

Easy Car Parking Using Arduino

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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.

Keywords— Arduino, Ultrasonic, Sensor.

I. 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 composes 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.

Parking garage Problems: Trouble in Finding Vacant Spaces, Quickly finding an empty space in a multilevel parking garage is troublesome if not unthinkable, particularly on ends of the week or open occasions. Discovering spaces amid ends of the week or open occasions can take over 10 minutes for around 66% of guests. Stadiums or shopping centre are swarmed at pinnacle periods, and trouble in finding empty openings at these spots is a noteworthy issue for clients. Inadequate car parking space \ prompt activity blockage and driver disappointment.

II. LITERATURE SURVEY

Before the cars users were very less before in early 1990's, because of high cost .so the users were getting very easily the place for parking the car. But as the time goes on i.e. ., after 1990's density of the car on the road is increase slowly. Because of that the traffic increased quickly that to be in metro-Politian cities, tourist places, and in capital cities.

After 2000's population is increased rapidly, as well as the people reduced the use of public transport and they start to use own vehicle for their comforts and luxuries. So the traffic is become menace. Automatically parking problem increased rapidly.

In order avoid this parking problem "NO PARKING" traffic system introduced by traffic police to segregate the parking of the vehicles. But it won't produce the permanent solution to it .so then they allotted the separate place for parking the vehicle for both two wheeler as well as four wheeler vehicle. In this system parking place was handled by the tendered peoples on need basis. Even this also not works properly because the following.

1. Getting empty slot was manual.
2. And manually people needs to guide the drivers to park the vehicle.
3. It was payable.

So due to this reasons this manual is also getting failure in this era. And many disadvantages come from this system.

1. **Time consuming:** It takes much time to find the vacant slot and park as well as due to vehicle traffic.
2. **Damage:** The vehicle may get physically damaged in traffic collision in parking area.
3. **Loss of money:** Due to physical damage.
4. And also the driver may get **bored, irritated and frustrated** if the traffic is more.
5. Cities noticed that their drivers had **real problems** to find a parking space easily especially during peak hours, the difficulty roots from not knowing where the parking spaces are available at the given time.
6. Even if this is known, many vehicles may pursue a small number of parking spaces which in turn leads to **traffic congestion**.

The traffic on roads and parking space has been an area of concern in majority of cities. So, parking monitoring is an important solution. To avoid these problems, recently many new technologies have been developed that help in solving the parking problems to a great extent.

- Firstly, this paper gives an overview about the concept of smart parking system, their categories and different functionalities.
- Then we present the latest developments in parking infrastructures.

- We describe the technologies around parking availability monitoring, parking reservation and dynamic pricing and see how they are utilized in different settings.
- In addition, a theoretical comparison is presented to show advantages and drawbacks of each different smart parking system to discuss results and open directions for future research.

III. PROPOSED METHOD

Proposed System overcomes the lack and inconvenience of existing system. So not finding a parking space for you sometimes is indeed a critical issue. The number of vehicles is also increasing daily adding to the parking vows at public places. Cities noticed that their drivers had real problems to find a parking space easily 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 traffic congestion. The traffic on roads and parking space has been an area of concern in majority of cities. So, parking monitoring is an important solution. To avoid these problems, this system will provide us facility to know the number of slots available in the parking area, as well as available slot numbers also. Once the driver knows this information in the display unit, the drive can move the vehicle toward the gate, when if the vehicle really wants to park. Then automatically the motor will opens the gate, immediately the counter decreases the total number of slots. After when the vehicle enters in to particular slot, the slot detail will get updated. And when the slots were not free even the vehicle wants to enter in to parking area the motor will not opens the gate. So this proposed system have many advantages as shown below.

Advantages

1. There is a greater sense of security.
2. It is highly feasible for extremely small sites that are unable to accommodate a conventional ramped parking structure.
3. There is high parking efficiency.
4. There is no need for driving while looking for an available space.
5. Emissions are greatly brought down and reduced.
6. There are less chances for vehicle vandalism.
7. There is a minimal staff requirement if it is used by known parkers.
8. It is possible that the retrieval time is lower than the combined driving/parking/walking time in conventional ramped parking structures.
9. There is easier facade integration since there are no ramping floors or openings in exterior walls.

Objectives

- ❖ The main objective of this system is to decrease traffic at parking area.
- ❖ The purpose of this system is to provide safety and avoid the damages may occur due to collision between the cars.

Hardware Requirements

- Arduino
- Ultrasonic sensors
- Servo Motor
- Resistors and Capacitors

- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- Transformer/Adapter
- Push Buttons
- IC,IC Sockets
- ALCD (Alphanumerical Liquid Crystal Display).

Software Requirements

- Embedded C.

FUNCTIONAL BLOCK DIAGRAM:

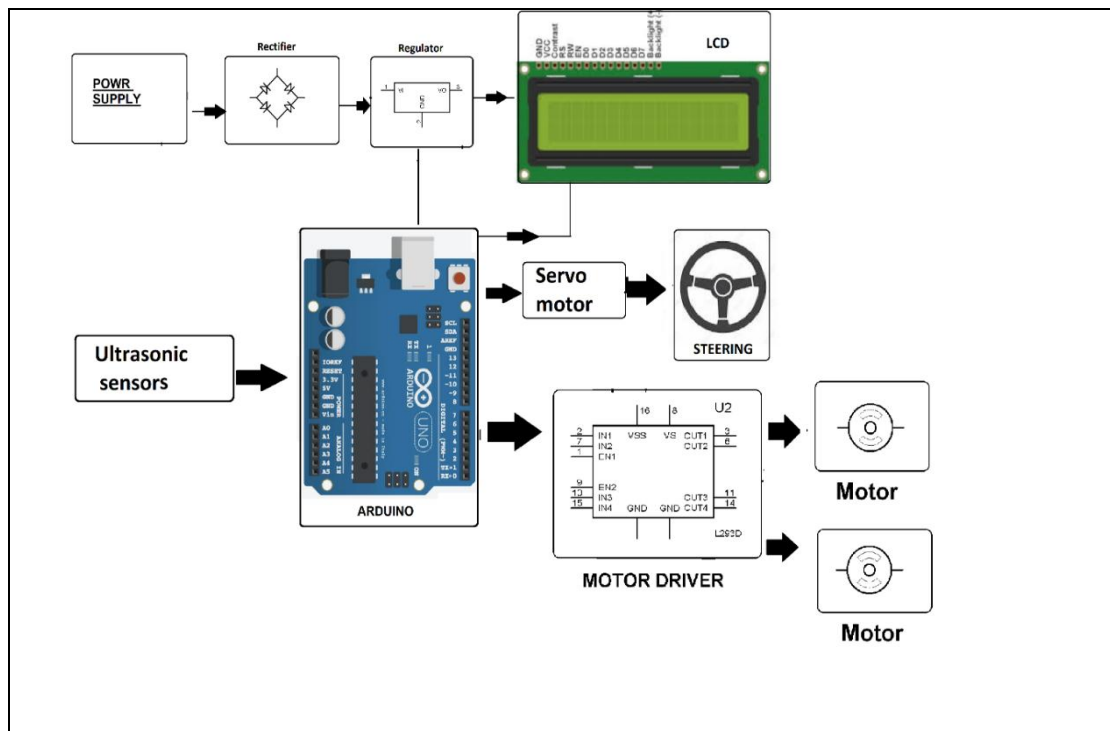


Figure 1: Functional Diagram of proposed system.

Figure 1 shows the functional components of the proposed system.

Following are the functional requirements for each of the components been used in the proposed model:

1. Arduino UNO
2. Infrared proximity sensor
3. LCD Screen
4. Servo Motor
5. Bread Board
6. Power Supply
7. Connecting Wires

Arduino UNO:

Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC-BY-SA license, while software is 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 from the official website or through authorized distributors.

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 ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the "Arduino language". In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool developed in Go.

The Arduino project began in 2005 as a tool for students at the Interaction Design Institute 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 Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

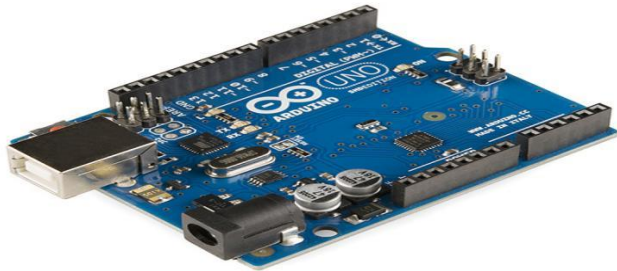


Figure 2: Arduino UNO Board.

Infrared proximity sensor:

1. A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact.
2. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.
3. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between the sensor and the sensed object.
4. Proximity sensors are also used in machine vibration monitoring to measure the variation in distance between a shaft and its support bearing. This is common in large steam turbines, compressors, and motors that use sleeve-type bearings.
5. A proximity sensor adjusted to a very short range is often used as a touch switch.

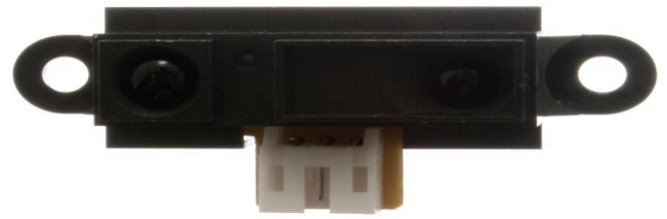


Figure 3: Infrared proximity sensor

ALCD: Alphanumeric LCD is used to display the messages which are sent by the controller whenever the gas leakage is detected or smoke value is above the threshold value .It's having 16*2 display pattern. Data pins were from D0 to D7.Each pin will able to display two characters. So two lines can able to display 32 characters. Each line will starts with different addresses, i.e. it starts with 0x8 or 0xC.



Figure 4: ALCD

Servo Motor:

1. A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration It consists of a suitable 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.
2. Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.
3. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing



Figure 4: Servo Motor

Flow Chart of smart car parking:

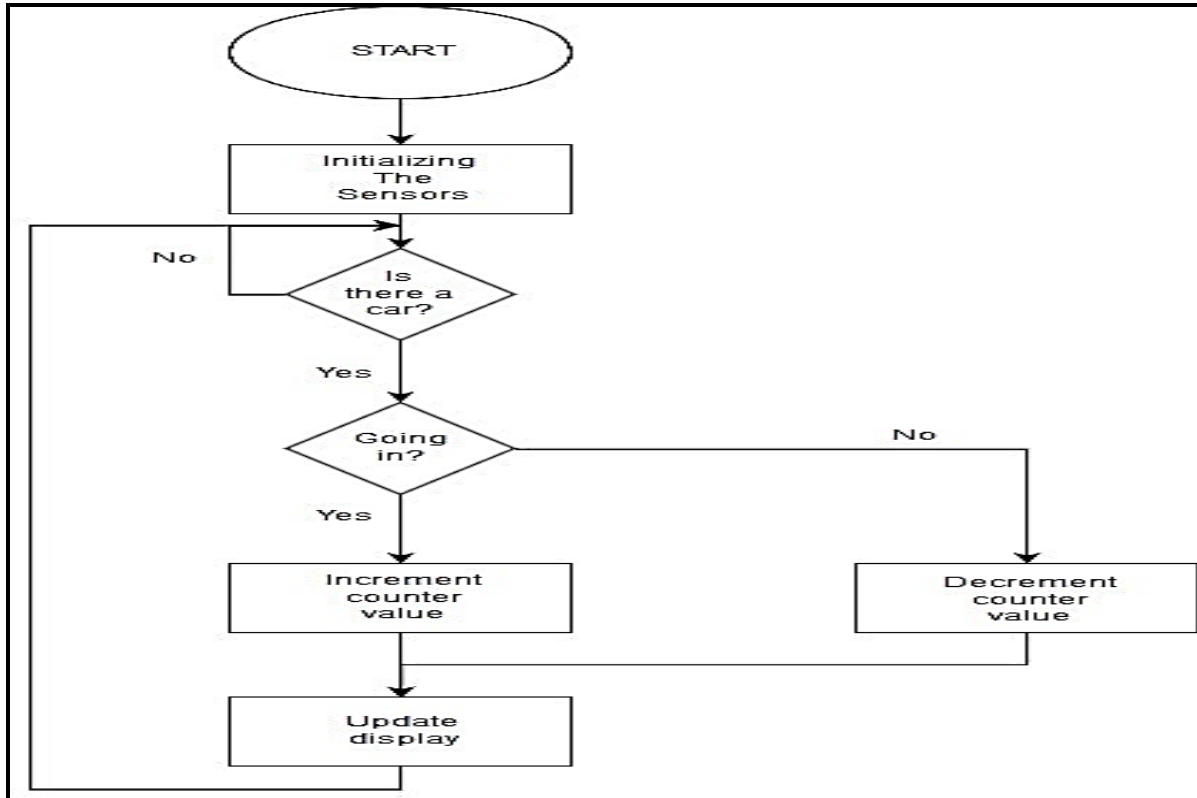


Figure 5: Flow Chart of smart car parking.

Step 1: System start.

Step 2: Initialize the system (sensors).

Step 3: If there is car, the car can enter in to the parking area by knowing the parking slots and parking vacancy information.

Step 4: If the car enters in to the parking area automatically counter value incremented. And the slot information also gets updates when the vehicle occupied a slot.

Step 5: If any vehicle exit from parking area then slots information also get updates when the vehicle vacated a slot from the parking area, and also automatically counter value decremented and both information reflected on the display unit.

Step 6: While exit and entry time the motor opens the gate automatically, depends on the vacancy information.

Step 7: Stop.

IV EXPERIMENTAL AND IMPLEMENTATION AND RESULT.

Schematics and circuit diagrams:

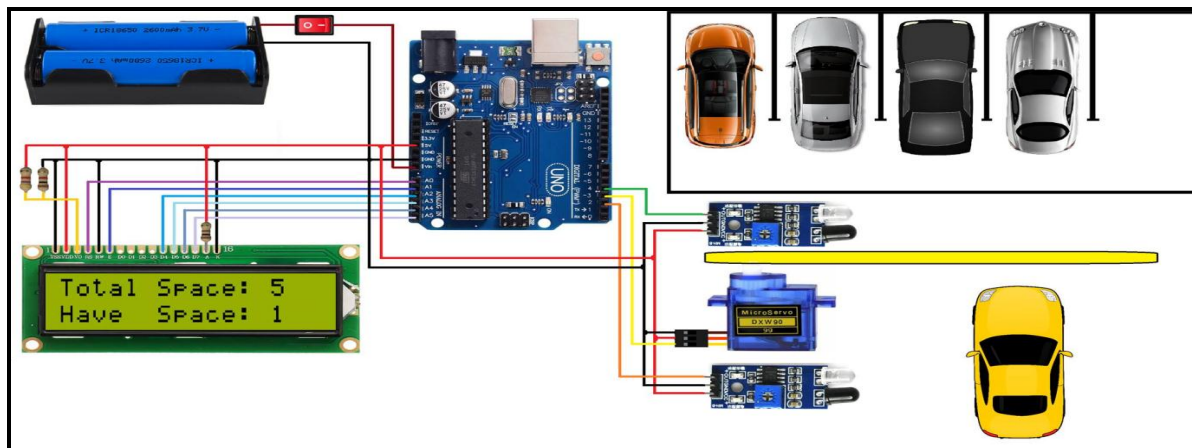


Figure 6: Schematic Diagram

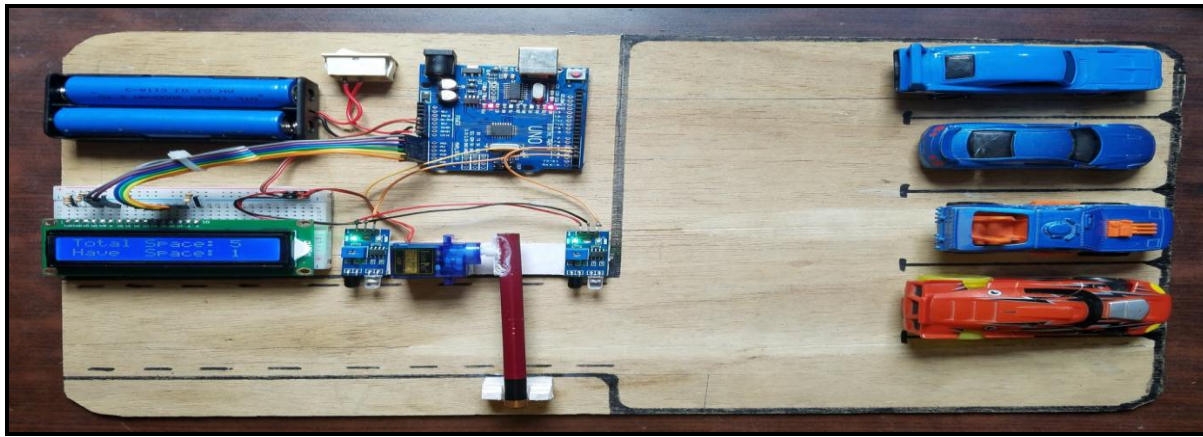


Figure 7: Prototype of Proposed System.

Step 1: Components/Parts

- Arduino - any board
- Infrared proximity sensor
- 330r resistor
- led display
- Servo motor - any model or size you wish.

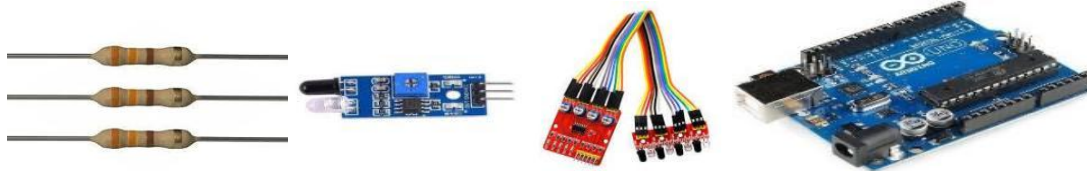


Figure 8: hardware parts of proposed system.

Step 2: Making the ALCD Display

- To make this LED display I have used a piece of breadboard then soldered the LED Display and the 330r resistor. Then just added a ribbon cable for nice finish.
- NOTE: I soldered the resistors on back so that they cant be seen from front to make the display.



Figure 9. ALCD connection

Step 3: Making the Parking Garage

- To make this I have used a card board box then cut it to make a nice slope. Then added a piece of cardboard on to the servo motor and hot glued it. Added one sensor on the entrance and another on each SLOT.
- Then hot glued two chopsticks with the display we have made and glue it to the box. And of course as we will use the USB cable of arduino to power the whole project cut some area of the box to access to that port.





Figure 10. Parking Area

Step 4: The Circuit

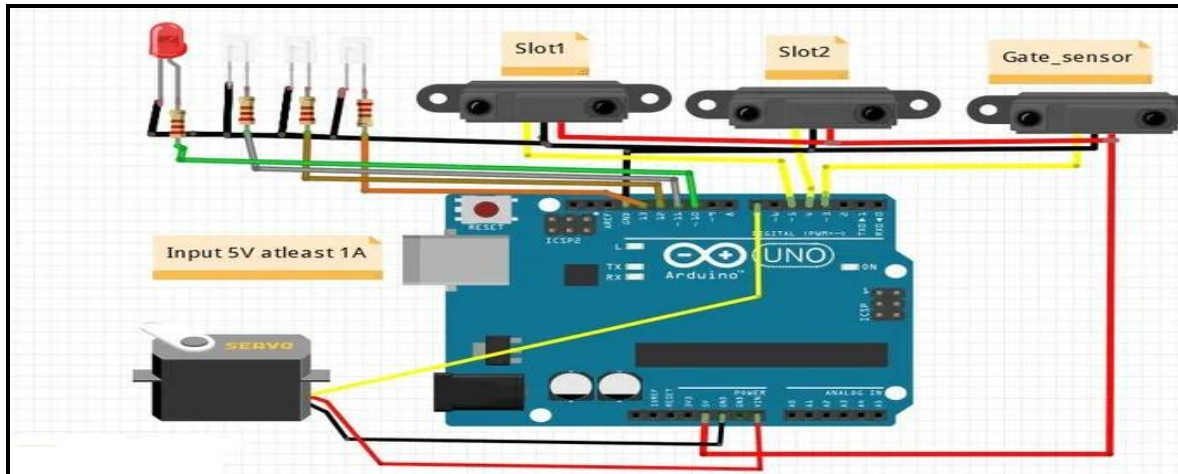
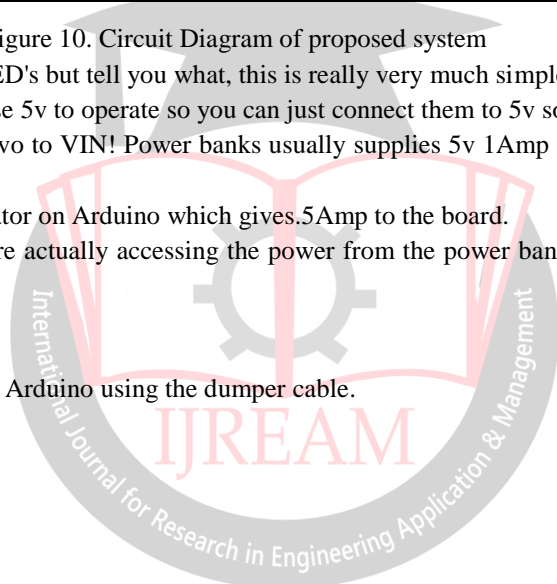


Figure 10. Circuit Diagram of proposed system

- It looks a bit mess for the LED's but tell you what, this is really very much simple circuit.
- NOTE: Proximity sensors use 5v to operate so you can just connect them to 5v source of Arduino.
- Why have we connected servo to VIN! Power banks usually supplies 5v 1Amp current which is input to Arduino via the USB cable,
- now there is a voltage regulator on Arduino which gives .5Amp to the board.
- By connecting to VIN we are actually accessing the power from the power bank without an breadboard. This works and safe.

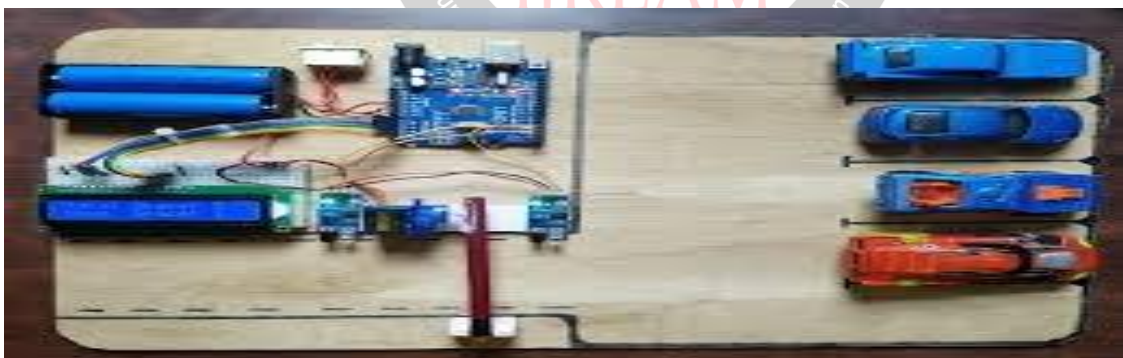
Step 5: The Code

Upload the following code to the Arduino using the dumper cable.



```
#include <LiquidCrystal.h>
#include <Servo.h>
Servo myservo;
int pos = 0;
LiquidCrystal lcd(2,3,4,5,6,7);
void setup()
{
  lcd.begin(16, 2);
  myservo.attach(9);
  pinMode(9, OUTPUT);
  pinMode(10, INPUT);
  pinMode(11, INPUT);
  lcd.print("Welcome");
}
void loop()
{
  if(digitalRead(10)==LOW){
    digitalWrite(9,HIGH);
    lcd.begin(16, 2);
    lcd.print("slot 1 is free");
    for (pos = 0; pos <= 90; pos += 1) { // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos);          // tell servo to go to position in variable 'pos'
      delay(25);                  // waits 25ms for the servo to reach the position
    }
    delay(5000);
    for (pos = 90; pos >= 0; pos -= 1) {
      myservo.write(pos);
      delay(25);
    }
  }else{
    digitalWrite(9,LOW);
    delay(10);
  }
  if(digitalRead(11)==LOW){
    digitalWrite(9,HIGH);
    lcd.begin(16, 2);
    lcd.print("No Slots Are Free");
  }else{
    digitalWrite(9,LOW);
    delay(10);
  }
}
}
```

Step 6: Finished



- ❖ Now give power to the project using a USB cable to arduino .

V 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 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 future.

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