Parking Management System: A Review

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ABSTRACT: In today's transport related concerns, vehicle parking has become a major issue in urban areas. Lack of parking facilities and increased amount of vehicles, due to this, drivers who are searching for parking space keep roaming around the city in peak hours. This causes traffic, waste of time and money. To solve these problems, a Smart Parking Management System can be designed. Earlier many efforts were done on it, to reduce these problems, such as by presenting drivers with real-time description about vacancy of parking slots through the mobile application. To sense car and analyse the count of vacant slots, Ultrasonic sensors and Raspberry pi were castoff at the entrance of parking areas. Also there was an effort to activate an idea which uses the video surveillance camera for tracking those vacant locations, also Matrix Laboratory(MATLAB) to practice the computer vision techniques like background deletion and addition for the update of vacancy and occupancy of spots. Sensor circuits were also designed, which includes Radio Frequency Identification(RFID) tag, a mode of digital payment and a different theft management feature. A smart parking system was also designed which was grounded on the amalgamation of the technologies of Ultra High Frequency(UHF), RFID and Wireless Sensor Network, for the same purpose desired. A parking system was also developed for motorcycles as those are the majority mode of transportation in Taiwan, which includes management system that was based on the wide concept of RFID system, Visual Basic (VB) language and My Structured Query Language(MySQL) system. Likewise, a model came up with the concept of Internet of Things(IoT) and theft management facility, a sensor circuit and RFID tag. It could be accessed and monitored remotely through the application.

Keywords- *IoT, Video Surveillance, RFID, UHF, WSN, Parking Management*

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I. INTRODUCTION

Finding parking space can be closely compared to treasure hunt. Public places such as malls, multiplex systems, hospitals, offices, market are the areas where finding a parking space is a very crucial problem. The car parking area has many slots for car parking. So to park a car one has to look for all the available lanes. This involves a lot of mental stress and time investment. So in this world full of automated technology, we need an automated parking system that can ease the task to find a parking space in a hassle free manner. Conventional parking systems do not have any intelligent monitoring system and the parking slots are monitored by security guards. A lot of time is consumed in searching for a free slot, moreover, available and secure ones are costly enough. So with the help of automated parking system one can save his time and even insure the safety of his vehicle as they will be operated through online application. It would reduce human efforts and time with additional comforts. The main reason of taking up this topic is increasing traffic leading to decreasing parking space. 10% of city space in Delhi is occupied by vehicles. Finding a place for parking is just another battle one has to go through every day.

II. PARKING MANAGEMENT MODELS

3.1 SMART URBAN PARKING DETECTION SYSTEM

As, in areas of urban locations, searching for the vacant parking slots is more than the basic problem of time as well as energy wastage. The problem which is of more concern is the problem of irate traffic and air pollution. Resulting, apart from other challenges, searching for vacant parking slot has proven out to be a matter of worrying in day to day life. This particular paper presents an unorthodox measure by presenting drivers with real-time description about vacancy of parking slots through the mobile application. To sense car and analyse the count of vacant slots, ultrasonic sensors and raspberry pi were castoff at the entrance of parking areas. To lodge multi-users in an android platform, client web server was used. Users can comprehend the vacant slots in real time on a map, one can also get route to the closest vacant spot with the help of mobile application. The parking management system is deliberated for various kinds of parking zones, like open space parking and multilevel parking, there is an inexpensive cost for installing the system because of less demand of Raspberry pi single board computer for local server [1], and also ultrasonic sensors for both in and out gates when comparison is done with one's

718

which demands a sensor for each slot of parking. The proposed system could be analysed through the figure 3.1.
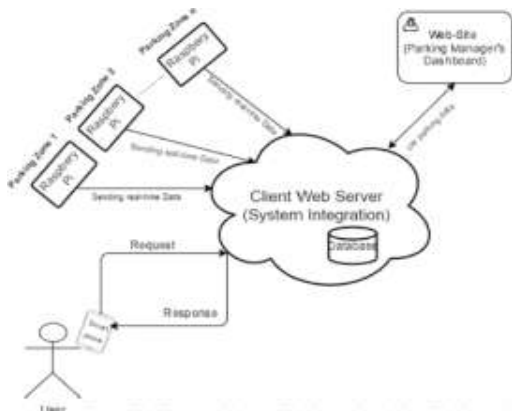

Figure 3.1: Block diagram of smart urban parking system

3.2 LOCATING AVAILABLE CAR PARKING BAYS USING ANDROID APPS

Owning a car has become a status symbol in today's society, this is resulting in uncontrollable count of cars on roads. Due to the wide facility of 4 wheeler parking presence in the malls, metro parkingare crowded 24 hours, and out of which many of them do arrive by 4 wheeler. People would be all filled with worry and uncertainty of whether they are going to get available parking space or not, and they would get to know the confirm status on reaching only. It is going to be beneficial to one if he gets to know and confirm about the status of parking availability even before reaching the spot. So, to be free from complexity and cost worry, this paper presents an idea which uses the video surveillance camera for tracking those vacant locations, also MATLAB to practice the computer vision techniques like background deletion and addition for the update of vacancy and occupancy of spots [2]. Architecture of the proposed model could be comprehended from figure 3.2. Moreover, there is an application associated with it, which allows an individual to get the status of the spots.
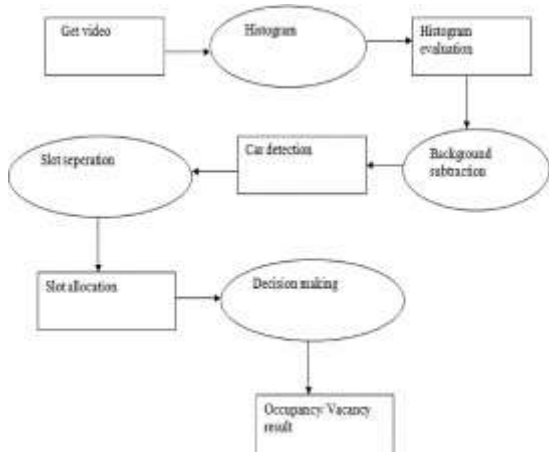

Figure 3.2 Architecture of proposed model

3.3 INTEGRATION OF RFID AND WSN TECHNOLOGIES IN SMART PARKING SYSTEM

This paper presents a Smart Parking System grounded on the amalgamation of the technologies of UHF, RFID and (WSN) wireless sensor network [3]. The prototype is capable of gathering information regarding the availability state of parking slot, and to instruct user towards the closest available slot with the help of customized mobile application. The mentioned application also facilitates the user to pay for the parking charges through electronic wallet. Moreover, in order to take care of the alert situations, for example illegal and inappropriate use of an occupied space or not pulling the vehicle back even after the expiration of the predetermined time, Google Cloud Messaging and an app based on Representational State Transfer(RESTful Java) are installed. In these cases, it sends a prompt to the traffic police with the help of an android application. This particular application is especially developed for such scenarios.

3.4 A MOTORCYCLE PARKING LOT MANAGEMENT SYSTEM BASED ON RFID

This paper presents a motorcycle parking lot management system. As because the transport has become a mandatory need of human to do stuff, and in this case the most popular used means of transport due to its comfort and low cost, is motorcycle, especially the source of transport in Taiwan, as per this paper. The developed management system is based on the wide concept of RFID system, Visual Basic (VB) language and MySQL system. To create a database for collecting and recording the occupancy related information, MySQL is used, and for the purpose of designing the software interfacing for accessing the shared database [4]. Figure 3.4 shows the framework of model proposed. The designed management system is incorporating Personal Home Page(PHP) to create parking description page. User could use RFID tag to record the parking update information, also can use the mobile app for the query of parking lot information.
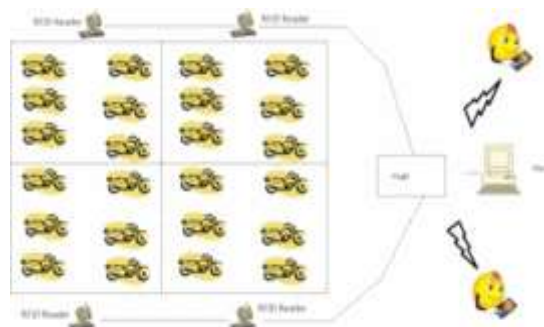

Figure 3.4: The framework of proposed system

719

3.5 A PROTOTYPE FOR IoT BASED CAR PARKING MANAGEMENT SYSTEM FOR SMART CITIES

Today, parking has become a matter of concern, due to the fact that the 4 wheeler mode of transport is dominating the traffic, and it is affecting the roads at peak hours, also there are insufficient parking areas available, which results the driver to search for vacant parking lots, resulting in wastage of time and money. To solve these issues, this paper presents the developed prototype, an amalgamation of sensor circuit, RFID and a wide concept of IoT. To identify the car details, RFID is used, to determine the occupancy status of the slots are acknowledged remotely with the use of IoT, and the installation of IR sensors at each slot [5]. The prototype assists the user in search of free parking area, through internet of things, which simultaneously maintains the database with the help of server which itself is shared one. So user can book the spots in advance. In addition to the parking, security feature would be there i.e. a stolen car comes for parking then the number plate is compared with steal list in the database, if it is in steal list then an alert is sent to the police. The whole process could be understand from the flowchart of the model (figure3.5).
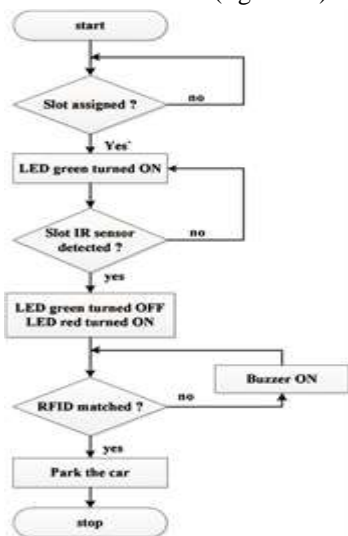

Figure 3.5: Flow chart for parking management system

3.6 TRAJECTORY ANALYSIS FOR PARKING LOT VACANCY DETECTION SYSTEM

Considering metropolitan's major issue of vacancy of parking slots due to large count of automobiles. This paper presents a real-time supervision, vision-based model for parking lots where outdoor parking is taken into count. Various actual surrounding challenges might face these models, for example, environmental conditions, brightness variations and viewpoint distortion. This paper presents a judgemental module grounded on a tracking methodology that describes in real time about the status of slots and confines the unoccupied lots in accordance with many extracted characteristics [6]. Above pronounced judgement is grounded on local attributes of slots and also the events a particular automobile does.

3.7 ARCHITECTURE FOR PARKING MANAGEMENT IN SMART CITIES

Since, the search and accommodation of parking lots are becoming more expensive and hard to acquire, due to which the air gets polluted, road congestion and many other related problems. To solve this issue to a satisfactory extent, this model presents an Intelligent Parking Assistant (IPA) architecture [7] whose main objective is to overcome with the above mentioned after effects of unwanted parking traffic. It works on the progression of industrial automation, wireless system, sensor circuit communication and the smart devices to pay the parking charges, i.e. financial transaction of parking, through mobile payment option. The proposed architecture discusses and manages the prototype scale simulation of the model proposed.

III. COMPARISION OF THE EXISTING MODELS ON PARKING MANAGEMENT

Starting from the model which uses and application which presents a real-time occupancy state of zone to user, and ultrasonic sensors and raspberry pie were installed at the entrance gate, it made the system less bulky but, it was insufficient in locating the exact location of parking and the online booking facility as well. Moving on, the paper which presents the idea of installation of video surveillance camera and an application associated with it to update the slot status, was able to show the exact location and simultaneous updation of status but was insufficient in making the system less complex due to installation of camera at various locations. Further, the paper which gives an idea of Smart Parking System grounded on the amalgamation of the technologies of UHF, RFID and WSN, was capable of making the system away from illegal actions such as inappropriate use of an occupied space, facilitates digital payment mode, and online updation of database regarding parking availability, but was not capable of facilitating with online booking option and theft management system. Resembling ideas also came up for the motorcycles as well, but with some constraints such as, restricted for two wheelers only. The most efficient idea compared to all above is the prototype for IoT based car parking management system for smart cities, which comes up with the facility of online booking of parking slots, e-wallet payment and theft management which manages the alert for the vehicles which are in the theft list.

IV. CONCLUSION AND FUTURE SCOPE

After scrutinizing through various papers on parking management system, we have reach to the following conclusion. There were many efficient efforts done on this particular matter of allocation and reduction of insufficiency of parking lots. Altogether, the main motive of the researches were to provide a real time solution for the user/driver to reach the vacant legal parking spot without any hindrance or hassling and problem faced by irate traffic to get more crowded unnecessarily. They have proposed to pursue it by making the system easily accessible through developing mobile application, for online booking of slots, using the concept of IoT to regular updation of database, theft management system, by installing video surveillance camera to allocate the slots and also by digital payment option associated with Near Field Communication(NFC) e-wallet.

A model can be designed which can proved to be the more efficient and covers all major issues. In that model one can achieve the goals by doing it with the amalgamation of IoT and embedded system. It can serve the purpose of online parking slot booking, e-wallet payment and security purpose. Security purpose can includes the feature that, if the thief is trying to steal the vehicle, as the vehicle leaves the slot, an alert reaches to the registered mobile number on the app. Furthermore, if the owner doesn't approve it, buzzer starts buzzing, and security can take care of it. It would save time, reduce unwanted traffic jams at peak hours due to the search of parking zones, also it would reduce noise pollution as well as air pollution due to traffic, and confirms the status before arriving the zone. So that it could result in amalgamation of online booking of parking slots, security of the parked vehicle and last but not the least, the digital payment. The model discussed can be installed at metro parking zones, multiplex/malls parking, parking zones specifically designated for electrically chargeable vehicles, multi-story parking, Parking zones for vehicle such as huge trucks and busses.

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721