

ENHANCED PARKING SYSTEM

Mitushi Matiman¹, Harsha Gupta², Sneha Prajapati³, Alok Singh Gaur⁴

Department of Information Technology

^{1,2,3,4}Pranveer Singh Institute of Technology, Kanpur, India

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Corresponding author: Mitushi Matiman

Abstract

With the rapid proliferation of vehicle availability and usage in recent years, finding a vacant parking space is becoming more and more difficult, resulting in several practical conflicts. Consistent efforts are being made in the field of IoT to maximize productivity and reliability in urban infrastructure. As the Internet of Things (IoT) plays a vital role in connecting the surrounding environmental things to the network and made it easy to access it from any remote location. Problems such as traffic congestion, limited car parking facilities, and road safety can be addressed by IoT. As congestion of traffic level increases with the increasing development of the population rapidly. Concerning the amount of population, the utilization of personal vehicles also increased. Due to more use of cars the traffic congestion occurred on the road. It is very difficult and time consuming to find parking space in most metropolitan areas, commercial areas, especially during the rush hours. It is often costly in almost every big city in all over the world to find a proper and secure parking space. In this paper, we present an IoT based smart parking system with an android application. 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 each single parking space. A mobile application is also provided that allows an end-user to check the availability of parking space and book a parking slot accordingly.

Keywords: Smart Parking System, IoT, Android application

INTRODUCTION

In recent researches parking became a problem of the day to day life. This results in an annoying issue for the drivers to park their vehicles as it is very difficult to find a secure parking slot. The drivers usually waste time and effort in finding parking space and end up parking their vehicles on the streets. In the worst case, people fail to find any parking space especially during peak hours and festive seasons. The paper "Smart Parking System by IoT and android"[1] is an intriguing automated technology that incorporates the use of the embedded system, sensors, Arduino, Android, and the Internet of things. The main motivation of this paper is to reduce the traffic jam that occurs in the urban areas which are caused by vehicles searching for parking as well as reducing the manual effort at the parking places.

As a quote says "why walk when driving" that is when the journey on wheels started and which has created hard ongoing problems to park vehicles into parking slots. In urban cities as the population is going on increasing the production of vehicles has also increased but parking space available has become congested to park N number of vehicles out of that people are finding it a great problem to search the available space during peak hours and festive times which consumes a lot of energy and waste valuable time which is a major drawback, to replace the above issue. Internet of things was first introduced in 1999 at the auto-ID center and first used by Kevin Aston. As evolving this latest burning technology, it promises to connect all our surrounding things to a network and communicating with each other with less human involvement. Still, the internet of things is in the beginning stage and there is no

common architecture exists till today. There are a lot of researches and implementations are currently being going on in all the respective areas.

Thus there are no guidelines or boundaries that exist to define the definition of the internet of things. So depending on the context, application the internet of things has different definitions. Shortly it is defined as the things present in the physical world or an environment are attached with sensors or with any embedded systems and made connected to a network via wired or wireless connections. These connected devices are called as smart devices or smart objects. And it consists of smart machines that communicating with other machines, environments, objects, etc. And also it incorporates connecting any two machines, machine to human and vice versa, etc. IoT technology grows in various fields of smart applications but we have not yet found boundary constraints of this technology. This is broadly classified into three categories such as sensing, processing, and connecting. Whereas sensing includes sensing the speed of vehicles and humans or any objects (accelerometer), sensing of temperature, pressure, etc. And these can be processing by using some processors such as network processor, hybrid processor MCU/MPU, etc. And the devices are connected by using some technologies called GPS, Wi-Fi, BT/BTLE, RFID, etc.

LITERATURE REVIEW:

The development and high growth of the Internet of Things have improved quality of life and strengthened different areas in society. Many cities worldwide are looking forward to becoming smart. One of the most popular use cases in smart cities is the implementation of smart parking solutions, as they allow people to optimize time, reduce fuel consumption, and carbon dioxide emissions. Some parking solutions have a defined architecture with particular components(sensors, communication protocols, and software solutions). Although there are only three components that compose a smart parking solution, it is important to mention that each component has many types that can be used in the deployment of these solutions. This identifies the most used types of every component and highlights usage trends in the established analysis period. It provides a complementary perspective and represents a very useful source of information. The scientific community could use this information to decide regarding the selection of types of components to implement a smart parking solution.

Cloud-Based Smart Parking System based on Internet of Things[2]:

This paper provides a unique algorithm that increases the capability of the current cloud-based smart parking system and it develops a network architecture based on the Internet of things technology. This system helps the user to find a free parking space with minimal cost based on new performance metrics which is automatic. These metrics will calculate the user spaces in each car park. To enhance parking management, an intelligent parking system was developed which reduced the purpose of hiring people to maintain the parking system.

This will provide a better performance, low cost includes resource allocation mechanism, provide a larger scale parking system.

Smart Routing[3]: A Novel Application of Collaboration Pathfinding to Smart Parking Systems:

Smart Parking System guides the drivers to find available parking spaces to avoid increasing parking issues. A-star pathfinding algorithm is been implemented to trace multiple users concurrently while taking into account one another's nearest distance to the parking area in their respective routes.

It improves the efficiency of smart parking systems.

It reduces traffic congestion in the metropolitan environment while increasing the efficiency of parking areas.

A New “Smart Parking” System Based on Optimal Resource Allocation and Reservations[4]:

In this system, a new smart parking system is implemented for cities. This system assigns and reverses a parking space for a user based on the user distance from the parking area and parking cost and also ensures that the overall capacity is effectively utilized. Their approach solves a Mixed Integer Linear Program at each decision point in a time-driven sequence.

They can receive a quick response from the system and have guaranteed reservations.

An upper bound on the cost this user is willing to tolerate for the benefit of reversing and subsequently using a resource.

History of the smart parking system:

What exactly is the smart parking system? The aim was to make an android application that can trace the empty slots of parking, reduce human efforts, reduce time in searching appropriate and secure parking lots, and a fully automated parking system at the place. In the past, some researchers proposed the idea of a smart parking system that is controlled by a mobile application over a network. After that, a lot of work has been done on the technology used by the application. Many modifications were made on how to check the availability of slots, how it detects the slots or area wise searching using distance algorithm. The main concept over which it mainly focused is it should be fully autonomous.

WORKING:

PROBLEM SPECIFICATIONS:

The connection of android application with server and database should be strong enough for accurate information. The Wi-Fi connection should be accurate at both ends for the real-time update of the android application. The IoT should be working with proper mechanisms and with all the real-time updates so that the hardware could work accurately at run time to acquire the desired result of reducing manual efforts. The time taken for an android application would only depend upon the real-time update, network connectivity over mobile data or wireless connection, and the response time over a server. If the connection works properly then it would be a matter of seconds. We prepared our dataset to ensure the proper working of the Android Application. Data set are used in the database to check the proper working of application at the user's end and it will help in connecting and signaling the IoT for automatic openings and closing of the doors. Our paper involves the generation of APK files that is an android application. This application will be accessed by smartphone users to run the app. The size is not so big and could be easily handled by all android versions above KitKat.

METHODS:

The entire paper is broadly divided into four modules according to the working in each phase of the application.

- MODULE 1 – Android-based GUI Application Software
- MODULE 2 – IOT embedded parking slots
- MODULE 3 – Servers

Android-based GUI Application Software

Android is a software stack for mobile devices that includes an operating system, middleware, and key applications. An Android app is a software application running on the Android platform. As the Android platform is built for mobile devices, a typical Android app is designed for a Smartphone or a tablet PC running on the Android OS (Android Operating System). There are four layers in the Android Operating System and they are-Linux, Kernel Libraries, Android Run-time Application, and Framework Applications.

Login Screen - The login screen is used for user authentication. It is used to prevent unauthorized uses access to the application. The user can access the account using a user name and password.

Registration Screen - A new user should first register with the application. To complete the registration process, certain details must be provided by the user. These details are full name, user name, password, A-number, and e-mail id. These details are used to identify the user.

Home Screen - The home screen is the first screen that the user sees when they login to the application. This screen shows all the activities that they can do using the app. The user can view their profile and also edit it. On the home screen, there is an option to view your booking history. QR code scanner with an e-wallet is also displayed. There is a logout button at the bottom of the screen.

Nearby Parking Screen - This screen displays all the available slots for selection. After the selection, the user can proceed to scan their QR code. In our application, the user can scan the QR Code to enter and exit the parking slot. As soon as the user scans the QR code there is an update in the number of slots available for parking. When the visitor scans to enter the no. of slots get reduced by one. While scanning the code while exiting the slot count is increased by one and the amount allotted for the particular parking gets deducted from the e-wallet attached to the account. Choosing a parking slot allows the user to navigate through the place.

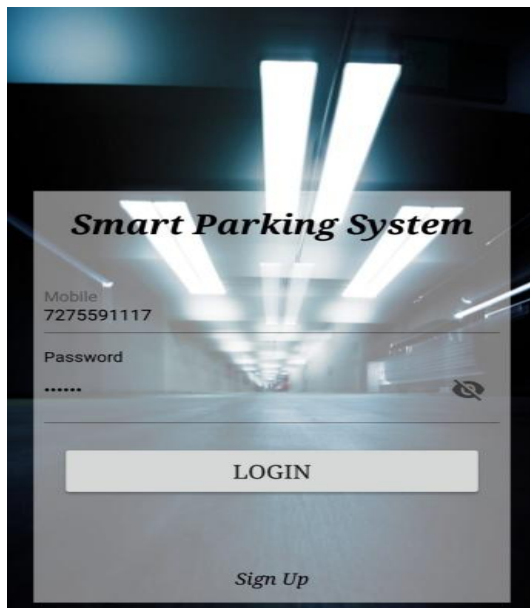


Figure 1: Login Screen

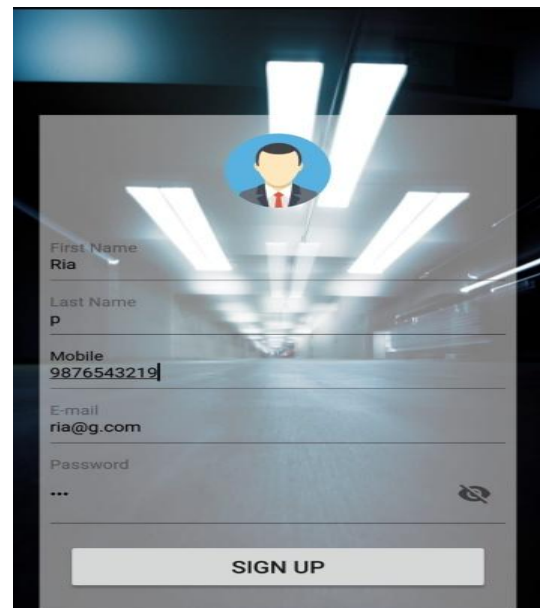


Figure 2: Registration Screen



Figure 3: Profile Screen

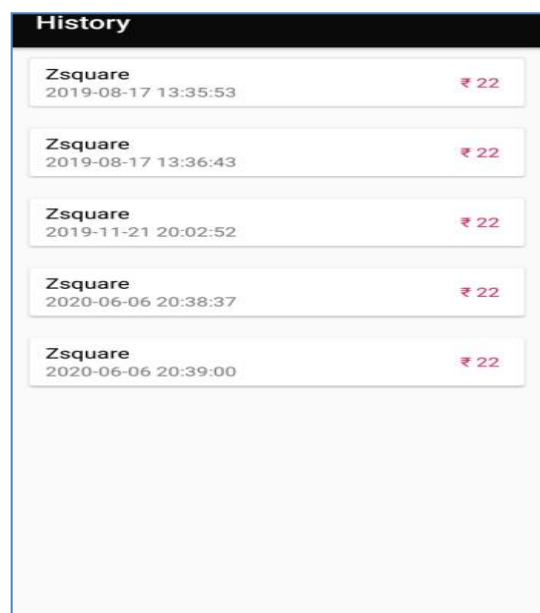


Figure 4: Nearby Parking Screen

History		
Zsquare	2019-08-17 13:35:53	₹ 22
Zsquare	2019-08-17 13:36:43	₹ 22
Zsquare	2019-11-21 20:02:52	₹ 22
Zsquare	2020-06-06 20:38:37	₹ 22
Zsquare	2020-06-06 20:39:00	₹ 22

Figure 5: History Screen

IoT embedded parking slots:

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals, or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

This connectivity is made using Arduino. Arduino acts as the brain of the system and processes the data from the sensor. Also, IDE software is needed for Arduino based IoT projects. And you need to use the ESP-8266 WiFi module to establish the Wi-Fi communication between the Arduino and cloud platforms.

Servers:

The server is implemented using REST service and JSON parser is used for 11 parsing service. JSON objects are sent across communication channels for application in mobile devices. For data input, the client has an android user interface to perform activities. The service layer is used for getting the result from GSON and will send the result to view. Apache HTTP client and Java REST client are used for writing code for connections. All requests that are received by the client are sent to the controller of the server through the REST service. The service layer in the server is used for implementing all databases. Finally, the data obtained by the JSON object is displayed in the user interface of Android.

DISCUSSION:

Car parking is an android application developed to make university parking convenient. The main functionality of the application is to show exactly which slots on various parking lots are available for the park. This is achieved with the help of QR codes. The user must scan the QR code provided to them in the menu options when they are parking and again when they are exiting. This simplifies the whole parking process.

Result:

The application-based research that the paper is all about if worked properly will help to improve the problem in real-time and would help save a lot of time and energy.

FUTURE SCOPE:

The SMART PARKING SYSTEM has been developed by using two application program interface technique Volley API and Direction API but in future scope, artificial intelligence and machine learning can also be used to keep records of all individual users and could suggest them based on their searches which would be similar to the concept used by social media handles.

From the safety point of view, we can install a camera at the parking places which could give live streaming at the user's mobile to keep a check on their vehicle.

Currently, the application is just a prototype but when developed into a more refined model which would essentially include booking and pre-bookings of the parking slots, suggesting services for the car parks and CCTV surveillance would improvise the standards of the application providing a user-friendly environment and a better business idea.

The following functions will help improve the application:

- The parking history collected in this application, can be used to make statistics and can notify the user, that their usual parking lot has free slots at that moment.
- The application can provide an option to certain professors or employees to select their own reserved parking.
- Provide-ability for a user to link their account with the islander account. By doing so they can access their sail account using this platform and buy their parking pass for the semester.
- A map with directions can be provided to the user from the entrance to the parking slot.

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