# Smart Parking System Using Arduino Uno

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***Abstract*- With the increasing population the no of automobiles on the road are increasing hence the management of car parking has become one of the primary difficulties in the city.it is difficult to monitor and manage the parking slots in government and private sector has a result the goal of this study is the construct are smart parking system using Arduino Uno. We'll utilize an Arduino UNO, a servo motor, IR sensors, and an LCD display in this project. IR sensors detect vehicles entering and exiting parking lots and transmit a signal to Arduino; an LCD shows the number of parking spaces available. In the past, studies on how to structure parking systems were done. Smart parking systems, on the other hand, are still in demand and are attracting researchers' interest as a potential upgrade to meet modern needs and requirements. It is critical to monitor and manage vehicle access in government and private sector parking lots in order to improve the world's security system. As a result, the goal of this study is to create and construct a smart parking system employing mobile application technology. The created system can control allowed vehicle admission into parking areas while blocking unauthorized vehicles. Currently, smart parking or parking guidance systems just receive available parking spot information from deployed sensor networks and then simply distribute it to drivers.**

***Keywords***: **Arduino Uno, IR Sensor, Servo Motor.**

## 1. INTRODUCTION

With the rising Population in the world, time is of the essence and hence we need to minimize the time taken by the trivial activities such as finding a place to park in a busy place and avoid traffic congestion. Looking out for a vacant parking space in peak hours is often frustrating for people. We haveseen in the existing systems that sometimes accidents may occur in parking situations by cars going at high speed caused by the frustrated drivers unable to find a parking space for a long time. This in turn has made it more difficult for people to park their vehicles in crowded public places like restaurants& malls during peak hours. We burn around one million barrels of oil every day

In smart cities, there is a greater need for new and effective technology to tackle many of the problems that are visible on the surface, as well as to makecities less crowded. Finding a parking spot is one of the most aggravating issues for drivers. Particularly in public venues such as shopping malls, 5-star hotels, and multiplex cinema halls. Even within the park, drivers waste time and fuel hunting for a spot to park their cars. This will damage the driver emotions as well as pollute the environment while searching for a parking spot. In this study, we create and design a smart parking systemthat effectively addresses these issues.

## II. OBJECTIVES and SCOPE OF THE PROJECT

1. To reduce the time and increase the efficiency of the current parking Management system.
2. Detect the empty slots and assist the driver in finding the parking in a parking area.
3. To decrease the human interference in managing the parking by proposing remote parking monitoring and automated guidance which will help to save a lot of time.

Finding Vacant Spaces Is Difficult, finding an empty place in a multilevel parking garage quickly is difficult, if not impossible, especially on weekends or during public events. For almost 66 percent of customers, finding places at the end of the week or during open events can take more than 10 minutes. At peak times, stadiums and shopping centers are swamped, and clients have a difficult time finding empty spaces in these locations. Inadequate automobile parking spaces cause activities to be stifled and drivers tobe dissatisfied. We can get around this by utilizing Smart Parking Assistance

As the cost of gasoline continues to rise, drivers will do all possible to conserve energy in their vehicles. They must wait a long time at the entrance gate during busy hours before finding an empty parking space. As a result, users will waste time and energy looking for a spare area.

Last but not least, the main problem with the parking system is the lack of available parking places. This could be due to developers poor planning of the areas. Aside from that, the user-friendly system lacked useful information

## III. BLOCK DIAGRAM AND DESCRIPTION

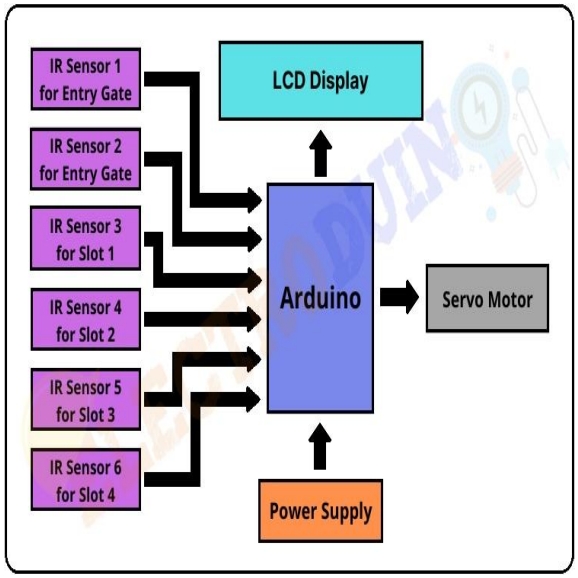


**Fig1. Block Diagram**

Fig. 1 The system deals with monitoring and controlling the traffic congestion and parking space with the use of Smart Parking System using Internet of Things. The current smart parking systems is parking guidance systems only obtain the availability information of parking spaces from deployed parking sensors network and simply publish the parking information to direct drivers.

## IV. HARDWARE COMPONENTS

A System Requirements Specifications (SRS) is a specification for a software system which gives the complete behavioral description of the system to be developed. It is comprised of use cases which describes all the interactions of the user with the software. Along with the use cases, it also contains functional & non-functional requirements.

- Arduino UNO
- Infrared Sensor
- Servo Motor
- Bread Board
- Jumper Wires
- Battery

### a) ARDUINO UNO

**Fig2. Arduino UNO**

The above figure 2 shows Arduino UNO board. The Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Liquid Crystal Display and motor. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via type B USB cable. It can be powered by the USB cable or external 9-volt battery, though it accepts voltages between 7 and 20 volts.

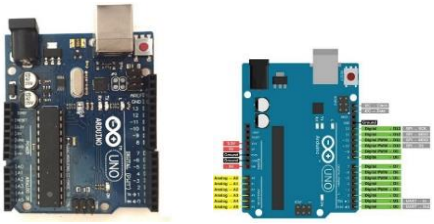

**Fig 3. Arduino UNO Pin Diagram**

b) **INFRARED SENSORS**

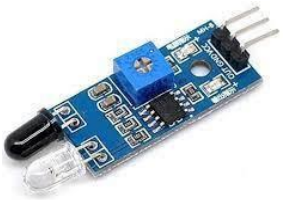

**Fig 4. IR Proximity Sensor**

The above figure 4 shows IR Proximity Sensor.IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations. The emitter is simply an IR LED (Light Emitting Diode) & the detector is simply an IR photodiode. Photo diode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photo diode, the resistances & the output voltages will change in proportion to the magnitude of the IR light received.

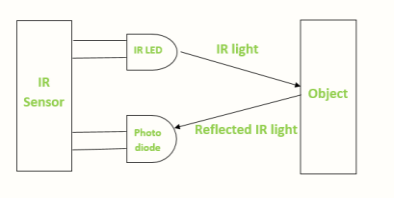


**Fig 5. Working Principle of IR Sensor**

**c) SERVOMOTOR**

**Fig 6. Servo Motor**

The above figure 6 shows Servo Motor. A servomotor is a linear or rotatory actuator that permits exact control of angular or linear position, velocity, and acceleration. It is made comprised of an appropriate motor and a position feedback sensor. It also necessitates a complex controller, which is frequently a separate module created exclusively for servomotors. Although the term servomotor is typically used to refer to a motor appropriate for use in a closed loop control system, it is not a specific type of motor. Stepper motors have some inherent capacity to regulate position, as they have built-in output steps. Servomotors are often employed as a high-performance alternative to the Because their driving signal specifies the number of steps of movement to rotate, they may often be utilized as an open-loop position control without the necessity of a feedback encoder however, the controller must & the position of the stepper motor on power up in order to do so. As a result, when the controller initially turns on, it must activate the stepper motor and turn it to a known point, such as until an end limit switch is activated. When an ink jet printer is turned on, the controller will shift the ink jet carrier to the far left and far right to set the end locations. Regardless of the original position at power up, a servomotor will instantaneously pivot to whatever angle the controller commands position, such as until an end limit switch is activated. position at power up, a servomotor will instantaneously pivot to whatever angle the controller commands.

**d) BREADBOARD**

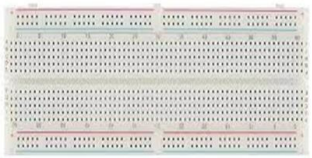

**Fig 7. Breadboard**

The above figure 7. shows Bread Board. A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronics components in electronic circuits can be interconnected by inserting their leads or terminals in to the holes and then making connections through wires where appropriate. The breadboard has strips of metal underneath the board and connects the holes on the top of the board. The metal strips are laid out as shown below. Note that the top bottom rows of holes are connected horizontally and split in the middle while the remaining holes are connected vertically.

**e) JUMPERS**

**Fig 8. Jumpers**

The above figure 8 shows Jumper Wires. Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points 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. Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female.
The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are use things into. Male-to-male jumper wires are the most common and what we likely will us most often. When connecting two ports on a breadboard, a male-to-male wire will be needed.

**f) BATTERY**


**Fig 9. Battery**

The above figure 9 shows Battery. The nine-volt battery, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts, depending on battery chemistry. A nine-volt battery, either disposable or rechargeable, is usually used in smoke alarms, smoke detectors, walkie-talkies, transistor radios, test and instrumentation devices, medical batteries, LCD displays, and other small portable appliances.

**g) LCD DISPLAY**

A liquid crystal display, or LCD, gets its name from its definition. It is made up of two different states of matter: solid and liquid. A liquid crystal is used to create a visible image on an LCD. Liquid crystal displays(LCDs) are ultra-thin display screens that are commonly seen in laptop computers, televisions, cell phones, and portable video games. When opposed to cathode ray tube (CRT) technology, LCD technology allows for significantly thinner displays. Two polarized panel filters and electrodes are among the components that make up a liquid crystal display. LCD technology is utilized in notebooks and other electronic devices such as small computers to display images. A lens projects light onto a layer of liquid crystal.

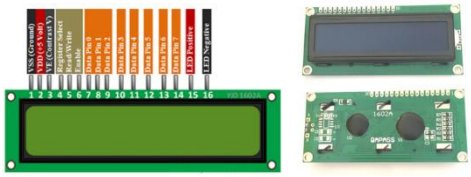

**Fig 10. LCD pin Configuration**

Rather than emitting light, the liquid crystal display screen works on the idea of blocking light. Because LCDs do not emit light, they require a backlight. We constantly utilize devices with LCD displays, which have replaced the use of cathode ray tubes. In comparison to LCDs, cathode ray tubes consume more energy and are also heavier and larger.

**Features of 16×2 LCD module**

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is built by a 5×7-pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

## V. SOFTWARE COMPONENTS

The Arduino programming language is used to program microcontroller boards such as the Arduino Uno to interact with sensors, actuators, and other devices connected to the board. In fact, the language is based on C++. The Arduino Integrated Development Environment - or Arduino Software (IDE) - connects to the Arduino boards to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved.
Arduino Uno is a microcontroller board, developed by Arduino.cc, based on the Atmega328 microcontroller and is marked as the first Arduino board developed (UNO means "one" in Italian).
The software used for writing, compiling & uploading code to Arduino boards is called Arduino IDE (Integrated Development Environment), which is free to download from Arduino Official Site.


**Fig 11. Arduino UNO**

## VI. RESULT

There are fewer available parking spaces. Smart Parking System solve the problem of finding an available spot by providing drivers within formation about available pots near them. Our results depend on the output of the LCD display. In this project we use two IR sensors .4.1 shows the scenario of occupied slots. When the parking space is full, the gate will not open even if the sensor senses the vehicle and it will be displayed in the LCD display

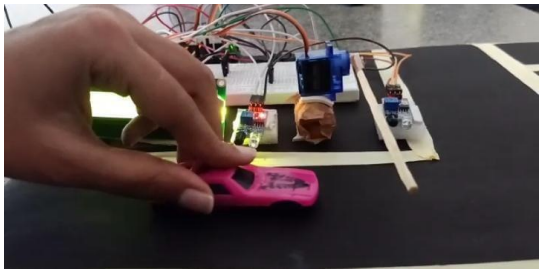

**Fig 12. When Parking is full**

The below figure 12 shows the empty parking slots. When the parking space is empty, the count value in the display will be less than 4 as we have designed it for 4 parking spaces. The sensor senses the vehicle and the gate will Open.

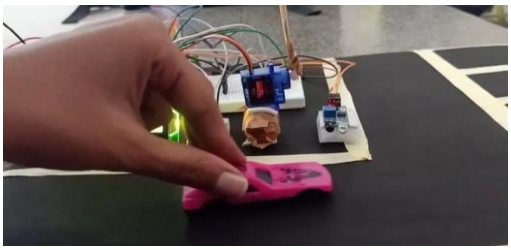

**Fig 13. When Parking is Empty**

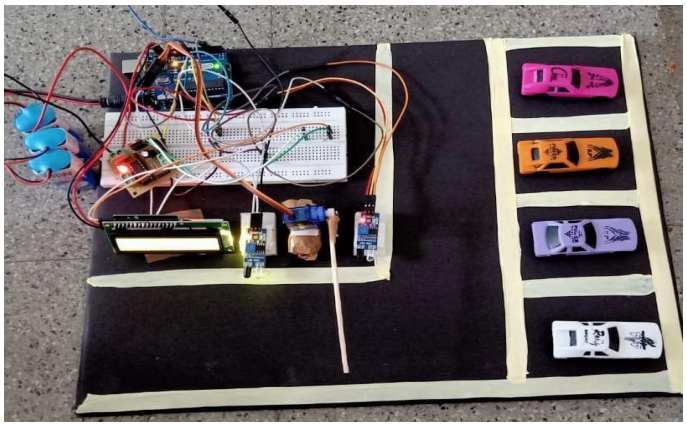

**Fig 14. Final Circuit design**

## VII. CONCLUSION

In this project we are going to monitor how the vehicles are being parked using smart parking system. This project focuses on implementation of car parking place detection using Internet of Things. This system benefits of System parking go well beyond avoiding time wasting. Developing a Smart parking solutions within a city solves the pollution problem. The main contribution of the study is to introduce the significant parking problem- i.e., finding an empty slots- and propose a solution .IR sensors can be used parking space detection. The proposed for a parking detection system would decrease searching time for vacant spaces and reduce instances of single cars improperly parking across two spaces. Future research might examine car park booking procedures and optimization of sensor usage. Cost effectiveness and marketing could be studied as well.

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. It helps store solve the growing problem of traffic congestion.

## VIII. FUTURE SCOP

1. 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.
2. IoT has many different applications, but one of the most exciting is its use in smart parking. IoT-based parking systems are able to better track the availability of parking spots on a given lot, making it easier to find an available parking spot.
3. It is important to note that not all IoT-based parking systems are the same. For example, some use QR codes to identify available parking spots, while others use sensors to detect when a car leaves a parking spot. The benefits of an IoT-based smart parking system that it is more creative, efficient, and convenient for both drivers and owners of the parking lot.

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