



## SMART PARKING LOT USING IOT AND WEB DEVELOPMENT

**Ch. Aparna, G. Ashwitha Reddy, M. Amruth Raj**

Department of Computer Science Engineering  
St. Peter's Engineering College  
Hyderabad, India

**K. Anil** (Assistant Professor)

Department of Computer Science & Engineering  
St. Peter's Engineering College,  
Hyderabad, India

### ABSTRACT

Intelligent Transportation Systems have been constantly evolving as an important topic to research in recent times, changing the total traveling and traffic experience by implementing a few advanced services and applications. These services try and contribute to mitigating the major problems that arise from the increasing need for transportation in our lives. Despite the progress that has been made, there is still a need for advanced and distributed solutions that can use the data that is available in systems to provide a real-time service or an application on parking systems. Therefore, in this presentation, we are going to present a new structure with distributed intelligence, and decentralized decisions. The proposed structure is scalable and deployed to tackle the problem arisen due to inefficient traffic management in parking lots, where traffic load is increasing substantially, by vehicles moving around with no proper destination, in an endless search for free parking spots. This web application can help in significantly reducing through the availability and diffusion of the information regarding vacant parking spots to users in a given parking lot.

### I. INTRODUCTION

Smart Parking Lot is a web application that uses the Internet of Things to find and display the data obtained about the parking area. There has been immense traffic in the parking areas because of the difficulty finding a vacant parking slot. The drivers roam around randomly, searching for any vacant parking slots for their vehicles.

There are a few IoT-based implementations to improve the parking experience which fail to deliver accurate results, and a virtual map of the parking lot to improve the tracking of vacant parking slots. This implementation gathers data using the IoT sensors and processes that data and displays it onto a webpage in the form of a virtual map which makes it easier for the user to track the vacant and non-vacant parking slots.

This software brings a completely smooth and understandable user interface with the virtual map of the automobile parking space with entry, exit, vacant, and non-vacant parking spots for the person spots for the user to understand the location of the vacant parking spots.

### II. IMPLEMENTATION

This project is implemented as a web application that uses IoT sensors to detect the data from the parking lot. The different types of equipment used to implement this project are IR sensors, Arduino UNO, LCD I2C Display 16x2, ESP-01, and Jumpers for Hardware Implementation. And to implement the Software implementation, the technologies used are Arduino IDE, My SQL, and Front End Technologies.

### A. Hardware Implementation:

#### 1. IR Sensors:

IR sensor modules consist of a receiver, transmitter, and two LED lights. The IR transmits a ray within the range of its frequency. If the ray detects any obstacle in between the ray is received by the receiver.

#### 2. Arduino UNO:

It is a microcontroller board. It is one of the most popular microcontroller boards used to create IoT projects. It has 14 digital pins which can be used to connect sensors such as IR, Ultrasonic, Humidity, Motion, etc. It also provides voltage for these sensors. This Arduino UNO is used to connect the IR Sensors in this project. The data that is obtained by IR sensors is processed by Arduino UNO.[1]

#### 3. LCD I2C 16x2 Display:

An LCD I2C Display is an output communication interface for the Arduino UNO. It connects to the Arduino UNO and displays the data that has been obtained by the IR sensors.[2]

#### 4. ESP-01:

An Esp-01 is a wifi module that connects to a microcontroller board. It is connected to the Arduino UNO. It provides Internet to the Arduino UNO board by connecting to a Wifi source. This helps us transfer the data obtained by the IR sensors to the database.[3]

#### 5. Jumpers:

These are small wires with input pins that help us connect the sensors to the microcontroller board.

## 6. Bread Board:

It is a solderless device used to making connect the electronic equipment parallelly or serially using jumper wires.[4]

## B. Software Implementation:

### 1. Arduino IDE:

Arduino IDE is an application used to write code using C and C++ functions to upload on Arduino compatible boards and some third-party cores. In this project, Arduino IDE was used to write a code to process the data obtained by IR sensors and display it on the LCD display. It was also used to connect ESP-8266 ESP-01 to an existing WiFi network to transfer the data to a database.[5]

### 2. My SQL:

My SQL is an open-source Database Management System. It is used to manage the data that has been sent by the Arduino UNO using ESP-01. The data is displayed on the web page.[6]

### 3. PHP:

It is a scripting language used to manage database and web technologies. PHP is used in this project to retrieve the data from the database and post it on the webpage.[7]

### 4. Front End Technologies:

Front End technologies are very essential for this project. It is the ultimate source to showcase the output obtained. The front-end technologies used in this project are HTML5, CSS, and JavaScript.

HTML5 is a markup language used to give a simple outline to the web page.

CSS3 is a styling language that is used to provide different styles for an HTML web page.

JavaScript is an advanced web development language. It is used to add advanced events to a web page.

The ultimate goal of front-end technologies is to display the obtained data in a neat and easy user interface.[8]

### 5. 000WebHost:

000WebHost is a free web hosting service. They provide space on a server for the clients for a limited amount of time. This is used to host the website onto the internet.

## III. WORKING MODEL

This project has been implemented as a website that obtains data from IoT sensors. The website has been hosted on the internet. The working of this project starts with the IR sensors that are placed in each parking slot that detects if a vehicle is obstructing its infrared ray or not. The IR sensor sends the data input to Arduino UNO. The Arduino UNO processes this data and displays it on the LCD I2C 16x2 display that is located in the parking lot physically. Then it also sends this data to a database using the WiFi module. The data that has been sent to

the database is further sent to the webpage.

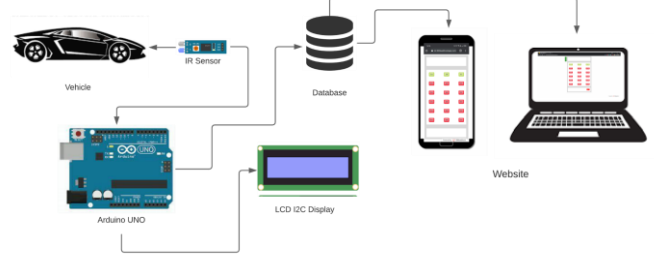


Fig 1. Workflow of Smart Parking Lot

Finally, the web page displays the output that has been collected by the IR sensors in the form of a virtual map which makes it easier for the users to track the vacant and non-vacant parking slots.

## IV. OUTPUT

When any user tries to open the website, the website displays the vacant parking slots that are currently available in the parking lot.

The images that are given below show the input that is taken and the output that is shown on the website.

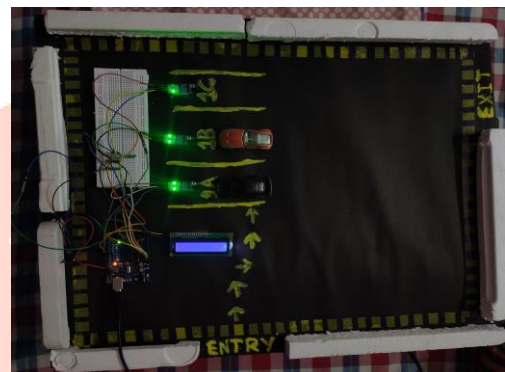


Fig 2. Input is taken in the Parking lot



Fig 3. Output displayed on the LCD Screen

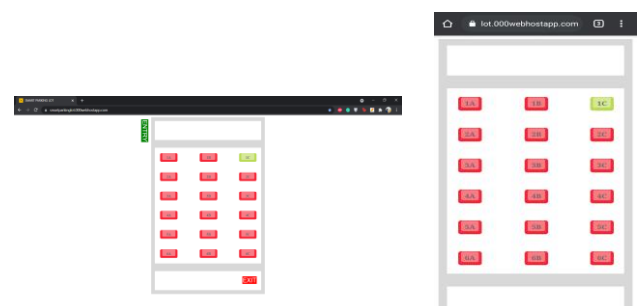


Fig 4. Website on Personal Computer and Phone

Fig 2. consists of the plastic model of the parking lot. Fig 3. consists of the output displayed on the LCD Screen in the Parking area. Fig 4. consists of the output displayed on the website on both Personal Computer and mobile phone respectively.

## V. SUMMARY

Smart Parking Lot is an integration of both web development and the Internet of Things which helps in resolving the real-time difficulty in finding an empty parking slot in a parking lot. This project provides accurate results with an easy and understandable user interface which is very helpful for the users to track vacant and non-vacant parking slots.

This is achieved by implementing IR sensors in every single parking slot, which emits infrared rays to check if any vehicle is obstructing its wave. This data is sent to the Arduino UNO which processes the whole data and displays the data onto the LCD I2C display. This data is also sent to the virtual database with the help of a WiFi module. Then this data is used to display onto the website in the form of a virtual map of the parking lot.

## VI. CONCLUSION

Smart Parking Lot proposes an idea that is very economic and easy to implement. There has been a lot of increase in the traffic in the urban area. This traffic can be caused due to many reasons such as improper management of traffic, difficulty in finding a slot for parking, not following rules, etc.

The reasons such as improper management and not following rules have been slowly improving due to the stricter rules that are being implemented by the traffic police. But, there are many few measures taken to reduce the traffic that is arisen due to not finding a parking slot for the vehicle. This makes it very hard to manage traffic at public places such as Movie theatres, restaurants, shopping malls, etc.

This project focuses on reducing the problems arising due to improper management in a parking lot in these public places mentioned above. This project provides an implementation plan that is economical and easier to implement in the parking lots that have already been built. It also provides faster and accurate results which makes it a feasible solution to reduce the traffic that is arising due to mismanaged parking lots.

## VII. REFERENCES

- [1] Hernando Barragán (2016-01-01). "The Untold History of Arduino". *arduinohistory.github.io*.
- [2] Vasquez, Joshua (2017-08-16), *Taking the leap off board: An introduction to I2C over long wires*.
- [3] Brian Benchoff (September 6, 2014). "The Current State of ESP8266 Development". Hackaday.
- [4] U.S. Patent 3496419. Archived 2018-01-23 at the Wayback Machine: "Printed circuit breadboard",
- [5] Jean-Luc Aufranc (2021-03-03). "Arduino IDE 2.0 beta released with live debugger, revamped user interface". *crx-software.com*.
- [6] Basil, Tom (4 September 2001). "Eyewitness account: "Monty Widenius, International Fugitive"". *MySQL Life* (Mailing list). Archived from the original on 4 October 2013.
- [7] Merchant, Amit. "These new string functions are coming in PHP 8". *Amit Merchant*.
- [8] Codesido, Ivan (28 September 2009). "What is front-end development?". *Theguardian.com*.

