VACANT PARKING SPACE DETECTION SYSTEM

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Abstract — Traditionally parking in huge malls and organizations was a very tedious job and required great man power. Therefore, there is a need of an automated, advanced and smart oriented assistance parking system. With the progress of computer vision techniques, many video surveillance systems provide new kinds of intelligent functions, like object detection and tracking. Using which it will be possible to design a system which will monitor empty spaces in parking lots using video surveillance, which will help driver park a car efficiently. Hence we propose a plane-based method which adopts a structural parking lot model.

Keywords- Histogram of Oriented Gradient, Smart Parking, Vacant Parking Detection

I. INTRODUCTION

parking in huge parking lots was very difficult. That is, driver has to wander inside the parking area in search of empty parking spot. Also, it required great man power to direct the driver towards empty parking spot. Now recently, video surveillance systems are being used almost everywhere. So with increasing advancement in Computer Vision Techniques it is possible to use the surveillance to detect the empty spots in a parking lot. That is we can implement vision based parking system providing information like location of vacant parking spaces, parking guidance, vehicle finding etc. Now, to perfectly detect empty spots in parking lot, there are various challenges that we need to take care like dramatic lighting variations, varying perspective distortion in the image, and inter-object occlusion among parked cars and the ground plane. Also, insufficient lightning during nighttime is another challenge. Considering these challenges, there can be four types of this method: Space oriented method, car oriented method, hybrid method and parking lot oriented method.

The paper is organized as follows: section (II) gives information about proposed system, section (III) gives methodology of proposed system, , section (IV) gives Mathematical model of the system, section (V) gives conclusion and references.

II. PROPOSED SYSTEM

Along with different facilities, the system should work all day, which leads to two major issues: The first is about how to obtain well exposed images, second is about the performance of vacant parking space detection and how to speed up the system for practical applications. To deal with first issue, we can use a pre-process to enhance the visibility of image contents, and to deal with second issue, a BHF (Bayesian Hierarchical Framework) is proposed for vacant parking space detection.

Firstly, parking lot is decomposed into many 3D planer surfaces with which we can utilize texture information for vacant parking space detection. Also, with many 3D planer surfaces, we can well represent patterns of inter vehicle occlusion. Fig. 1 shows the flow of proposed system. The system works in two steps: Preprocessing step and Detection step. In preprocessing step, multi exposed images are captured with different exposer settings. Later, these multi exposed images are combined to obtain improved quality of image.
III. SYSTEM METHODOLOGY

The proposed system works in two steps: Preprocessing step and Detection step.

3.1. Pre-processing step

As mentioned earlier, in this step, multi-exposed images are captured with different exposer settings. When images in dark environment are captured, their texture information and color degrades, which ultimately affects performance of vacant parking space detection system. We can use of multiple images under different exposure settings, to extract useful image features in both dark and bright areas. To get multi exposure images, special camera like AXIS M 1114 can be used which can adjust exposure values during image capturing.

3.2. Detection Step.

In this system, parking spaces are treated as set of cuboids, each composed of six patches. These patches are then used for status inference of parking spaces. Based on 3D cuboid model, parking is viewed as set of 3D planer surfaces. In this step, those patches of cuboids are classified in different classes like side surface, front or rear surface, ground surface, top surface.

IV. MATHEMATICAL MODEL

System Description:
Let S be the system, S={input, output, Functions, Success, Failure}

• Input: Video Surveillance or Frequently taken Snapshots from the CCTV footage

• Output: Locations of empty parking spaces in the lot which will be displayed as a 3D model highlighting the vacant spaces

• Functions : 1. Customer or driver database
2. Vehicle database
3. System analyzer
4. Image classification

- Success Conditions: Vacant parking space found successfully and generate a 3D model.
- Failure Conditions: Unable to detect vacant parking space and fail to form a 3D model.

V. CONCLUSION

Vacant parking detection is useful as it provides secure and reliable parking and pre-reservation of parking slot. Vacant car parking detection system will become rapid and efficient way of parking in smart cities and project related to it. Experiments demonstrated that our vacant parking space detection system performed well under various kinds of weather conditions in both day time as well as night time. Conflicts are also handled very well and required minimum number of manpower. Results can be quickly transferred to centralized database.

REFERENCES