IOT based Smart Parking System

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Abstract— In metropolitan areas, most vehicle drivers have the daily concern of finding a vacant parking space especially during the rush hours. It is time-consuming and it is leading to more traffic congestion, air pollution and driver frustration. A few systems focused on the applications of smart parking system using video camera sensor technologies to collect the information in vehicle parking field. Could tell the availability but could not make a reservation COMMON PARKING SYSTEM.

Keywords: Smart Parking System, IOT

I. INTRODUCTION

Smart Parking is defined as connected parking management solutions deployed on public on-street and on off-street parking facilities where the occupancy of a parking space is determined by sensing devices such as sensors embedded in the ground/pavement of individual parking spaces that can feed data to help/direct drivers to find a vacant parking space, and enable remote payments. The smart parking technologies considered include vehicle detection sensors, license plate recognition systems, smart payment infrastructure (e.g. connected parking meters and Pay-by-Phone functionality for paid parking spaces), and IoT platforms which are networked via wireless and wired connections to transmit information to various channels such as mobile applications, web applications etc.

This helps reduce the time spent in searching for parking spaces and also helps maximize the revenue gained by parking administrators and business owners. The unoccupied parking spaces can be utilized in a better way by using smart parking system. Smart Parking structure in perspective of reservation using Internet of Things (IoT). The wonder of Internet of Things is inter-communication using the Internet where server ranches could assemble the data and look at and control anything. The two magnificent words in IoT are "Internet" and "Things". The Internet is the vast global network of connected servers, computers, tablets and mobiles using the internationally used protocols and connecting systems. Things could be commonly said as any possession or object. The machine-to-machine (M2M) data that is generated has a wide range of uses, but it is specifically seen for Smart Parking here.

II. EXISTING THEORIES

Various methods are prevalent for development of autonomous or intelligent parking systems. Study of these systems shows that these require a little or more human intervention for the functioning. One of the intelligent systems for car parking has been proposed by making use of Image processing. In this system, a brown rounded image on the parking slot is captured and processed to detect the free parking slot. The information about the currently available parking slots is displayed on the 7-segment display. Initially, the image of parking slots with brown-rounded image is taken. The image is segmented to create binary images. The noise is removed from this image and the object boundaries are traced. The image detection module determines which objects are round, by estimating each object's area and perimeter. Accordingly, the free parking space is allocated.

A vision based car parking system is developed which uses two types of images (positive and negative) to detect free parking slot. In this method, the object classifier detects the required object within the input. Positive images contain the images of cars from various angles. Negative images do not contain any cars in them. The co-ordinates of parking lots specified are used as input to detect the presence of cars in the region. Haar-like features are used for feature detection. However, limitations may occur with this system with respect to the type of camera used.

Also, the co-ordinate system used selects specific parking locations and thus camera has to be at a fixed location. Limited set of positive and negative images may impose limitations on the system. Number Plate Recognition technique for developing autonomous car parking system uses image processing basis to process the number plates of the vehicles. In this system, the image of the license number plate of the vehicle is acquired. It is further segmented to obtain individual characters in the number plate. Ultrasonic sensors are used to detect free parking slots. Then the images of number plate are taken and analysed. Simultaneously, the current timing is noted so as to calculate the parking fees. The LCD displays 'FULL' sign to indicate that a parking slot is not available.

However some limitations with the system include background color being compulsorily black and character color white. Also, analysis is limited to number plates with just one row. Smart Parking system designed proposed a mechanical model with an image processing facility. The car would be parked with the use of lift at multiple levels. Also, image processing is used to capture the number plate and store in database for comparison to avoid illegal car entry. Thus, we aim to propose a car parking system that represents a fully automated model with minimum human intervention and overcome the limitations of existing systems.

III. PROBLEM STATEMENT

The parking management problem can be viewed from several angles. Limited number of parking lots, drivers not knowing where parking lots are, drivers not sure if parking lots have enough space and a tendency to park illegally on the roads.

IV. SOLUTION

To achieve this goal, each parking lot has to be equipped with a control system that enables monitoring of the number of free and occupied parking places and informing potential parking lot users about the parking lot status (open with/without free available parking spaces or closed) locally and in a wider area. Additionally, it is preferable that the systems contains driver navigation to a parking lot with free

parking spaces in an urban area and driver navigation to a free parking space in a parking lot, tracking of parking lot occupancy during parking lot working hours for further analysis, parking service payment according to parking time duration, and security monitoring of the parking lot.

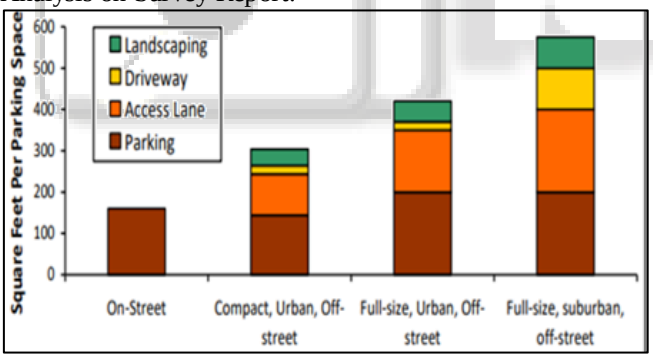
V. SURVEY ANALYSIS

A survey regarding the land areas and their values in day to day life.

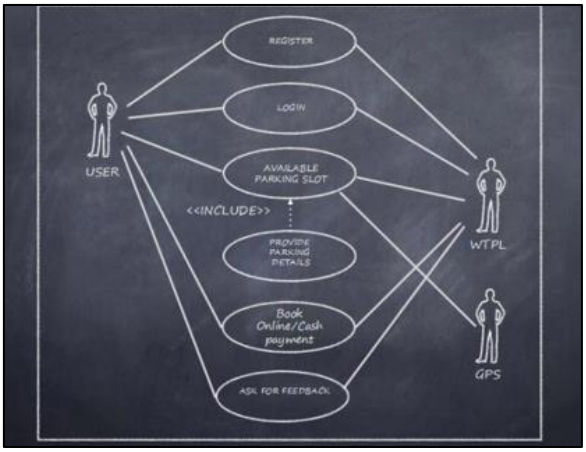
Land Area and Value A typical parking space is 8-10 feet (2.4-3.0 meters) wide and 18-20 feet (5.5-6.0 meter) long, totaling 144-200 square feet (13-19 sq. meters).1 Off-street parking typically requires 250-350 square feet (25-35 square meters) per space, including access lanes and landscaping, allowing 125-175 spaces per acre (250-450 per hectare), depending on design. Field studies indicate that U.S. off-street parking spaces average 513 square feet.

Land costs can vary from thousands of dollars per acre in rural areas to millions of dollars per acre in central business districts (CBDs). Because parking must be located near destinations, it often requires relatively high-value land. Parking facility land is sometimes considered to have little or no value. For example, building or campus managers sometimes consider land as free, and so only consider operating and maintenance expenses when calculating parking costs. But there is usually an opportunity cost to devoting land to parking, since it could be used for buildings, landscaping, leased or sold. Similarly, parking lanes can be converted to traffic lanes, busways, bike lanes, landscaping, or additional sidewalk space. Some cities even convert parking spaces to “parklets” (small sidewalk parks).

Analysis on Survey Report:



VI. USE CASE DIAGRAM



A. Use Case Description:

- User registers itself on the app through portal.
- User's mobile phone will detect the nearby available parking slots where user can book himself for the parking.
- User will get the billing details once the slot is booked.
- User have the facility to provide the feedback of parking, so that the portal can verify whether the parking is authorized or not.

VII. COMPONENTS REQUIRED

A. Raspberry pi:

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards and mice) or cases. However, some accessories have been included in several official and unofficial bundles.

The organisation behind the Raspberry Pi consists of two arms. The first two models were developed by the Raspberry Pi Foundation.

B. RFID scanner:

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does it require line-of-sight to a reader. The RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 feet, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items. It will be possible to see unmanned, secure, automized parking-lots functioning with RFID technology in the future. Check-ins and check-outs will be handled in a fast manner without having to stop the cars so that traffic jam problem will be avoided during these processes.

VIII. RESOURCES AND CONSUMABLES REQUIRED

A. Dependencies:

1) Internet

The Internet is a global wide area network that connects computer systems across the world. It includes several high-bandwidth data lines that comprise the Internet "backbone." These lines are connected to major Internet hubs that distribute data to other locations, such as web servers and ISPs.

B. Technology Stack:

1) Python

Python is a general purpose programming language. Hence, you can use the programming language for developing both desktop and web applications. Also, you can use Python for developing complex scientific numeric applications. Python

is designed with features to facilitate data analysis and visualization.

2) Android Studio

Android Studio is the official integrated development environment (IDE) for Android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools.

3) GPS

GPS, or the Global Positioning System, is a global navigation satellite system that uses at least 24 satellites, a receiver and algorithms to provide location, velocity and time synchronization for air, sea and land travel. The satellite system consists of six earth-centered orbital planes, each with four satellites. GPS works at all times and in almost all weather conditions.

4) Google Map Api

API is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other. Each time you use an app like Facebook, send an instant message, or check the weather on your phone, you're using an API.

IX. Conclusion

- The system benefits of smart parking go well beyond avoiding the needless circling of city blocks. It also enables cities to develop fully integrated multimodal intelligent transportation systems that don't pn cars in the first place.
- Developing smart parking solutions within a city requires data standardization and management mobile phone integration; hardware and software innovation and coordination among various stakeholders (on and off street parking facility owners, business owners etc).

These technical solution and stakeholders are the same data structures and development groups integral to making a smart phone enabled, multimodal, fully integrated transportation solution a reality. In effect, the technical enables and multi stakeholder coordination effort behind development of a local smart parking solution creates a launch pad towards full transportation system integration

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