An Implementation of Vacant Parking Space Detection System

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Abstract: Now a days, finding a vacant parking space in urban areas is very time-consuming. Previous vacant parking space detection systems are very high expensive due to hardware requirement for each parking lot (like sensors). In this paper we propose low cost video-based parking space detection system. The aim of this paper is to present an intelligent system for parking lot detection based on image processing. The system captures the images and processes and produces the information of an empty vehicle parking spaces. This system operates day and night. There are many challenges during day and night time like lighting conditions, shadow effects, inter- object occlusion etc.

Keywords: Image processing, space detection, intelligent parking

I.   INTRODUCTION

In today's world, the major problem faced by car drivers in urban areas is finding the parking space. Currently most of the existing car parks are manually managed and inefficient. Various parking system have been done to ensure smoothness of traffic in car areas. The old system used manual implementation where they control the entrance by barrier gates and tickets are used extensively for access purpose.

In this paper, we handled many problems in both day time and night time like shadow effect, various   dramatic and complicated lighting conditions, inter object occlusion. To overcome these problems there are different methods has been implemented before, like car oriented, space oriented method, parking lot oriented method.

In car oriented method, system detects the vehicle/car detected automatically and it determine the parking space status based on result. In space oriented method, system compares the current appearance of parking space with previous appearance of the ground plane.

II.   LITERATURE SURVEY:

The previous systems are normally either video-based or by using sensors (which increases the cost of the project). And also there are some challenges which are not handled in some systems like inter-object occlusion.

The author of [2] Xu et al proposed a method that detects parking slot markings based on the color segmentation technique.

When an image is captured in dark environment then image quality is degraded. Some problems occurring while finding the vacant space from these images. So in [1] they proposed a system which uses some methods to enhance the quality if the images. There are some methods to improve the quality of images like Retinex-based algorithm, DCT, Gray level grouping method, etc.

The object detection (vehicle or people) is handle in [3]. Pedro F. Felzenszwalb used the HOG(Histogram of oriented Gradients) feature which counts the occurrences of the gradients in the localized portion of an image.

There are some challenges in parking reservation like fake parking request, verification of user identity, etc. which are handle by MohitPatil and Rahul Sakore in [4]. This system provide efficient way to overcome the problem of fake parking request comparing the new request with existing id requests. And after reserving the parking space they will get one QR code and at the parking lot they check/verify the user identity by scanning the QR code.

In our project, the term Inter-Object occlusion means a vehicle occupies two parking lot rather than one. The author of [5] NorliaMustaffa proposed a system which is based on ultrasonic sensors which helps to overcome the problem of inter object occlusion. The ultrasonic sensors transmits a sound, which hits a vehicle and reflected back to ultrasonic sensors. The sensors are fixed on ceiling (roof) above each parking space. As the number of parking space increases the number of sensors required also increases and which is costly.

III.   PROPOSED SYSTEM:

In this section, we present the design of proposed video-based parking space detection system, which provides reservation facility to reduce the traffic at the parking lot.

To develop a vacant space detection system that operate day and night, we faced some issues. The first issue is handling the lighting conditions. Lighting conditions may include dramatic changes, which affects the color and texture information of the image. Another issue is to improve the performance of the system for space detection. We are dealing with this issue by decomposing the parking lot in each separate parking block. The inter-object occlusion issue is handled by 3D planar

surfaces. We are capturing the images of the parking lot by different sides (4 images from the 4 sides) in a fixed angle (45 degree). By taking the images from different sides we are calculating the vehicle is in proper position or not.

Before all this, we first checking the image quality. As mentioned above, there are some problems while detecting the vacant space from the degraded image. The actual reason behind this is visibility of the image content or information is not readable to system. So the first step is to check the image quality, and if image quality is degraded then enhance the visibility of image information. This situation may occur at nighttime.

There are some methods to improve the image quality like DCT method, Retinex algorithm, Histogram equalization method. The system architecture is shown below:
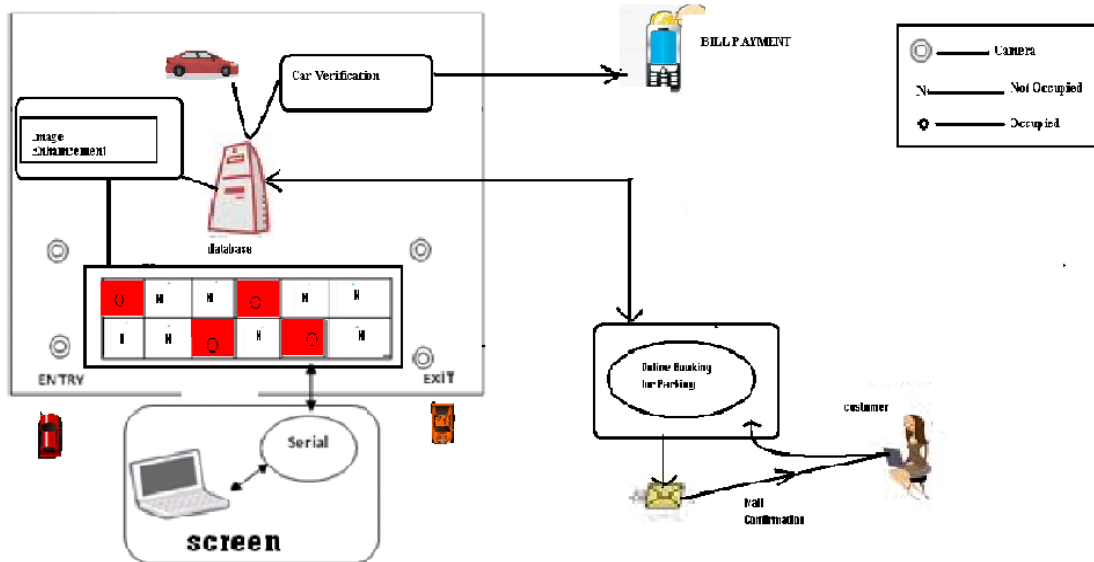
The project contains two main apps:
1.Desktop Application
2.Mobile Application

The Mobile application consists of following thing:
1.Registration
2.Reservation/Cancel Reservation
3.View All Reservation
4.About us

And the Desktop Application consists of:
1.Registration
2.Reservation/cancel Reservation
3.Vacant parking Space
4.View Reservation
5.Weather condition
6.Billing
7.Navigation

IV.   DESIGN & IMPLEMENTATION:

The vacant parking detection system has two main apps as specified above. The user can reserve the parking space through mobile application after registration. After reservation of parking space the user will get confirmation message or email sent by system. The user can also cancel reservation from mobile application.

The Desktop application provide facilities of reservation,cancel reservation, billing, Navigation, vacant parking space. It is impossible to handle all weather conditions at real time. So we have handle weather conditions on static images.

Reservation :
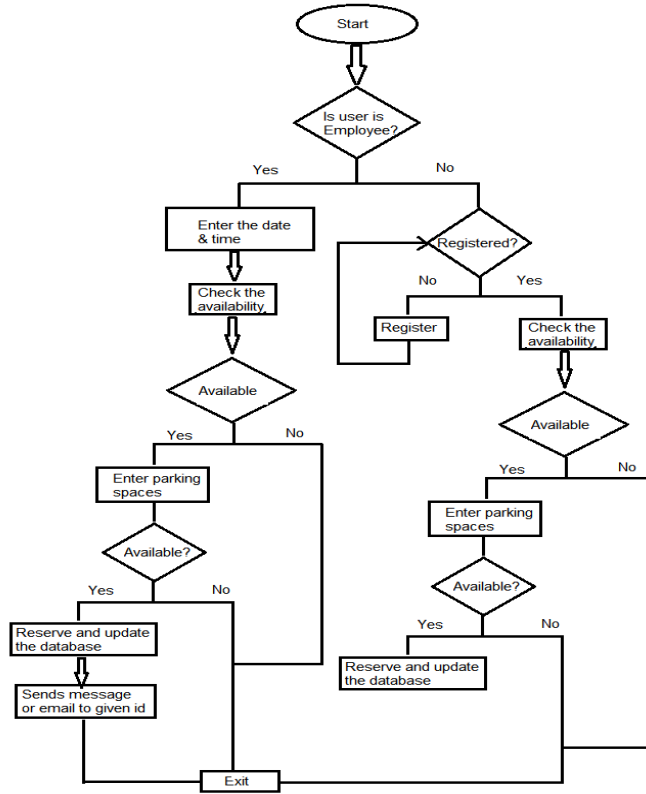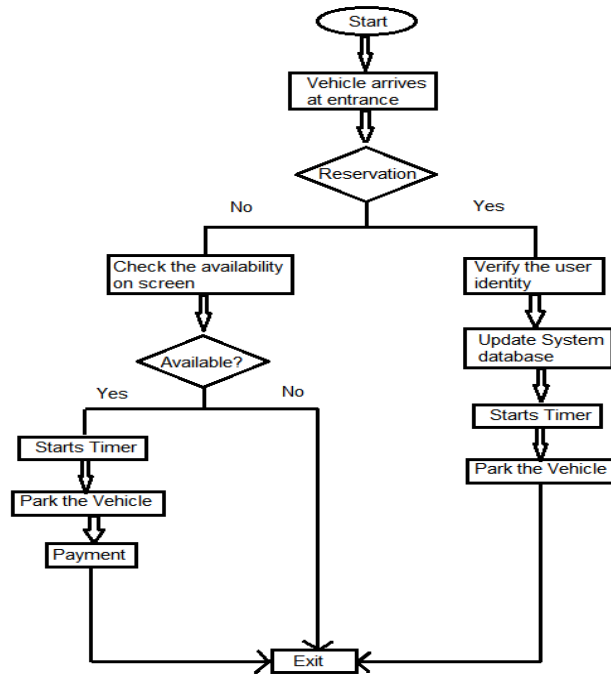
V.   EXPERIMENTAL RESULT:

In our project, we worked on parking model and static images for detection of the vacant parking space. For parking lot we set up cameras for monitoring the statuses of parking spaces.
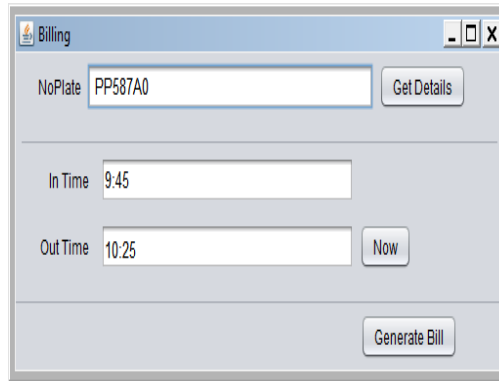
I.Desktop application:
This is the first page i.e. welcome page of the system. User or employee cam register through desktop application.
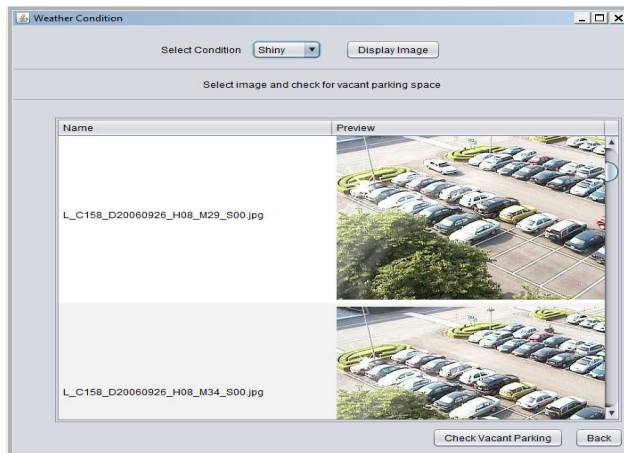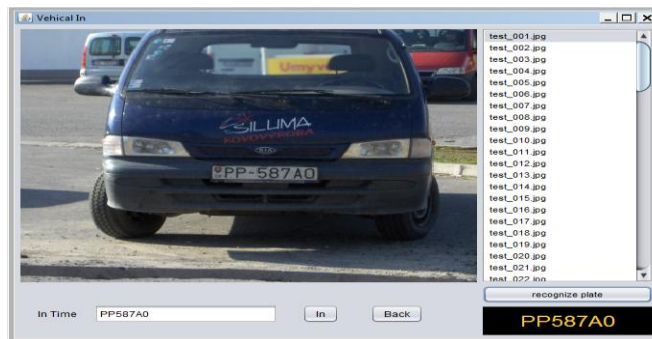
Registration:

Billing:
Here, system can be generate bill and show us the vehicle details like in time, out time, total bill by entering vehicle no.

Weather condition:

Vehicle In:

When vehicle enter into parking lot system can automatically detect the number plate (shown in fig).

VI.   FUTURE SCOPE:

Even though our parking system works well in outdoor parking lot, it is still challenge to detect parking space in an indoor parking area. The system performance can be further improved in night time. Also the problem of inter object occlusion can be handle in better way to remove it 100 %.

VII.   CONCLUSION:

In this paper, the goal was to detect the vacant parking space for the car in parking lot. Here we detected the vacant space for car parking without any problems. In this project we eliminated all effects which caused problems to detect vacant space. Here we handled weather conditions such as rainy, shiny, cloudy etc which give correct output to find vacant space. In this paper we gave facilities to the user for registration, to cancel registration, to find the path of the car parked. Hence this project gives the user to park their vehicle without any problems and time wasting.

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