Social Relevant Project Report

On

SMART CAR PARKING SYSTEM USING ARDUINO

By

Renangi Venkata Nivas – 192U1A04D2

Sanampudi Siva Sai – 192U1A04D4

Shaik Abdul Hameed – 192U1A04D6

Shaik Anwar Babu – 192U1A04D7

Under the Guidance of

Dr. K. Sravan Kumar, Associate Professor, ECE

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Accredited by NBA

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

A Unit of USHODAYA EDUCATIONAL SOCIETY

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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137

Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

(AY:2021-22, III B.Tech II Semester)

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Institute Vision:

To emerge as a leading engineering institution imparting quality education.

Institute Mission:

IM_1 Implement effective teaching-learning strategies for quality education IM_2 Build congenial academic ambience for progressive learning

IM_3 Facilitate skill development through Industry-Institute initiatives

IM_4 Groom environmentally conscious and socially responsible technocrats

Department Vision:

To become a reputed learning centre producing competent professionals.

Department Mission:

DM_1 Provide quality education through interactive teaching-learning practices.

DM_2 Establish technology-enabled environment for building core competencies including robotics.

DM_3 Arrange Industry-Interaction to hone professional skills. DM_4 Organize activities to foster social skills and ethical values.

Program Educational Objectives:

Graduates of B. Tech in Electronics and Communication Engineering Programme shall be able to

PEO1 Apply engineering concepts to solve Electronics and Communication Engineering problems of social relevance.

PEO2 Design and develop electronic devices and Systems for Industry or pursue research.

PEO3 Demonstrate competencies through continuous learning and adapt to multi-disciplinary environment.

PEO4 Practice professional values and contribute to the societal needs.

Program Specific Outcomes:

PSO1 **Professional Skills**: Apply principles of Analog and Digital Electronics, Communication Systems, Image processing, VLSI and Embedded Systems to solve diverse problems.

PSO2 **Software Knowledge**: Develop solutions for complex engineering problems of social relevance by employing Xilinx, CC Studio, Micro Wind, Keil, NG Spice, Scilab tools.

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CERTIFICATE

This is to certify that the Social Relevant Project report entitled **Smart Car Parking System using Arduino** that is being submitted by **Mr. (Renanagi Venkata Nivas, Sanampudi Siva Sai, Shaik Abdul Hameed, Shaik Anwar Babu)** the work carried out under my guidance and supervision.

Internal Guide
Dr. K. Sravan Kumar, Associate Professor
Dept. of ECE

Head of the Department
Dept. of ECE

Submitted date: _____

SRP Examiner

(2021-2022)

ACKNOWLEDGEMENT

Our special thanks to **Mr. P. Raghava Reddy, Associate Professor, H.O.D of ECE Dept,** Geethanjali Institute of Science and Technology, Nellore, for his timely suggestions and help during the progress of Social Relevant Project work in spite of his busy schedule.

We would express heartfelt gratitude and indebtedness to our guide, **Dr. K. Sravan Kumar, Associate Professor, Dept of ECE**, Geethanjali Institute of Science and Technology, Nellore, for his keen interest, critical, constructive and support each and every stageof project and for giving her advice when ever needed.

During the work, we received valuable academic inputs as well as moral support from other departments, general teaching and nonteaching faculty at **Geethanjali Institute of Science and Technology**, Nellore.

Project Associates:

Renangi Venkata Nivas

(192U1A04D2)

Sanampudi Siva Sai

(192U1A04D4)

Shaik Abdul Hameed

(192U1A04D6)

Shaik Anwar Babu

(192U1A04D7)

ABSTRACT

In the early times the concept of smart cities has 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 project introduces 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 project additionally depicts an abnormal state perspective of the framework engineering. Towards the end, the project examines the working of the framework in type of a utilization case that demonstrates the rightness of the proposed show. The InfraRed Sensor is utilized with Arduino to indicate the empty slot. By measuring the distance using InfraRed 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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CHAPRER 1

INTRODUCTION

INTRODUCTION

The Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

"Things", in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, cameras streaming live feeds of wild animals in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring, or field operation devices that assist firefighters in search and rescue operations. Legal scholars suggest regarding "things" as an "inextricable mixture of hardware, software, data and service".

These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

Devices and objects with built in sensors are connected to an Internet of Things platform, which integrates data from the different devices and applies analytics to share the most valuable information with applications built to address specific needs.

These powerful IoT platforms can pinpoint exactly what information is useful and what can safely be ignored. This information can be used to detect patterns, make recommendations, and detect possible problems before they occur.

Our project is on smart parking system which will implement internet of things to facilitate the real time availability of parking spaces. Traffic congestion caused by vehicle is an alarming problem at a global scale and it has been growing exponentially. Car parking problem is a major contributor and has been, still a major problem with increasing vehicle size in the luxurious segment and confined parking spaces in urban cities. Searching for a parking space is a routine (and often frustrating) activity for many people in cities around the world. This search burns about one million barrels of the world’s oil every day. As the global population continues to urbanize, without a well-planned, convenience-driven retreat from the car these problems will worsen.

Smart Parking systems typically obtains information about available parking spaces in a particular geographic area and process is real-time to place vehicles at available positions. It involves using low-cost sensors, real-time data collection, and mobile-phone-enabled automated payment systems that allow people to reserve parking in advance or very accurately predict where they will likely find a spot. When deployed as a system, smart parking thus reduces car emissions in urban centers by reducing the need for people to needlessly circle city blocks searching for parking. It also permits cities to carefully manage their parking supply Smart parking helps one of the biggest problems on driving in urban areas; finding empty parking spaces and controlling illegal parking.

CHAPTER 2

LITERATURE SURVEY

- The existing parking system simply gather the available information of vacant parking slots using various sensor networks, and update the data to direct drivers. But the problem lies here, this system will not be able to direct the drivers to their respective parking slots. Blind searching is a common way by which drivers look out for vacant spaces when there is no availability of parking information. The drivers keep searching for empty parking spaces within a close distance to their end location. The drivers will not stop looking around until they find an empty space and keep extending the searching area.

- When there are many vehicles wanting to park in a limited amount of available space, this system will have some extra spaces reserved in order to avoid a conflict. But it is a difficult task to estimate the number of spaces required. If the reserved space is too small, then we cannot overcome the problem of "many-vehicles-chase-single-slot". If the buffer is too large, then parking space cannot be utilized effectively. Walking distance and Traffic volume are two performance metrics that address these issues.

- In order to address these challenges few systems have been already proposed such as Reservation Performance where the system continuously retrieves and stores data about the performance metrics, it also includes the status of parking slot (occupied or vacant), reservation time, exact parking location and also about driver's identity. As soon as the reserved space is occupied by a vehicle, the system should automatically verify the driver's identity in order to block that slot. Iris-net has proposed a system which uses cameras, microphones and motion detectors. These sensors are used to detect the availability of vacant parking spaces. It also acquires real time information about vacant parking slots through their web applications. But the problem is that it generates huge amount of data.

- One of the main limitations of this system is high energy consumption and it also suffers from technical aspects. E-parking system makes use of latest technologies to merge reservation of parking slots and the payment systems. A driver can utilize this system to get information about the availability of vacant parking spaces, to reserve a parking space at his desired location and also to make the payment when leaving. The above system can be accessed through a smartphone, or through web. But still there is a requirement of conventional detectors to detect the status of the parking slot. Smart parking system makes a way for an efficient use of limited number of parking spaces.

CHAPTER 3

HARDWARE DESCRIPTION

3.1 BLOCK DIAGRAM

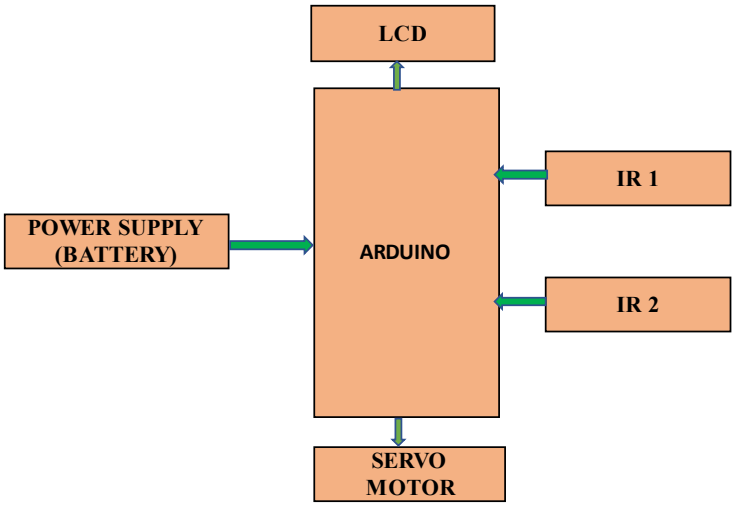


FIGURE 1 BLOCK DIAGRAM

Smart Parking systems typically obtains information about available parking spaces in a particular geographic area and process is real-time to place vehicles at available positions .It involves using low-cost sensors, real-time data collection, and mobile-phone-enabled automated payment systems that allow people to reserve parking in advance or very accurately predict where they will likely find a spot. When deployed as a system, smart parking thus reduces car emissions in urban centres by reducing the need for people to needlessly circle city blocks searching for parking. It also permits cities to carefully manage their parking supply.

Smart parking helps one of the biggest problems on driving in urban areas; finding empty parking spaces and controlling illegal parking.

For implementing the project, we have used various equipment and materials which are as follows:

1. Arduino UNO
2. IR Proximity Sensor
3. Servo Motor
4. LCD Display
5. Jumpers
6. Bread board
7. Battery

1. ARDUINO UNO

Arduino is an open-source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name *Arduino* comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

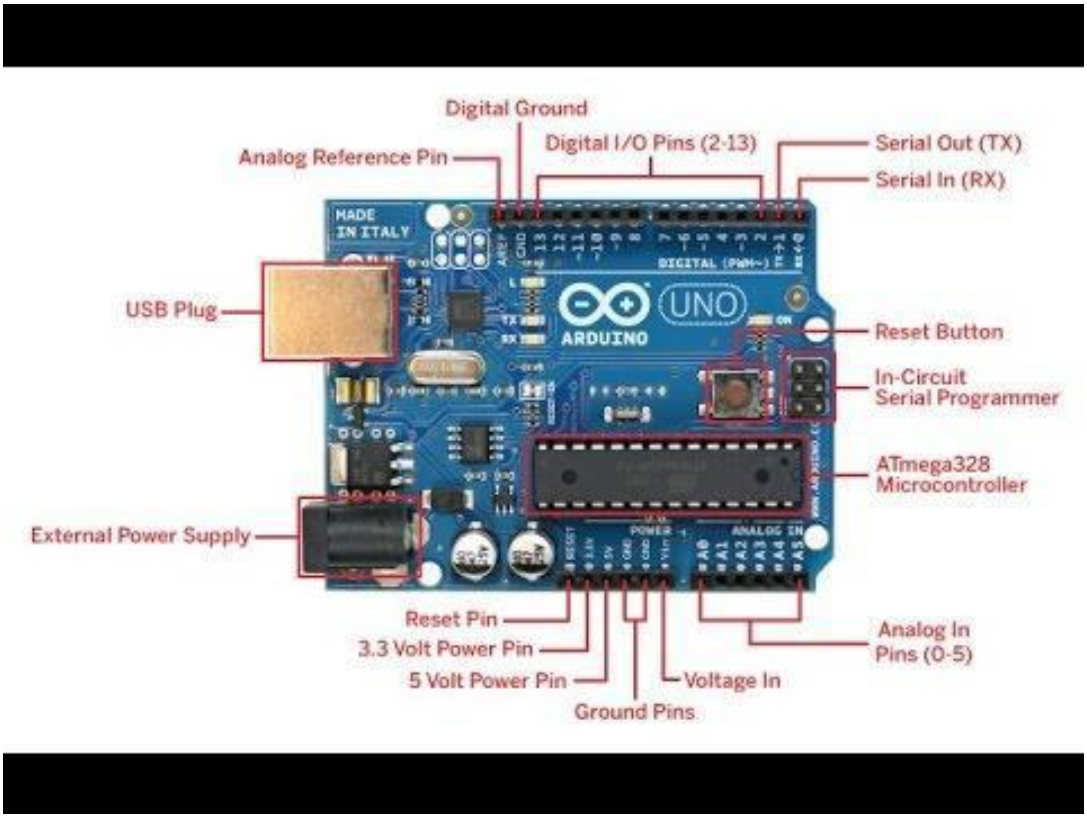


FIGURE 2 ARDUINO UNO

Features of the Arduino UNO:

Microcontroller: ATmega328
Operating Voltage: 5V
Input Voltage (recommended): 7-12V
Input Voltage (limits): 6-20V
Digital I/O Pins: 14 (of which 6 provide PWM output)
Analog Input Pins: 6
DC Current per I/O Pin: 40 mA
DC Current for 3.3V Pin: 50 mA
Flash Memory: 32 KB of which 0.5 KB used by bootloader
SRAM: 2 KB (ATmega328)
EEPROM: 1 KB (ATmega328)

Clock Speed: 16 MHz

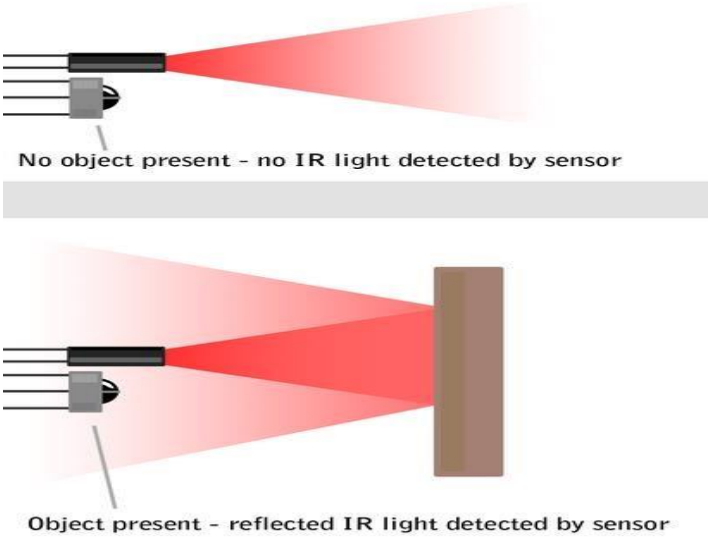
2. IR SENSOR

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

FIGURE 3 INFRA RED SENSOR

Principle of IR Sensor :

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.



3. SERVO MOTOR

A servomotor (or servo motor) is a simple electric motor, controlled with the help of servomechanism. If the motor as a controlled device, associated with servomechanism is DC motor, then it is commonly known as a DC Servo Motor. If AC operates the controlled motor, it is known as a AC Servo Motor.

A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

There are some special types of applications of an electric motor where the rotation of the motor is required for just a certain angle. For these applications, we require some special types of motor with some special arrangement which makes the motor rotate a certain angle for a given electrical input (signal). For this purpose, servo motor comes into the picture.

The servo motor is usually a simple DC motor controlled for specific angular rotation with the help of additional servomechanism. Nowadays, servo systems are used widely in industrial applications.

Servo motor applications are also commonly seen in remote-controlled toy cars for controlling the direction of motion, and it is also very widely used as the motor which moves the tray of a CD or DVD player. Besides these, there are hundreds of servo motor applications we see in our daily life.

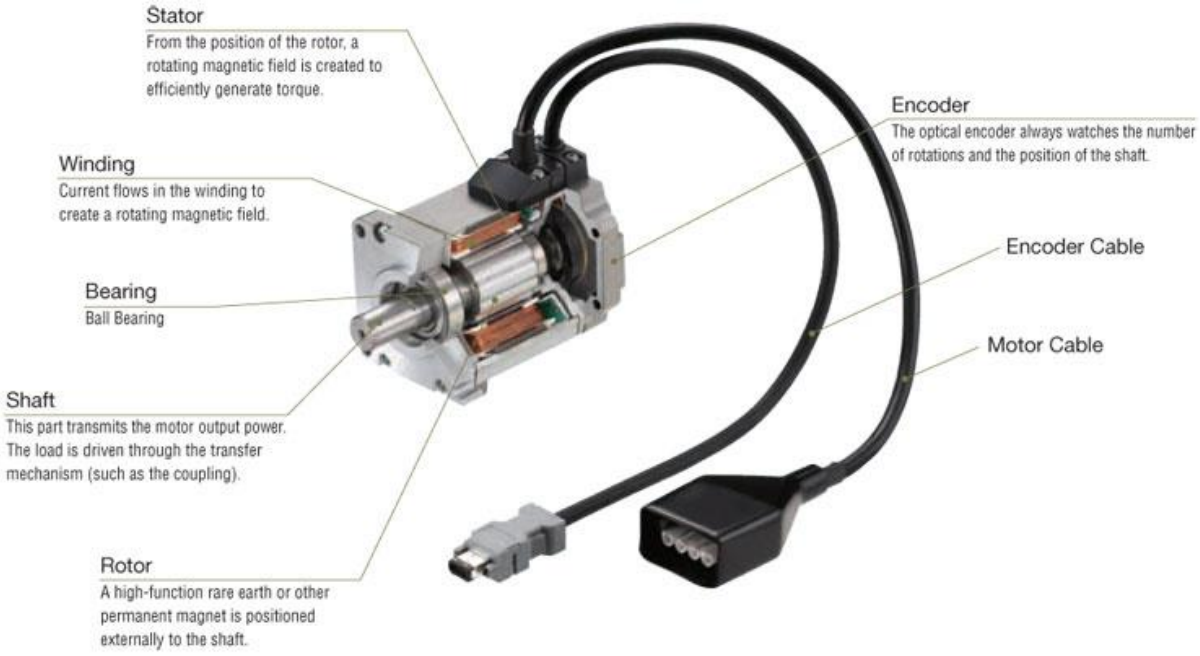


FIGURE 4 SERVO MOTOR

- **Stator** From the position of the rotor, a rotating magnetic field is created to efficiently generate torque.
- **Winding** Current flows in the winding to create a rotating magnetic field.
- **Bearing** Ball Bearing
- **Shaft** This part transmits the motor output power. The load is driven through the transfer mechanism (such as the coupling).
- **Rotor** A high-function rare earth or other permanent magnet is positioned externally to the shaft.
- **Encoder** The optical encoder always watches the number of rotations and the position of the shaft.

4. JUMPER WIRES

FIGURE 5 JUMPER WIRES

A jump wire (also known as jumper, jumper wire, jumper cable) is an electrical wire with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, without soldering.

5. LCD DISPLAY

The LCD (Liquid Crystal Display) is a type of display that uses the liquid crystals for its operation. Here, we will accept the serial input from the computer and upload the sketch to the Arduino. The characters will be displayed on the LCD.

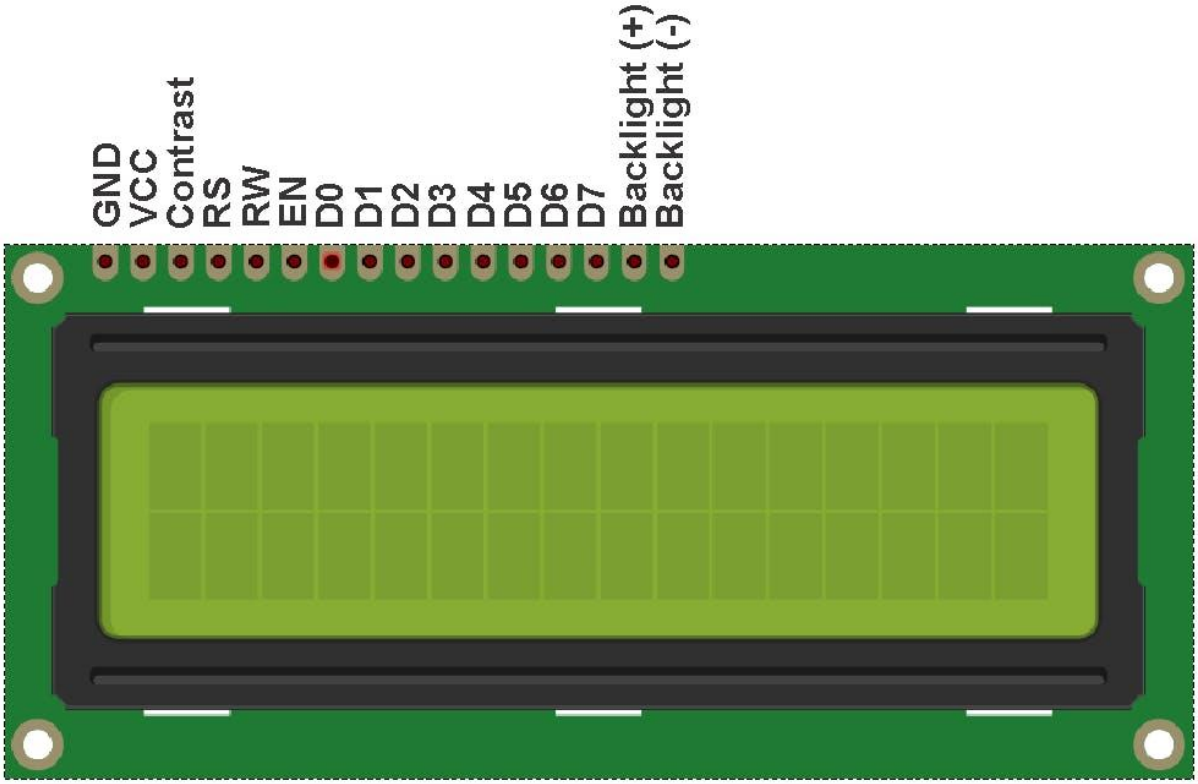


FIGURE 6 LCD DISPLAY

The use of pins listed below

GND(VSS)

Connect the ground pin of the power supply to this pin.

VCC

Connect this pin to 5v

Contrast (VEE)

This pin is used to adjust the contrast of Display. Connect a potentiometer (POT) to this pin. Rotate the knob of the POT to adjust the contrast.

RS

RS pin means Register select pin. Selects command register when the pin is LOW. And selects data register when this pin is HIGH.

RW

It represents the Read Write pin. When this pin is LOW, the MCU write to register. And when the pin is HIGH, MCU read from the register. Here we want to write. It connect it permanently to GND.

EN (E)

EN pin means the Enable pin. Send data to data pins when a HIGH to LOW pulse is given.

D0-D7 (DB0-DB7)

These are 8 data pins. Here I interface this LCD with Arduino is in 4 bit mode. So we need only D4 to D7.

Backlight(+)

This is the anode pin of the backlight of the display.

Backlight(-)

This is the cathode pin of the backlight of the display.

3.2 CIRCUIT DIAGRAM

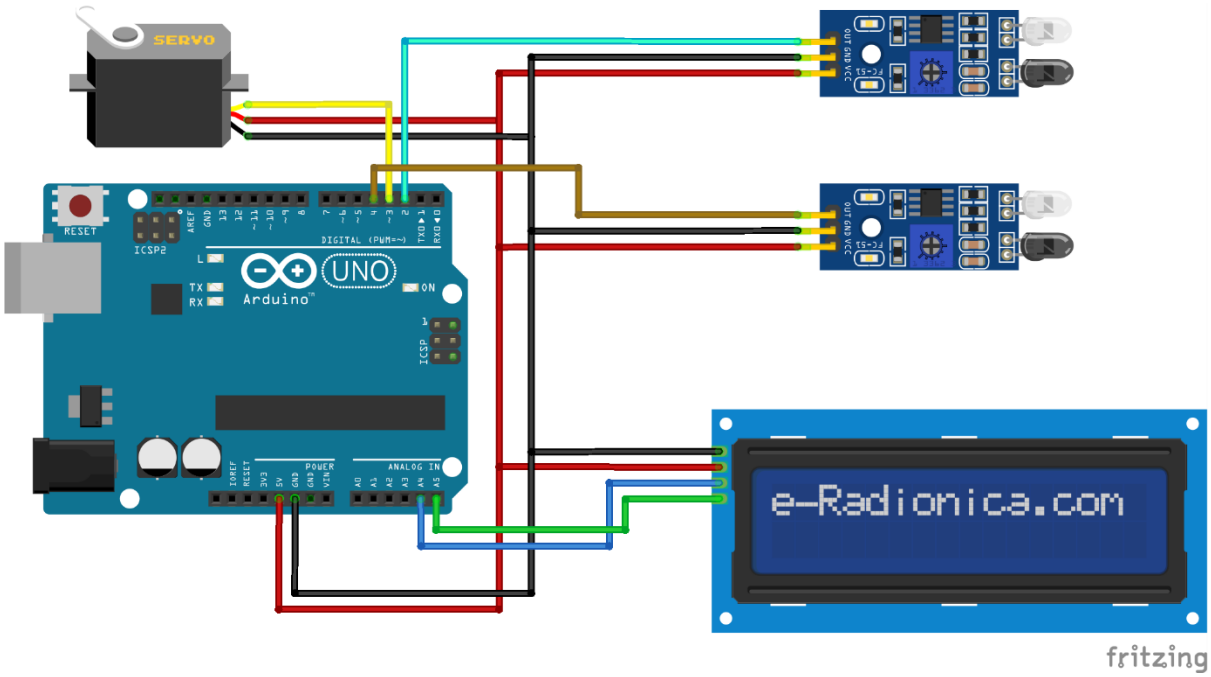


FIGURE 7 CIRCIUT DIAGRAM

CHAPTER 4

SOFTWARE DESCRIPTION

4.1 ARDUINO SOFTWARE PART:

In order to execute this project, we require Arduino IDE to program the Arduino. The interface of an Arduino IDE is shown in below figure.

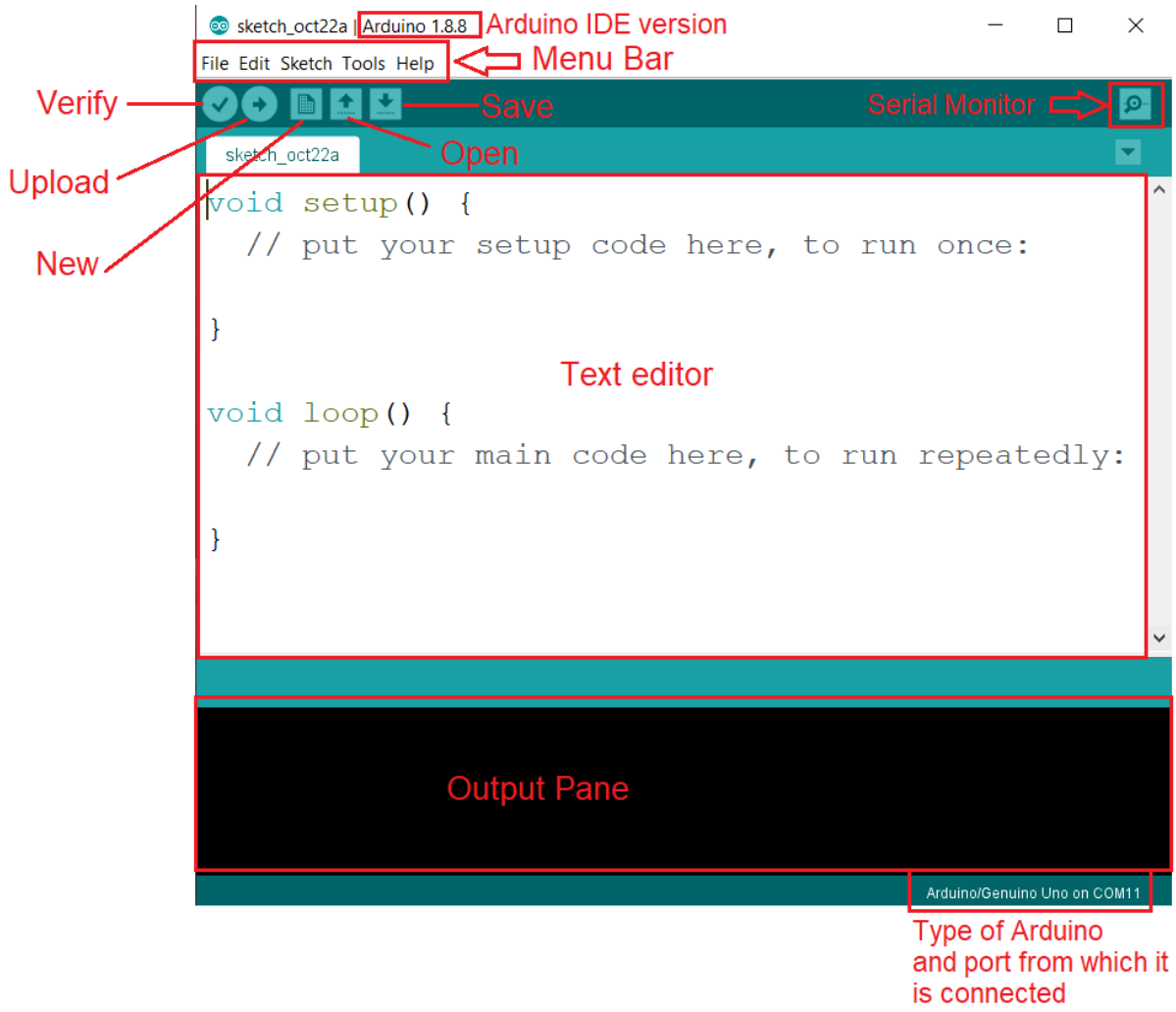


FIGURE 8 INTERFACE OF ARDUINO IDE

IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages *Processing* and *Wiring*. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple *one-click* mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

SKETCH

A program written with the Arduino IDE is called a *sketch*.[58] Sketches are saved on the development computer as text files with the file extension *.ino*. Arduino Software (IDE) pre-1.0 saved sketches with the extension *.pde*.

A minimal Arduino C/C++ program consist of only two functions:

setup(): This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.

loop(): After *setup()* has been called, function *loop()* is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

4.2 CODE:

```
// Arduino Car 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.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);
}
```

CHAPTER 5

APPLICATIONS

ADVANTAGES

LIMITATIONS

APPLICATIONS

Smart Parking would enable the following:

• Accurately predict and sense spot/vehicle occupancy in real-time.

• Guides residents and visitors to available parking.

• Optimize Parking Space Usage.

• Simplifies the parking experience and adds value for parking stakeholders, such as drivers and merchants.

• Help traffic in the city flow more freely leveraging IoT technology.

• Enables intelligent decisions using data, including real–time status applications and historical analytics reports.

• Smart Parking plays a major role in creating better urban environment by reducing the emission of CO2 and other pollutants.

• Smart Parking enables better and real time monitoring and managing of available parking space, resulting in significant revenue generation.

• Provides tools to optimize workforce management.

ADVANTAGES

- Optimized parking
- Reduced traffic
- Reduced pollution
- Enhanced User Experience
- Integrated Payments and POS
- Increased Safety
- Real-Time Data and Trend Insight
- Decreased Management Costs
- Increased Service and Brand Image

LIMITATIONS

- Availability of the space could be found only after the car enters the parking lot, so if parking space is not available it has to avert from there and it might cause traffic congestion.

CHAPTER 6
RESULT AND CONCLUSION

RESULT

The demand of smart parking system is increasing significantly. This allows user to involve real time access of the availability of the parking space. The existing system in today's world doesn't contains the facilities of parking reservation and parking slot availability checker. The existing system was vision-based monitoring system which estimates the number of the parking slots available in the area by counting the number of incoming and outing cars which consumes lot of time and efforts. The next existing system was sensor-based system which uses infrared sound waves for detecting the presence of vehicles and then two-tier parking came into existence which used the concept of parking cars one above another. The result of the project is to make the parking area connected with the world as well as reduces time and can be cost effective for the user. This project reduces overall fuel energy of the vehicle which is consumed in the search of the car.

CONCLUSION

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 project enhances the performance of saving users time to locate an appropriate parking space. It helps to resolve the growing problem of traffic congestion.

FUTURE SCOPE

The Smart parking system based on Slot booking is implemented, using the Android application. Using this 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.

CHAPTER 7

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REFERENCES

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- https://www.youtube.com/watch?v=p06NNRq5NTU