Smart Car Parking With Reservation System Using QR Generator

Aswathy James
Department of Computer Science, St. Josephs College Of Engineering And Technology, Palai, India
E-mail: aswathy.james3@gmail.com

Prince Abraham
Asst. Professor Department of Computer Science, St. Josephs College Of Engineering And Technology, Palai, India
E-mail: prince.abraham@sjcetpalai.ac.in

Abstract. Nowadays parking has become an expensive resource in the almost any major city’s in the world, and its limited availability is the concurrent cause of urban traffic congestion and air pollution. The common method of finding a parking space is manual where the driver usually finds a space on the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. In this paper, an attempt has been done to automate the car as well as the car parking system with a Smart Parking System (SPS) which is based on the integration of an Android app and QR Code reader. The introduction of a novel algorithm that increases the efficiency of the current smart-parking system and develops an android app to collect information about the occupancy state of parking spaces, and to inform the drivers to the nearest vacant parking spot. The entering into or leaving the parking slot is controlled by an Android-based application. The algorithm helps improve the probability of successful parking and minimizes the user waiting time.

1. Introduction
Major cities all around the world are facing a new problem nowadays lack of sufficient parking space. With families getting smaller and the total number of motor vehicles is more than the total number of heads per family, the parking scenario is woefully falling short of the current requirements in the country. The situation is such that on any given working day approximately 40% of the roads in urban India are taken up for just parking the cars. The problem has been further exacerbated by the fact that nowadays even people from the low-income group are able to own cars. Particularly in the cities and the big towns, there is a problem where the supply-demand ratio makes parking a problem for parking space providers, the motorists or both. Here comes the significance of a smart car parking system (SPS) technology.

In the development of traffic management systems, an intelligent parking system was created to minimize the cost of hiring people and for optimal use of resources for car-park owners. Currently, the commonly used method of finding a parking space is manual where the driver
usually struggles a lot to get a parking slot and sometimes fails to get one parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination.

Here with the project, we aim to develop an autonomous car parking system which is controlled by an Android application and thus to provide an efficient car parking system. The proposed system ensures the driver to reserve a particular parking space in a given parking area, which will be intimated according to the availability of free space. Although the application is capable of suggesting the most optimal parking space for the user based on the destination provided, it has to be further modified in such a way that it can notify the queuing time required when a given slot is already been occupied by someone else.

2. Existing Systems
Various methods are used to improve the intelligent parking mechanisms. Study of these existing systems shows that these systems need little or more human intervention for the functioning. One of the existing systems is [01] Intelligent Systems For Car Parking With Image Processing. In this paper, a brown rounded image on parking slot is captured using the camera and it is used to detect the free parking slots. The currently available parking spaces are displayed on the seven segment display. First, the image of the parking slot with the brown rounded image is taken. Then create the binary images according to the brown rounded images. Due to this, we have to remove the noise of the images and identifies the object boundaries. The image detection module determines which objects are round, by determining each objects area and perimeter. Accordingly, the free parking slots are allocated.

Another Existing method is Integration of [02] RFID and WSN Technologies in a Smart Parking System. Basically, the SPS provides innovative services for the automatic supervision of paid parking spaces through the deployment of an IEEE 802.15.4-based WSN able to collect and deliver the data to the central server. A customized application on the server analyzes the received information and also sends an alert message to the mobile application of the traffic cop in case of unauthorized use of a reserved space or expiration of a parking receipt. Drivers can also use the system to pay the fee. The framework of the system consists of WSNs, Smart Gateway (SG), Central Server (CS) and two different mobile applications, called Parking App and Policeman App, designed for vehicle drivers and traffic cops, respectively. The main peripherals of the deployed Zigbee network are Router (R) and Coordinator (C) nodes. The R nodes provide forwarding and routing capabilities, where the c node collects the received data and forwards them to the Central Server. In the RFID-WSN integrated system, the Router Reader (RR) node typology has been introduced, which identifies an R node interfaced with a UHF RFID reader. The designed system consists of a WSN with some R node and RR nodes are spread out in the parking area. In particular, R nodes, equipped with a light sensor, are placed on each parking slot to monitor their state, while the RR nodes are on poles located their neighboring reserved parking space.

The information retrieved by the nodes is delivered, in a multi-hop manner, to the C node, which delivers them to the Smart Gateway. This last one, in turn, tests the collected data and sends them, together with the position of the parking zone, to the CS. The SG provides also an NFC way to finalize users payment for their parking fee. The main function of the RR nodes includes control the reserved parking space and fill that space by using only authorized cars, labeled by UHF RFID tags. More specifically, when the CS receives the information that a reserved parking space has been occupied, it checks if a new RFID tag has been read by the RR node responsible for controlling that specific reserved space, and, in such a case, it verifies its authorizations. The CS maintains a database handling a lot of information about parking spaces available and users payments. In case of improperly use of a reserved space or expiration
of parking receipt, a parking monitoring application on the CS informs the traffic staff, exploiting the Google Cloud Messaging (GCM)

[03] A vision based car parking system includes 2 type of images. The positive image and negative image. The positive image contains images of cars from various angles but the negative image does not contain the images of cars. Based on these two images parking slots are reserved

3. Proposed System

The public parking system developed within the SPS project will partially remodel the public off-street parking system so that only the authorized users can use these facilities and only these users can be reserved the parking space. First, the users can register at the SPS Android App and also book the vacant parking slot. In the rest of the paper, we will refer to an on-street public space managed by SPS as SPS parking spot/space. To establish the SPS architecture, the following business rules have been defined.

First, Reservation confirmation with a QR Code can be sent only to the authorized customers. Second, A reservation is held for a grace period (e.g. 15 min) after the start of the reserved interval in order to account for customers who do not show up in time. If the customer arrives within that period he will park his vehicle to his reserved area. If the customer does not reach within that particular period a message will inform him/her about the expiration of his/her reservation. Third, If the customer can arrive anytime between the grace period, a vacant and unreserved spot will be offered for the remaining period if any free space is available although he has to reserve a new space from his app. The customer will be billed from the start to the end of his/her original reservation. Fourth, No-show customers will not be billed for the canceled reservation. On a further modification of the project, If the customer fails to clear their parking slot at the scheduled time then he can pay the additional charge. A message (e.g. SMS or email) will be sent to the customer to notify these events. SPS business policies do not allow overbooking since IPA is thought for customers who are willing to pay for an on-street parking stall in order to have the absolute certainty to find a parking spot at their arrival in a high-density trafficked area of the city. If SPS allowed overbooking, there will be no difference between a regular parking spot and an SPS stall. Furthermore, SPS parking stalls must be paid independently at the time of exit from the slot, so there is no loss of revenues.

The SPS architecture consists of two modules user and server (admin). This subsystem is a core module of the SPS system. It manages the communication with the customer, for example, accounting, reservation, cancellation, and billing. This module communicates with the user. First user login to the system then enters the destination then choose the suitable parking space. i. The user can see the available slot in the parking space and book the slot before arriving at the venue. Book the slot. The booking is confirmed by the generation of unique QR code which is used in future for verification purpose. The user can cancel the booking.

Next module is Server (admin). The administrator is the person who manages the domain. This module provides the facilities for the admin for managing users. This module could update the details of a new parking area to the existing system. The booking will expire if the user does not turn up within 15 mins from the time specified. The QR code is generated when the slot is booked. Once the user leaves, the system updates the database.

4. IMPLEMENTATION

Project implementation (or project execution) is the phase where visions and plans become reality. This is the logical conclusion, after evaluating, deciding, visioning, planning, applying for funds and finding the financial resources of a project. Technical implementation is one part of executing a project, the Implementation process is simply a translation of the design into physical realization, using the language of the target architecture.

- User login.
Figure 1. Proposed Architecture of the Smart Parking System with Reservation

- Enter the destination.
- Choose the suitable parking space.
- The user can see the available slot in the parking space and book the slot before arriving at the venue.
- Book the slot
- The booking is confirmed by the generation of unique QR code which is used in future for verification purpose.
- User can cancel the booking.
- Admin can add parking area and slots.
- The booking will expire if the user does not turn up within 15mins from the time specified.
- Slot QR.is being generated
- Once the user leaves, the system updates the database

5. Result And Discussions
In this project, we have presented a novel parking reservation system, called SPS with Reservation, for the management of the off-street parking spots in consolidated cities. SPS puts the management of parking spots into a different perspective that goes over the simple
automation of parking system through the use of advanced technological solutions, such as wireless networks and sensor communication. In fact, SPS is concerned with (i) the quality of life in modern cities, in terms of the amount of pollution and effects of the urban traffic congestion on the abilities of the drivers and (ii) the quality of mobility in urban areas.

On further modification, we are looking forward to implementing an intelligent parking assistant (IPA) architecture aims at overcoming current public parking management solutions. Further considerations would be made about the evaluation of the revenue of the parking site. Future modifications the SPS system will include:

- a module for the Smartphone App to navigate the users to the assigned parking spots using a vocal guide.
- a module to use Bluetooth technology to complete the check-in process.

6. References

[1] R. Yusnita, Fariza Norbaya, and Norazwinawati Basharuddin "Intelligent Systems For Car Parking With Image Processing."

[2] I. L. Mainetti, L. Palano, L. Patrono, M. L. Stefanizzi, and R. Vergallo, "Integration of RFID and WSN technologies in a smart parking system," in Proc. 22nd Int. Conf. Softw., Telecommun. Comput. Netw. (SoftCOM), 2014, pp. 104110.

[3] Hamada R. H. Al-Absi, Justin Dinesh Devaraj, Patrick Sebastian, Yap Vooi Voon "A vision based car parking system."

[4] A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies.

[5] C. W. Hsu, M. H. Shih, H. Y. Huang, Y. C. Shiue, and S. C. Huang, "Verification of smart guiding system to search for parking space via DSRC communication," in Proc. 12th Int. Conf. ITS Telecommun. (ITST), 2012, pp. 7781.

[6] Wigmore, Internet of Things (IoT). Newton, MA, USA: TechTarget, Jun. 2014