

Smart Parking System using IOT

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Abstract—In recent years, many parts of the city have experienced an increase in the number of visitors and residents due to urban development, expanding transportation services and increasing social networks. For this reason, there is an increase in the number of vehicles on the roads and parking space is not enough parking spaces. This highlights the need for effective park management. We can use IoT technology for the parking management which provide a reliable service to people looking for parking in many places with computer systems. In this environment, IoT connects physical stations to information and communication technologies to facilitate cloud-based intelligent management. The app will allow users to check parking availability and book a specific parking space accordingly. Each car park will be equipped with a management system that tracks locations and locations, and the app will provide instant updates on the car park's status (open, location available or closed). In addition, the application will display parking fees according to parking duration and will be able to detect the arrival by allowing users to view parking spaces online from anywhere easily. Finally, the system effectively solves the parking problem in the city.

Keywords—Smart parking, IoT, mobile apps, parking space sharing, on-time payment & online payment options.

I. INTRODUCTION

The Internet of Things (IoT) is the network of physical items, such as vehicles and household appliances, that are connected and capable of communicating with one another through

actuators, software, and electronics. IoT technology joins the larger class of cyber-physical systems—which also includes smart grids, smart homes, intelligent transportation, and smart cities—when it is paired with sensors and actuators. This makes it possible to sense and operate items remotely over the current network infrastructure, creating prospects for a more direct integration of the physical world into computer-based systems that will increase economic value, efficiency, and accuracy. Not only can everything be uniquely identified by its embedded computer system, but it can also function with the existing Internet infrastructure.

Applications related to the Internet of Things include smart parking systems. The first version of this technology was

released in 1999. More specifically, an assortment of objects or things that can be linked to each other via wired or wireless connections is referred to as the Internet of Things (IoT).

Through communication between these components, new services, and even apps can be developed. The number of cars on the road is increasing every day because of economic growth and population growth. Parking is one of the biggest problems cities face nowadays, and it's becoming very pricey. Finding a parking spot, for instance, might be challenging when working. Searching for a spot in a parking lot irritates users more.

To address this problem, several parking guidance systems that seek to enhance the basic parking system have recently been put out. For each method, there must be a way to figure out whether a car is in the parking area. The person may register for a parking space to park his or her vehicle. There is a time limit and a unique ID generated for every user who enrolls. The system will calculate the vehicle's in and out times while it is parked and deduct the amount from their account.

II. PROBLEM STATEMENT

Improper management of parking spaces. Sometimes, users must drive around to find an open spot, which causes traffic jams when more cars enter the parking lot.

III. COMPONENTS AND WORKING

A. Component used.

- Arduino Uno
- Breadboard
- Infra-Red Sensor
- I2C Display
- Servo Motor
- Jumper Wires

1) *Arduino Uno*: The Arduino Uno is free-source microcontroller board that was created by Arduino.cc and first made available in 2010. It is based on the Microchip ATmega328P microprocessor. Sets of digital and analog input/output (I/O) pins on the microcontroller board allow it to be interfaced with different expansion boards (shields) and other circuits. Using a type B USB cable and the Arduino IDE, the board's include 14 digital and 6 analog I/O pins that can be programmed. Either a USB cable or a barrel connector that can handle voltages between 7 and 20 volts can power it. It contains 1 KB of EEPROM, 32 KB of flash memory, and 2 KB of SRAM memory.



Fig 1. Arduino Uno SMD R3

2) *BreadBoard*: A protoboard, often known as a solderless breadboard, is a development platform used to build semi-permanent models of electronic circuits. Unlike a perfboard or stripboard, which need to have their tracks patched or ground up, breadboards can be reused. Because of this, breadboards are far too common in inventive education and with understudies. With breadboards, a wide range of electronic systems, from tiny analog and digital circuits to entire central processing units (CPUs), can be prototyped.



Fig 2. Breadboard

3) *Infra-Red Sensor*: An infrared sensor is an electrical device that uses light emission to identify objects in its environment. It has the ability to measure an object's heat emission as well as its velocity. The majority of objects produce thermal radiation in the infrared spectrum, which is observable by an infrared sensor but undetectable to the human eye. An IR LED serves as the emitter and an IR photodiode serves as the detector in an infrared sensor. When the LED emits infrared light, the photodiode reacts by changing resistances and output voltages in accordance to the intensity of the infrared light that is received. A standard infrared detection system comprises five fundamental components: an infrared source, a transmission medium, An

infrared source, a transmission channel, optical elements, infrared detectors or receivers, and signal processing are the five basic parts of a typical infrared detection system. Infrared sources are infrared lasers or LEDs with a certain wavelength. The three primary transmission mediums are vacuum, optical fibers, and the environment. Optical components are employed to focus infrared radiation or limit spectral response.

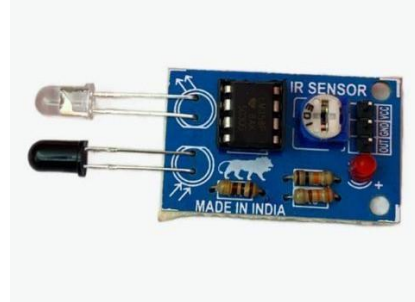


Fig 3. IR Sensor

a) *IR Transmitter or IR LED*: An IR LED or Infrared Transmitter, which emits infrared radiations that are invisible to the human eye. While it may appear similar to a regular LED, the light it emits falls outside the visible spectrum.



Fig 3.1. IR Transmitter

b) *IR Receiver or Photodiode*: An Infrared Transmitter, also known as an IR LED, emits infrared radiation that are not seen by naked eyes. While it is seen like a regular LED, the light which is emitted by it falls outside the visible spectrum.



Fig 3.2. IR Receiver

4) *I2C Display*: A popular communication protocol for graphic character, segment LCD is the I2C display interface. An LCD controller and a display module are the typical components of an I2C display system. Two wires are used for communication: a clock line and a data line



Fig 4. I2C Display

5) *Servo Motor*: It is a rotary actuator enabling precise control over angular position. It comprises a motor paired with a position feedback sensor. Additionally, it necessitates a servo drive to function effectively. The drive utilizes feedback from the sensor to accurately regulate the motor's rotary position.



Fig 5. I2C Servo Motor

6) *Jumper Wires*: Jumper wires are electrical wires that connect different electronic components and circuit boards without soldering. People often use them in breadboards and Arduino projects for prototyping and testing circuits. Jumper wires come in male-to-male, male-to-female, and female-to-female types. This variety allows for flexible connections between sensors, displays, microcontrollers, and other devices. In the smart parking system, jumper wires link the Arduino Uno, IR sensors, I2C display, servo motor, and breadboard. This setup ensures proper communication and power transmission among all components.



Fig 6. Jumper Wires

B. Working

The basic idea behind the smart The smart parking system works on the simple principle of identifying obstacles and providing visual feedback. The infrared sensor is present on each parking space lot which consist of infrared emitter and receiver. The IR emitter emits infra-red rays, and these rays generally bounce off objects. The IR receiver receives these rays and converts them into electrical signals. With the help of these electrical signals, we can know whether the parking lot is empty or occupied which was displayed on the screen. A servo motor is used to maintain the one-to-one entrance and exit of the vehicle, and this is done by IR sensor which is connected to it.

Case 1: When the parking space is empty, the ray emitted by the IR transmitter does not bounce back an object is not detected, and the IR receiver does not give any feedback which result in the availability of parking slot which will be displayed on the screen.

Case 2: When the parking space is occupied, the ray emitted by the rays emitted by the IR transmitter is bounced back from the height of the vehicle, and the feedback will be received by IR receiver.

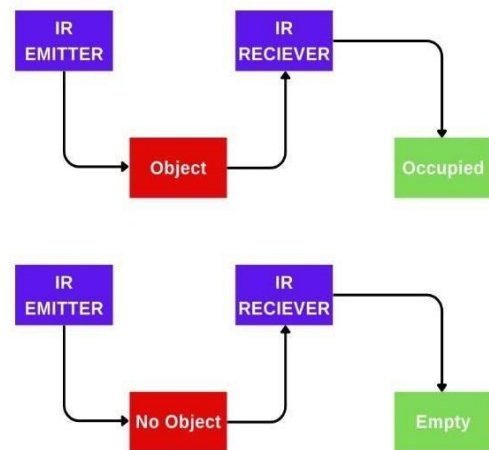


Fig 7. Working block diagram

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