this leaves the client to scan for their parking among other parking area which makes more movement and abandons them with no sign on accessibility of parking spot. To defeat this issue there is certainly a requirement for composed parking in business condition. To outline such parking there need to assess reservation of parking space with ideal parking spot which relies upon cost and time. However this project compose the time driven grouping strategy which takes care of the issue of parking utilizing opening assignment technique.

The fundamental inspiration of this venture is to diminish the movement clog that happens in and around the urban zones which is brought on by vehicles looking for parking. In the daily papers, many articles with respect to the stopping issue all over India like Delhi, Mumbai, Chennai, Bangalore and numerous metropolitan urban areas. Developing populace has made numerous issues; stopping issue is one of the enormous issues in our everyday life. In a current study, analysts have found that for one year, car cruising for stopping made what might as well be called 38 times trips far and wide, consuming 177914.8 liters of fuel and delivering 730 tons of CO₂. To diminish every one of these elements we go for the savvy stopping framework.

- a) To build up a canny, easy to understand robotized car stopping framework which diminishes the labour and movement blockage.
- b) To offer sheltered and secure stopping openings inside constrained territory.

1.2. PROBLEM STATEMENT

- Parking management influences drivers search time and cost for parking spaces.
- It may also causes traffic congestion.
- Finding a parking space in most metropolitan areas, especially during the rush hours, is difficult for drivers.
- Difficulty arises from not knowing where the available spaces may be at that time traffic congestion may occur.

1.3. LITERATURE SURVEY:

D.B.L. Bong, K.C. Ting and K.C. Lai(2007)

worked on Integrated approach in the design of car park occupancy information system (coins)--- In large parking areas such as those at mega shopping malls or stadiums, drivers always have difficulty to find vacant car park lots especially during peak periods or when the parking lots are almost full. A solution to reduce the drivers' searching time for vacant car-park lots will greatly save time, reduce cost and improve the traffic flow in the car park areas

M. Rashid, A. Musa(2012)

proposed "Carmatic Parking Management System and Parking Fee Collection Based on Number Plate Recognition"-----This paper discussed on carmatic parking system and electronic parking fee collection based on vehicle number plate recognition. The aim of this research is to develop and implement an carmatic parking system that will increase convenience and security of the public parking lot as well as collecting parking fee without hassles of using magnetic card

D. J. Bonde Jan(2012)

proposed "Carmated car parking system commanded by android application"-----The aim of this project is to carmate the car and car parking as well. A miniature model of an carmated car parking system that can regulate and manage number of cars that can be parked in given space at any given time based on the availability of parking slot. Carmated parking is a method of parking and existing cars using sensing device.

Mr. Basavaraju S R(2014)

proposed An Carmatic Smart Parking System using Internet of Things (IOT)-----Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology.

Faiz Shaikh¹, Nikhilkumar (2015)

proposed A Survey on “Smart Parking” System-----People owning vehicles face parking problems in most metropolitan area, especially during peak hours. The difficulty roots from not knowing where the parking spaces are available at the given time, even if this is known; many vehicles may pursue a small number of parking spaces which in turn leads to serious traffic congestion. This paper focuses on different smart parking techniques developed to overcome said problem using various wireless sensor network and providing real-time data analysis

Prof. Yashomati R. Dhumal¹, (2016)

proposed Android Based Smart Car Parking System-----The purpose of this system is to computerize the parking space reservation. Its talk about undertaking which introduces a miniature model of car parking that can direct and manage the number of cars that can be parked in given space at any given time based on availability of parking space after doing the registration by user using android application on his smart phone

Vishwanath Y¹ (2016)

proposed A survey paper on smart parking system based on internet of things a Smart Parking system---- It provides an optimal solution for parking problem in metropolitan cities. Due to rapid increase in vehicle density especially during the peak hours of the day, it is a difficult task for the drivers to find a parking space to park their vehicles

Ivan Ganchev and Mairtin (2020)

A cloud based intelligent car parking services for smart cities”----- In this the IOT sub system includes sensor layer, communication layer and application layer. The primary goal of the intelligent car parking system is to find, allocate and reserve the best available car parking lot for a user who is driving a car in a particular area and to provide instructions for reaching this lot. Sensor layer detecting the car lot occupancy.

2.1. WORKING PRINCIPLE:

After assembling all components according to the circuit diagram and uploading the code to the Arduino board. Now place the sensors and servo motor at accurate positions.

There are four parking slots in this project, [IR sensor](#)-3, 4, 5, and 6 are placed at slot-1, 2, 3, and 4 respectively. IR sensor-1 and 2 are placed at the entry and exit gate respectively and a servo motor is used to operate the common single entry and exit gate. The LCD display is placed near the entry gate.

The system used IR sensor-3, 4, 5, and 6 to detect whether the parking slot is empty or not and IR sensor-1, and 2 for detecting vehicles arriving or not at the gate.

In the beginning, when all parking slots are empty, then the [LCD display](#) shows all slots are empty.

When a vehicle arrives at the gate of the parking area then the IR sensor-1 detects the vehicle and the system allowed to enter that vehicle by opening the servo barrier. After entering into the parking area when that vehicle occupies a slot then the LED display shows that the slot is full. In this way, this system automatically allows 4 vehicles.

In case the parking is full, the system blocked the entrance gate by closing the servo barrier. And the LED display shows that slot-1, 2, 3, and 4 all are full.

When a vehicle leaves a slot and arrives at the gate of the parking area then the IR sensor-2 detects that vehicle and the system open the servo barrier. Then the [LED display](#) shows that the slot is empty. Again the system will allow entering a new vehicle.

2.2. COMPONENTS REQUIRED

Arduino Uno	1	
IR Sensors	2	
Servo Motor	1	
Lcd i2c display	1	
Breadboard	1	
Connecting wires		

3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board

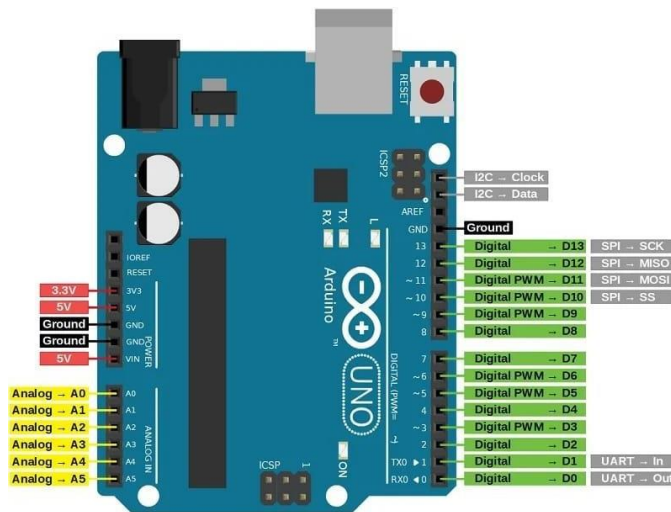


Fig.2.3.2.ARDUINO UNO PIN CONFIGURATION

GND: This pin of the board is used to ground the Arduino board.

Reset: This pin of the board is used to reset the microcontroller. It is used to Resets the microcontroller.

Analog Pins: The pins A0 to A5 are used as an analog input and it is in the range of 0-5V.

Digital Pins: The pins 0 to 13 are used as a digital input or output for the Arduino board.

Serial Pins: These pins are also known as a UART pin. It is used for communication between the Arduino board and a computer or other devices. The transmitter pin number 1 and receiver pin number 0 is used to transmit and receive the data resp.

External Interrupt Pins: This pin of the Arduino board is used to produce the External interrupt and it is done by pin numbers 2 and 3.

PWM Pins: This pins of the board is used to convert the digital signal into an analog by varying the width of the Pulse. The pin numbers 3,5,6,9,10 and 11 are used as a PWM pin.

SPI Pins: This is the Serial Peripheral Interface pin, it is used to maintain SPI communication with the help of the SPI library. SPI pins include:

SS: Pin number 10 is used as a Slave Select

MOSI: Pin number 11 is used as a Master Out Slave In

MISO: Pin number 12 is used as a Master In Slave Out

SCK: Pin number 13 is used as a Serial Clock

LED Pin: The board has an inbuilt LED using digital pin-13. The LED glows only when the digital pin becomes high.

AREF Pin: This is an analog reference pin of the Arduino board. It is used to provide a reference voltage from an external power supply.

Servo motor:



Servo motor is a rotary actuator or motor that allows for a precise control in terms of angular position, acceleration and velocity, capabilities that a regular motor does not have. It is a special type of motor which is automatically operated up to a certain limit for a given command with help of error-sensing feedback to correct the performance. It is used to open the barrier gate when a user arrives at an entry point and departs at an exit point.

IR SENSORS:



This IR Proximity Sensor is a multipurpose infrared sensor which can be used for obstacle sensing, color detection, fire detection, line sensing, etc. and also as an encoder sensor. The sensor provides a digital output. These sensors are good for detection between 100cm-500cm (1-5 meters / 3-15 feet). The long range makes them a good alternative to sonar sensors.

LCD I2C DISPLAY:



16 x 2 LCD is a perfect I2C LCD display for Arduino and Raspberry Pi with high contrast and easy deployment. 16x2 means two lines and each line has 16 columns, 32 characters in total. With the help of Grove I2C connector, only 2 signal pins and 2 power pins are needed.

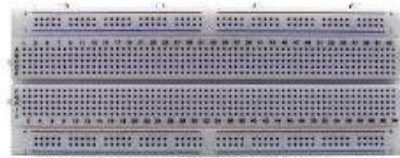
CONNECTING WIRES:

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with [breadboards](#) and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wire



BREAD BOARD:

The breadboard is a white rectangular board with small embedded holes to insert electronic components. It is commonly used in electronics projects. We can also say that breadboard is a prototype that acts as a construction base of electronics.



A breadboard is derived from two words bread and board. The word breadboard was initially used to slice the bread pieces. But, it was further named as a breadboard for its use in electronics around the 1970s. Hence, the term breadboard refers to these boards only and provides a quick electrical connection.

3.1. METHODOLOGY:

A. Hardware description

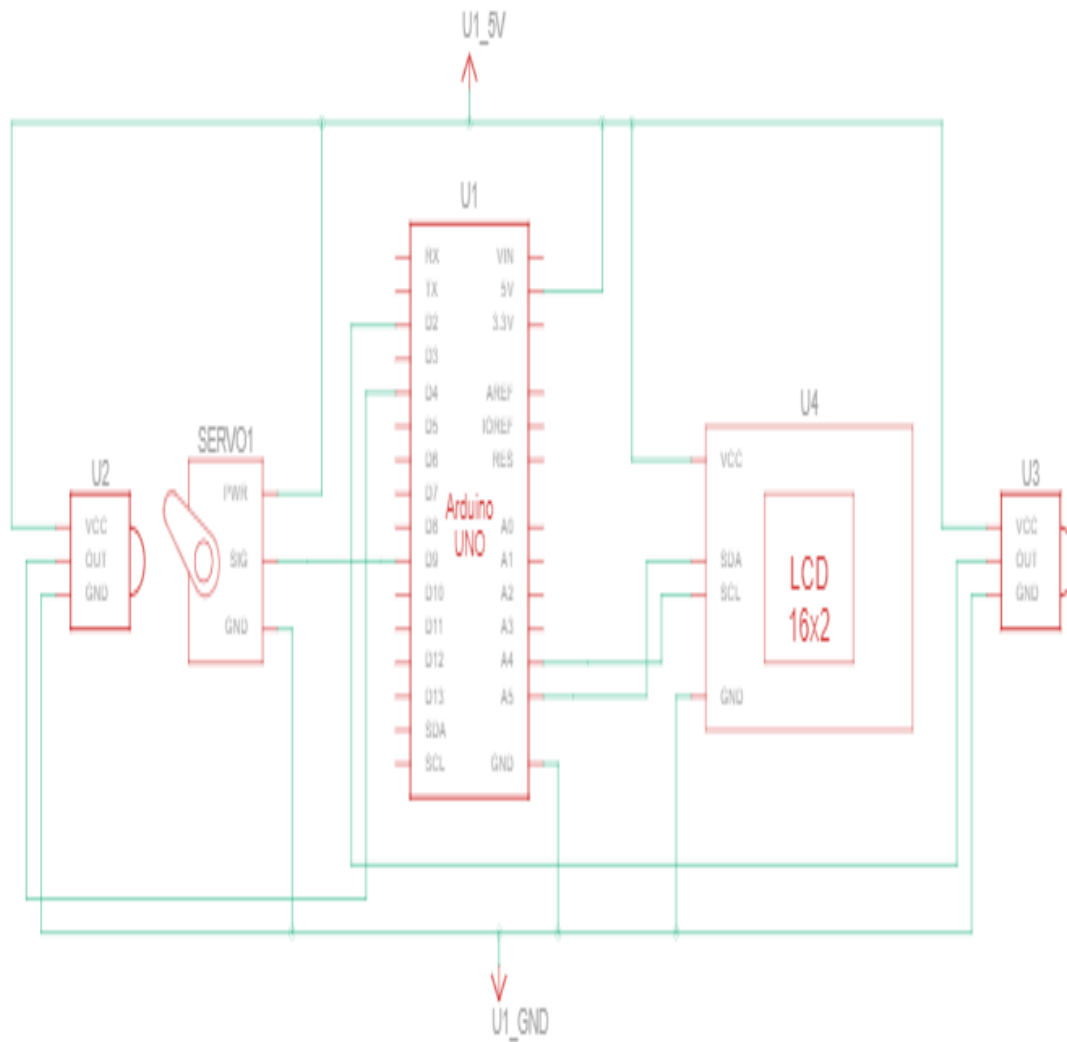
The required hardware component are Arduino UNO microcontroller, Wi-Fi module, LCD, Active IR sensor, servo-motor, power supply, Key pad and LEDs.

- 1) **Arduino Uno:** The Arduino Uno is a microcontroller board based on the ATmega328 (data sheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, and a reset button. This contains all the required support needed for microcontroller.
- 2) **Sensor:** Sensor is placed in each slot to know the status of each parking slots. It sends signal to micro controller, here active IR sensor are used.
- 3) **Servo motor:** Servo motor is a rotary actuator or motor that allows for a precise control in terms of angular position, acceleration and velocity, capabilities that a regular motor does not have special type of motor which is automatically operated up to certain limit for a given command with help of error-sensing feedback to correct the performance. It is used to open the barrier gate when user arrives at entry point and departure at exit point.
- 4) **LCD Display:** Display is placed in outside of parking area at entrance. It contains parking slots status like number of slots occupied and number of slots available.

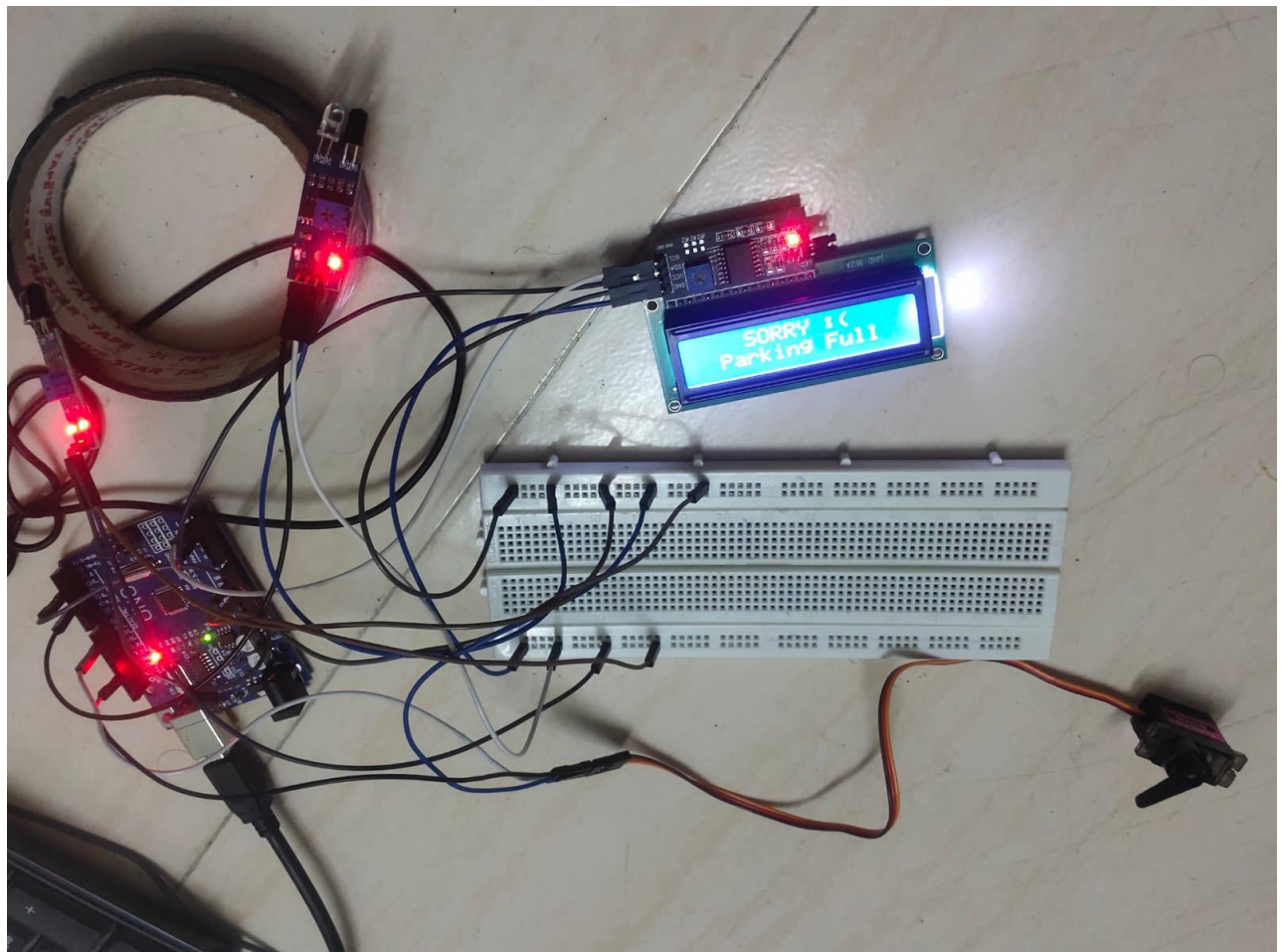
Using IR Sensor for Traffic Management :

Rani et al., (2017) developed the traffic management system by utilize an IR sensor to detect the obstruction when a vehicle passes through. The IR sensor will receive the signal when the car is crowded on the road and when there is a long obstruction. The roads that have more traffic will have more time to get pass the traffic light while the roads that have less traffic experience less time. These IR sensors are used to ensure incoming vehicles meet the signal on the side of the road. Then, the Raspberry Pi controller works as a central console to determine which sideways of the road signal is to get open or close based on data gathered from the sensors. The Raspberry Pi commands the traffic control to display the relevant signal based on traffic density.

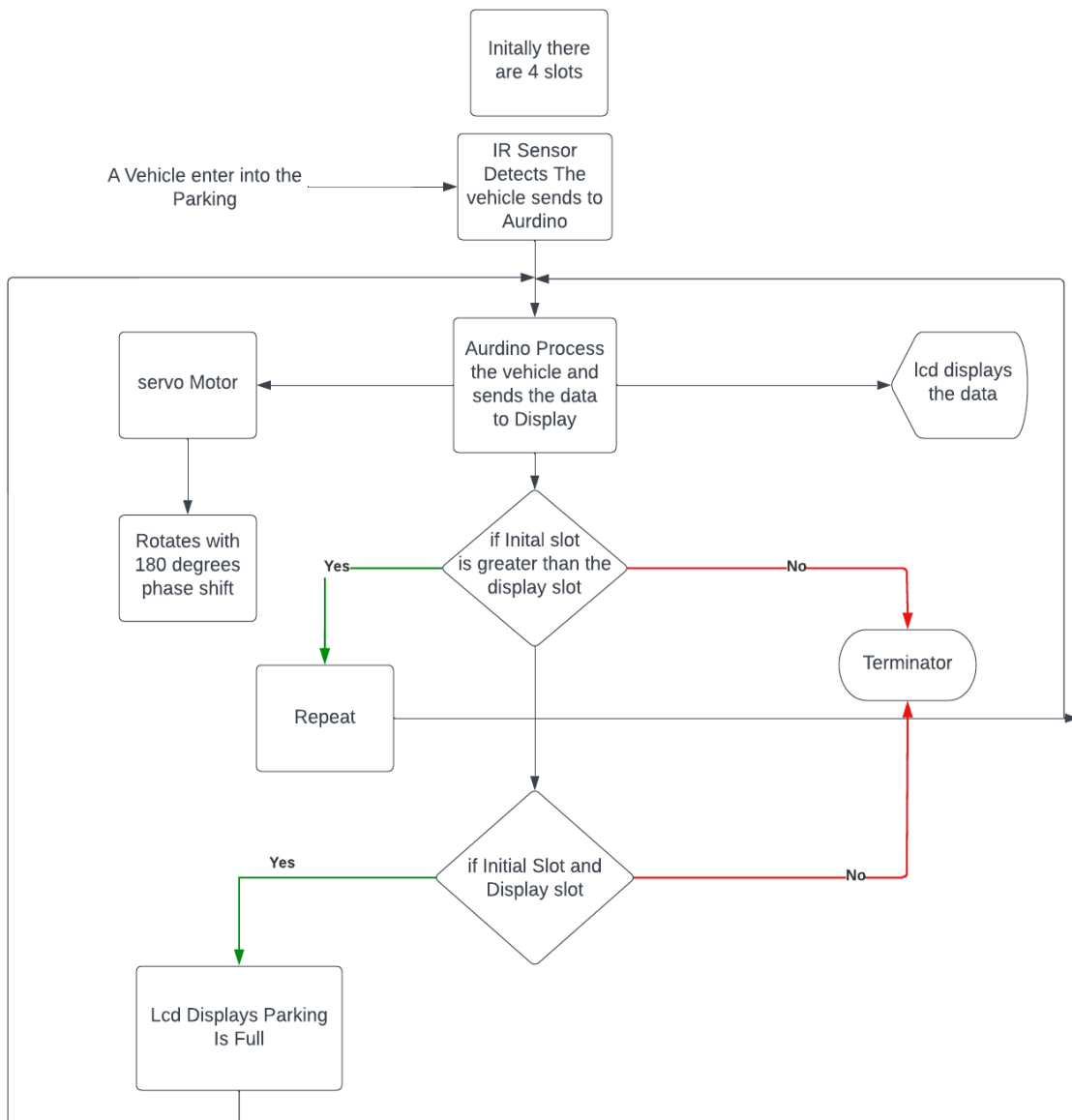
Meanwhile, Deekshitha et al., (2017) proposed and developed the traffic management system based on IR sensor. The system is designed for traffic jam detection, and the idea is to count the direction of the car wisely. A display screen on each main road will warn the car owner about traffic jams. In each signal and main road, the system will use two IR sensors. The counter rises when the vehicle is detected with the first detector. The counter is added to the "vehicle count" and the previous counter decreases when the second sensor senses the vehicles. If the first sensor detects any vehicles and the second sensor senses no vehicle for a certain duration, it takes the conclusion that a traffic jam has been occurred. The IR sensor was connected to the 8051-family microcontroller.



SNAP SHOTS :



FLOW CHART :



3.2. CODE FOR ARDUINO :

LCD CODE :

```
// Arduino 16x2 LCD I2C Scanner  
Analog Pin 4 - SDA  
Analog pin 5 - SCL  
5V - Vcc  
GND - GND  
*/  
  
#include <Wire.h>  
void setup()  
{  
Wire.begin();  
Serial.begin(9600);  
Serial.println("\nI2C Scanner");  
}  
void loop()  
{  
byte error, address;  
int Devices;  
Serial.println("Scanning...");  
Devices = 0;  
for(address = 1; address < 127; address++ )  
{  
  
Wire.beginTransmission(address);  
error = Wire.endTransmission();  
if (error == 0)  
{  
Serial.print("I2C device found at address 0x");  
if (address<16)  
Serial.print("0");  
Serial.print(address,HEX);  
Serial.println(" !");  
Devices++;  
}  
  
}
```

```

else if (error==4)
{
  Serial.print("Unknown error at address 0x");
  if (address<16)
  Serial.print("0");
  Serial.println(address,HEX);
}
}
if (Devices == 0)
  Serial.println("No I2C devices found\n");
else
  Serial.println("done\n");
delay(5000);
}

```

CODE FOR VEHICLE PARKING SYSTEM :

```

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x3F,16,2); //Change the HEX address
#include <Servo.h>

Servo myservo1;

int IR1 = 2;
int IR2 = 4;

int Slot = 4;      //Enter Total number of parking Slots

int flag1 = 0;
int flag2 = 0;

void setup() {
  lcd.begin();
  lcd.init();
  lcd.backlight();
  pinMode(IR1, INPUT);
  pinMode(IR2, INPUT);
}

```

```
myservo1.attach(3);  
myservo1.write(100);
```

```
lcd.setCursor (0,0);  
lcd.print("  ARDUINO  ");  
lcd.setCursor (0,1);  
lcd.print(" PARKING SYSTEM ");  
delay (2000);  
lcd.clear();  
}
```

```
void loop(){
```

```
if(digitalRead (IR1) == LOW && flag1==0){  
if(Slot>0){flag1=1;  
if(flag2==0){myservo1.write(0); Slot = Slot-1;}  
}else{  
lcd.setCursor (0,0);  
lcd.print("  SORRY :(  ");  
lcd.setCursor (0,1);  
lcd.print(" Parking Full ");  
delay (3000);  
lcd.clear();  
}  
}
```

```
if(digitalRead (IR2) == LOW && flag2==0){flag2=1;  
if(flag1==0){myservo1.write(0); Slot = Slot+1;}  
}
```

```
if(flag1==1 && flag2==1){  
delay (1000);  
myservo1.write(100);  
flag1=0, flag2=0;  
}
```

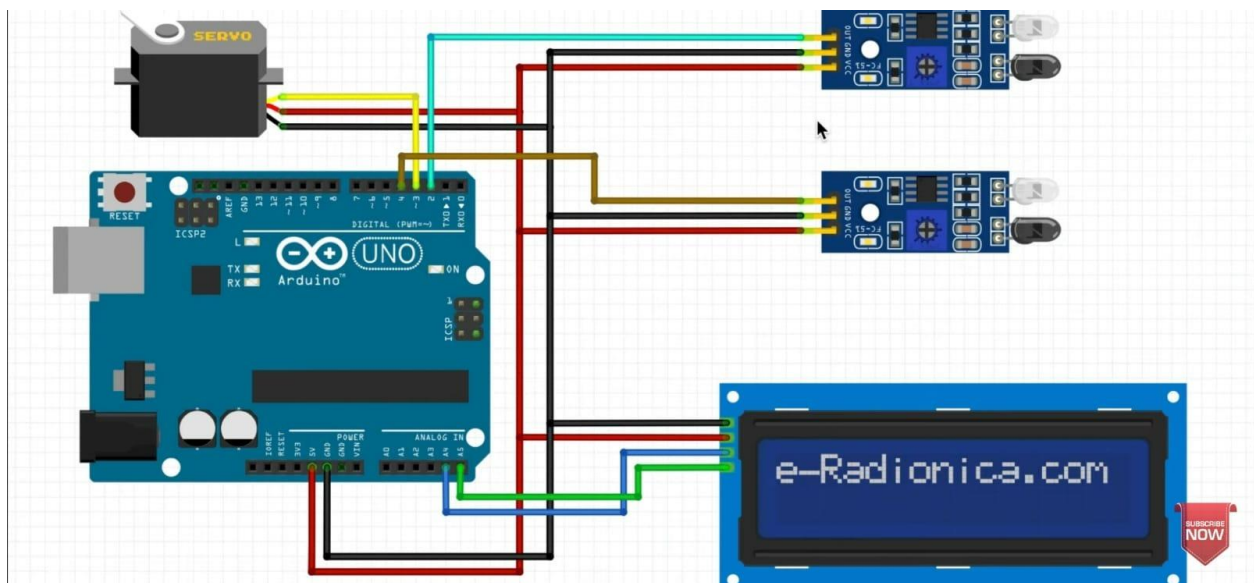
```
lcd.setCursor (0,0);
```

```

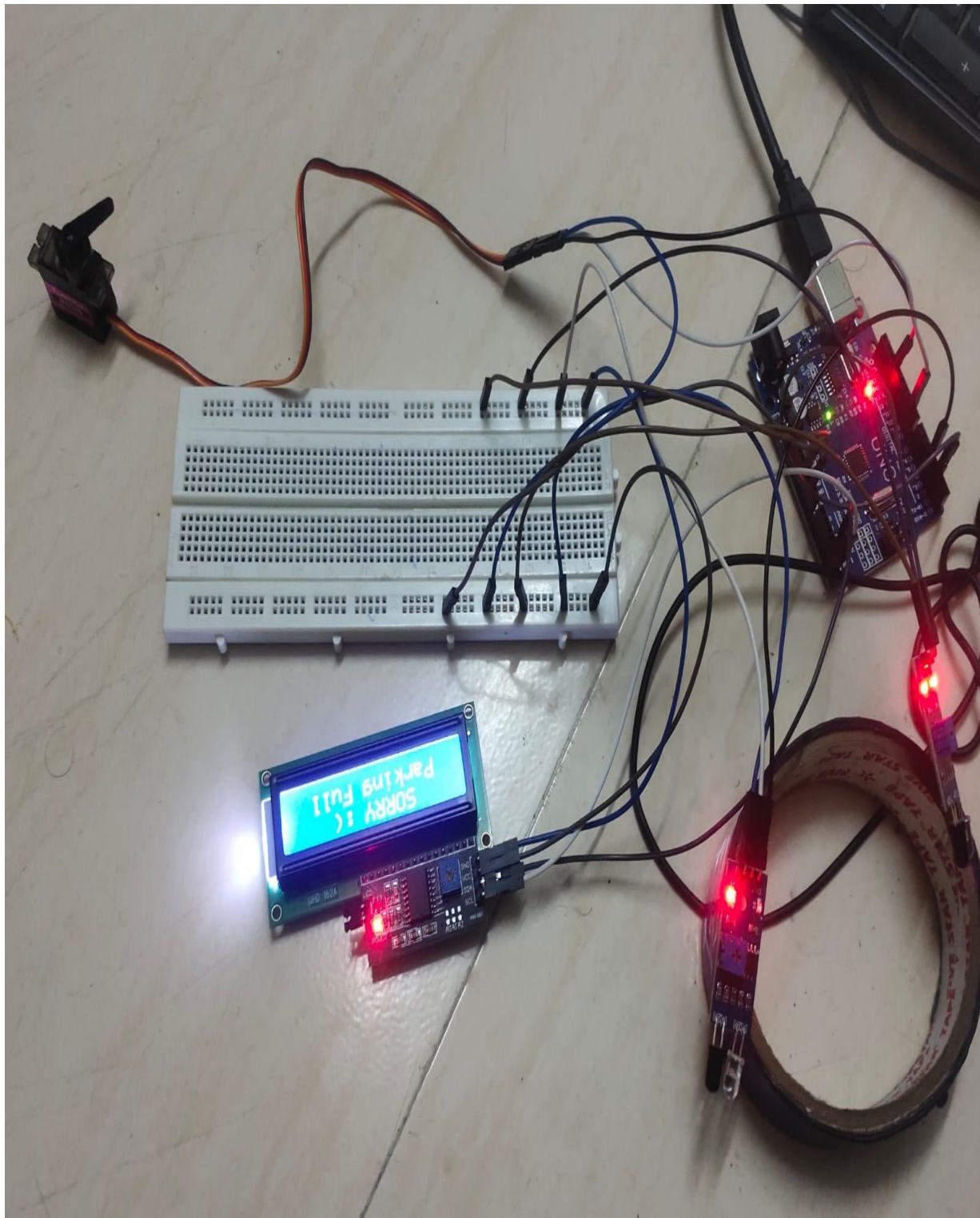
lcd.print("  WELCOME!  ");
lcd.setCursor (0,1);
lcd.print("Slot Left: ");
lcd.print(Slot);
}

```

3.3. SIMULATION MODEL :



3.4. OUTPUT :



4.1. APPLICATIONS:

- The intelligent parking system with guidance to a free parking space can improve the traffic situation in cities.
- Drivers find a free parking space faster, which reduces congestion and various other negative externalities.
- On the other hand, the system has high acquisition costs and other problems.
- Appliances: You can work your oven, vacuum cleaner, fan, fireplace, and air conditioning units—to name a few—via your phone.
- Lights: Switch your lights on or off, or dim them at a whim via your smart device.
- Energy savers: Monitor the electricity used by each device throughout the house, locate and eliminate the energy drainers, and save money in the procedure.
- . IR sensor is a very user-friendly Sensor and it can be easily interfaced with the Arduino Uno or Mega using Male to Female type Jumper wires.

4.2. CONCLUSION :

The present time brings us a constant increase in the intensity of road traffic. This problem brings strong negative externalities of urban transport, such as environmental pollution, noise, congestion, and traffic accidents resulting from high traffic density. Solutions for this problem are always time-consuming and expensive. In historical centers of Slovak cities, it is not possible to build new parking areas anymore. There is no more space, so there is only one more option. We should improve the efficiency of parking. Modern telematics applications can improve the traffic situation in our cities. In Žilina, for example, citizens can use various smartphone applications connected with transport services. It is possible to use the Bolt app for ordering a taxi or renting an e-scooter. Bike sharing also has an independent application named BikeKIA. Based on our survey, we can say that people like free applications. We managed to carry out a quality questionnaire survey in parking lots in Žilina. The parking situation is not as bad as the public sees it. Vehicles occupied less than 80% of city parking spaces during the peak hour. For this reason, there is a precondition for the implementation of a parking system. Our article further defines the proposal of the system. It should allow reservation and intelligent guidance to the parking lot. In the discussion, we evaluated the main possible problems of implementation and operation.

4.3. BENEFITS:

A surge in the demand for secure parking spaces has been observed due to two major trends, which are increasing urbanization and an increase in car ownership. The increased number of vehicles on the road is making the parking experience adverse for the drivers. In the traditional parking system, drivers face considerable losses in terms of money, productivity and time which is wasted in search of parking spots in densely populated areas. This not only makes the drivers frustrated but also increases the traffic on the road which in turn consumes 35% of the overall commute time of the drivers. Hence, it can be said that the traditional parking systems are not capable of providing a smooth parking experience to the drivers along with reducing the parking search traffic on the roads. This highlights the rationale of adopting advanced technologies to make the urban transport system modern and ease the problem faced by the drivers.



1. Consumption of Less Fuel

Smart Parking solution is an outcome of human innovations and advanced technology which not only provides easy access to the parking spots but also help in saving valuable resources such as fuel, time and space. In the urban regions where smart parking solutions are incorporated, drivers are guided straight to the empty parking spots. This eliminates the need of driving extra kilometres in order to find empty parking spots. Hence, less fuel is wasted with the Smart Parking solution which ultimately saves the drivers' money and smoothen their parking experience.

2. Cost and Time Efficient Solution

Smart parking technologies have the potential to save both time and money for drivers. This is because when the drivers enter the congested parking area they spent several minutes in search of a parking spot. This ultimately wastes their time, making them frustrated as the drivers are not able to reach the desired destination on time. Likewise, travelling extra kilometres in search of parking increases the fuel waste which in turn increases the money spending of the drivers of the car fuel. Smart Parking is an IoT based solution, equipped with sensors that send data to applications about the vacant parking spots. The drivers use this application to direct themselves to the available parking spaces instead of wasting their time and fuel in search of one.

3. Minimize the Personal Carbon Footprint

Another benefit of smart parking is that it reduces carbon emissions from vehicles by decreasing the congestion and mobility of the vehicles in search of parking. When the drivers move from one place to another for parking, this enhances the individual environmental footprint. Nearly, 20 minutes are

spent by each driver in the USA in search of parking, wasting fuel and time, along with creating traffic congestion in urban areas. The increased search time increases the emission of carbon footprint, but with the help of a smart parking solution, the search time can be minimized. All the fuels such as diesel, petrol and fossil fuel produce carbon dioxide emissions which adversely impact the environment. Another negative factor of the personal carbon footprint release from the vehicles is that it does not directly impact human life, but it is a potential contributor to climate change. When smart parking solutions are integrated into the urban areas, the release of individual environmental footprint, especially the release of carbon dioxide is ultimately reduced.

4. Reduce Parking Stress

The majority of the people avoid going to the congested part of the city as they do not want themselves to get stuck in the parking hassle which creates stress and anxiety among the drivers. Knowing that you will be spending so much time in search of parking but will still end up parking your car in a space far away from the destination is extremely discouraging. Furthermore, driving around the same street again and again and still not finding a space to park a car is frustrating. Smart parking solutions are aimed to make the parking experience of the drivers stress-free. Smart parking applications let the drivers know about the available parking space in the area they want to travel to. This reduces the unpredictability and stress associated with finding an appropriate parking space near the desired destination.

5. Reduce Search Traffic on Streets

Nearly, 30% of the traffic in the urban areas is created by parking search.

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. Smart parking technologies ensure to reduce the number of cars circling around the streets for finding a parking spot. This ultimately smoothens the traffic flow and minimize the search traffic on streets as much as possible.

4.4. ADVANTAGES:

- Consumption of Less Fuel. ...
- Cost and Time Efficient Solution. ...
- Minimize the Personal Carbon Footprint. ...
- Reduce Parking Stress. ...
- Reduce Search Traffic on Streets.

DISADVANTAGES

- Increased Privacy Concerns
- Increased Unemployment Rates
- Higly Dependent on the Internet
- Lack of mental and physical acitivity by humans leading to health issues
- Complex System For Maintenance
- Lack of security
- Absence of international standards for better communication

4.5.FUTURE SCOPE:

The Smart parking system based on Slot booking is implemented, using the Android application. 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. Safety measures such as tracing the vehicle number face recognition of the drivers so as to avoid theft & automatic billing process can also be designed. We plan to expand the tests on the real time environment where the users can have the "Smart Parking" system in their handheld devices.

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