

Parking Space Detection Using Image Processing

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Abstract: *In modern era, the trouble of parking is also growing because of the growth within side the quantity of vehicles. From the closing decade, there are numerous researches took place with a goal to broaden a really perfect automated parking slot occupancy detection. There is an auto mechanism that can park vehicle automatically but it is required to detect which parking slot is available and which one is busy. In this paper propose a parking space detection using image processing. In this paper proposes parking-space occupancy detection, Visualization of free parking spaces, Parking statistics, Wireless communication, Easily available components, System will get Live-stream video of the parking lot from camera. Images are captured when a car enters or leaves the parking lot. System will also work in Mobile phone (Browser).*

Keywords: Image processing, Visualization, Wireless Communication, space detection

1. Introduction

Growing in the technology make evolution in day to day life. Buy seeing towards the technology the human is going towards the automation, but at many places it is not affordable to there system. Coming to the point there should be the easy way to complete the work. Taking one of the example as car parking system. It is just the solution to help to detect no of cars present in a parking to know how many empty slots are available for parking. The search for a parking space in urban areas is often time-consuming and nerve-racking. Efficient car park guidance systems could support drivers in their search for an available parking space. Image Processing base systems are a reasonably priced alternative to systems employing other sensor types and their camera input can be used for various tasks within the system. Current systems detecting vacant parking spaces are either very expensive due to their hardware requirements or do not provide a detailed occupancy map. Now a day, the parking system has increased rapidly.

It is required to develop an automatic parking slot detection system that helps to entertain useful and careful parking. Exploitation of an automatic and systematic parking system may reduce the human effort and able to work efficiently to avoid any obstruction and wastage of time. There are different methods related to parking system have been employed till now such as user interface-based approach, free space-based approach, parking slot marking-based approach, infrastructure-based approach. AVM is the best example for parking slot marking based approach. AVM provides 360 degrees around the system nearby visual images. System have been employed till now such as user interface-based approach, free space-based approach, parking slot marking-based approach, infrastructure-based approach. AVM is the best example for parking slot marking based approach. AVM provides 360 degrees around the system nearby visual images. Human faults are the chief reason of accidents in traffic, so the techniques are building to check the available space in parking lots, dodging accidents and providing automatic. Human faults are the chief reason of accidents in traffic, so the techniques are building to check the available space in parking lots,

dodging accidents and providing automatic guidance during parking of vehicle becoming an essential region of research. Hierarchical tree structure is used for the marking of parking slots of various types. AVM i.e. Around View Monitor system is used for the assistance to the driver while parking. System consists of four cameras which is capable to show the footage of all direction. Visual assistance on the monitor while parking helps the driver to accurately park his vehicle. Ultrasonic sensors, Radio frequency Identification and some other sensing technique were also used to develop an automatic parking system.

2. Literature Survey

Different techniques and methods have been proposed to solve the problem of parking in the congested areas. Ming-Yee Chiu *et al.* proposed a method for counting the vehicles at the checkpoint from which the number of available parking spaces can be counted [1]. The counting is done by installation of the induction loop sensors. Although the usage of sensors was less cost, not easily affected by environmental conditions and it detect object accurately however, it installation was difficult and cause damage to roads. It was also difficult to maintain [2]. Moreover, the exact locations of free parking area cannot be find because the counting method is not able to provide the detail data, it just records the count of vehicles passing to that place [3].

The other methods was use for providing different sensors like ultrasonic, infrared and microwave for the detection of vehicles [4]. These sensors are placed on every parking area. Wan-Joo Park *et al.* proposed the method used of ultrasonic sensors mounted on the cars to search for a free parking space. The disadvantage of this method was that the sensors are easily affected by natural environment problems or weather conditions like rain, high temperature, snow and fast air breeze. Another method was presented by Vamsee K. Boda *et al.* based on wireless sensor nodes. This method was less costly and it uses the wireless sensors implemented at the critical places like the lane turns, entrance and exit positions of the parking lot. The total number of cars in the parking area can be determined by the difference of incoming and outgoing cars [5].

Other different detection methods are presented based on vision based methods. Through vision based methods, the whole parking area available for parking can be examined through the camera, the data is then processed and the result generated will determine the exact number and location of the free parking spaces. Zhang Bin *et al.* proposed that vision based parking space detection methods are very easy to install, low in cost and the detector can be easily adjusted according to requirements. Moreover, the data obtained from images is very rich. However, the defects in the vision method are that the accuracy is highly dependent upon the position of the camera. Thomas Fabian proposed an unsupervised vision based system for parking space occupancy detection. The proposed system has low complexity in computation and needs less image frames per minutes. He claims that the major problem in images detection is the occlusions and shadows [6]. For unsupervised learning more advanced clustering algorithms are used. H. Ichihashi *et al.* proposed the method vision based parking space detection system are mostly affected by weather changes and lighting condition like the falling of rain drops on the lens of camera during heavy rainfall. Low and high lighting conditions. For this reason the cameras are mostly used for the detection of vehicles in the indoor parking areas not for the outdoor parking lots [7].

R. Yusnita *et al.* presented a method in which a brown color round patch was drawn in each parking space manually. When the system is initialized it looks for the rounded shape in each space, if patch is detected that particular space is considered as free and will be displayed the driver [8]. When the patches are blocked by vehicles then the system assumes the particular spaces are filled by vehicles. The system was good enough for managing the parking lot, however it does not work well in heavy rainfall and snow. N. True proposed an efficient parking space detection by using the combinations of color histogram and vehicle features detection [9]. Najmi Hafizi proposed an image-based method for detection of free slots in the outdoor parking area. A low resolution web camera is used for acquiring images of the parking lot that reduces the cost greatly. The images acquired are preprocessed and then a pair of ROI is applied on every division of the parking lot, which increases the reliability of detecting vehicles [10]. In [11] an image processing technique was presented that captures the brown circle drawn on the parking area and process it to detect whether that parking division is free or reserved. In [12] an image of car is saved as reference and the other images are matched with the reference image by edge detection technique and information about free and reserved slots are displayed. There are number of methods has been proposed for the extraction of features from the images like [13] - [17]. In this paper, we have designed and implemented a system Using image that captured from external webcam 5Megapixels and using model simulation. To find position of the parked vehicle is correctly. The system can be used in 24 hours without have a strong shadow.

3. Proposed System

The main flow of framework is shown is Fig. 1. Two methods are used online preprocessing and initial

configuration. In online preprocessing detail steps are followed see in the figure firstly give input as a video. From video generate a different frames. We apply preprocessing on that frames. Detect how much car are present on that frame and calculate it. Using that calculation parking space extraction are done. We apply DNN algorithm for metrics measurement, history creation and classification. After the classification parking space status are generated. Parking space extraction are done using car detection and parking space status. At the end parking Lot result are shown. In Initial configuration Define space based on 4 coordinates. In that parking area map extraction are done.

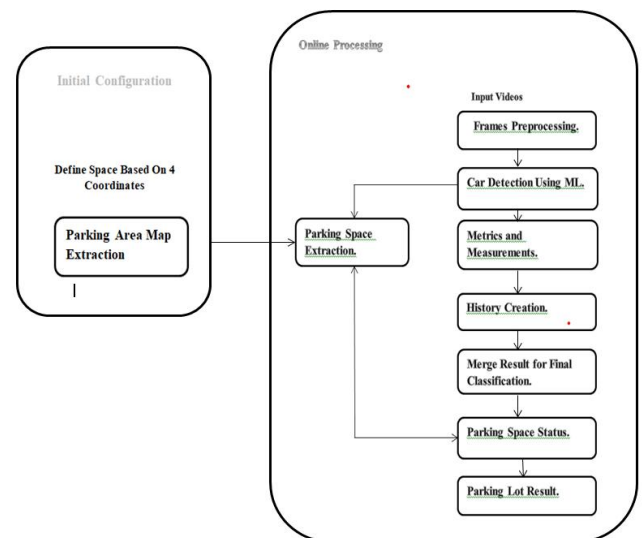


Figure 1: Proposed system architecture

In this paper we propose parking-space occupancy detection using occurrence of vehicle and Visualization of free parking spaces, Parking statistics. Wireless communication are done. Easily available components System will get Live-stream video of the parking lot from camera. Images are captured when a car enters or leaves the parking lot. System will also work in Mobile phone(Browser). In this system camera access using CV2 module. OpenCV-Python is a library of Python bindings designed to solve computer vision problems. `cv2.VideoCapture()` method load, save and read video.

a) DNN Algorithm

We use DNN algorithm for image processing. Deep Neural Networks (DNNs) are typically Feed Forward Networks (FFNNs) in which data flows from the input layer to the output layer without going backward and the links between the layers are one way which is in the forward direction and they never touch a node again.

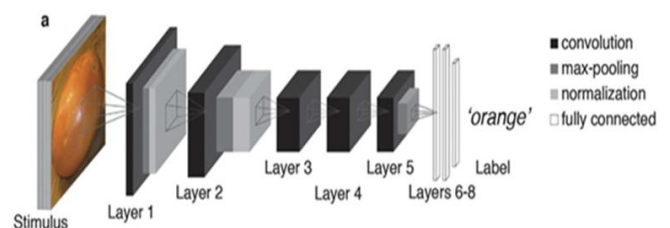


Figure: Architecture of DNN

4. Conclusion

The main contribution of this study is to optimize the identification of available parking slots to possibly reduce the congestion in parking arena. By using image processing and Machine Learning prototype in parking area. It becomes easier to reserve and locate the parking slot.

References

- [1] Ming-Yee Chiu; Depommier, R.; Spindler, T.; , "An embedded realtime vision system for 24-hour indoor/outdoor car-counting applications," Pattern Recognition, 2004.
- [2] Zhang Bin; Jiang Dalin; Wang Fang; Wan Tingting; , "A design of parking space detector based on video image," Electronic Measurement & Instruments, 2009.
- [3] T. Mar; N. Marcel; , " Video-based parking space detection," 2012 [Online]. Available: http://www.ini.rub.de/data/documents/tschentscherneuhhausen_parking_space_fbi2012.pdf
- [4] Ichihashi, H.; Notsu, A.; Honda, K.; Katada, T.; Fujiyoshi, M.; , "Vacant parking space detector for outdoor parking lot by using surveillance camera and FCM classifier," Fuzzy Systems, 2009. FUZZ-IEEE 2009.
- [5] Boda, V.K.; Nasipuri, A.; Howitt, I.; , "Design considerations for a wireless sensor network for locating parking spaces," SoutheastCon, 2007.
- [6] Fabian, T. , "An Algorithm for Parking Lot Occupation Detection," Computer Information Systems and Industrial Management Applications, 2008.
- [7] Ichihashi, H.; Katada, T.; Fujiyoshi, M.; Notsu, A.; Honda, K.; , "Improvement in the performance of camera based vehicle detector for parking lot," Fuzzy Systems (FUZZ), 2010.
- [8] Yusnita, R.; Fariza N. ; Norazwinawati B.; "Intelligent Parking Space Detection System Based on Image Processing," International Journal of Innovation, Management and Technology, Vol. 3, No. 3, June 2012.
- [9] N. True;, "Vacant Parking Space Detection in Static Images," Projects in Vision & Learning, University of California, 2007[Online]. Available: <http://www.cs.ucsd.edu/classes/wi07/cse190-a/reports/ntrue.pdf>.
- [10] Najmi Hafizi Bin Zabawi, Sunardi, Kamarul Hawari Ghazali, "Parking lot detection using image processing method", October 2013.
- [11] Yusnita, R., Fariza Norbaya, and Norazwinawati Basharuddin. "Intelligent Parking Space Detection System Based on Image Processing." *International Journal of Innovation, Management and Technology* 3.3 (2012): 232.
- [12] Banerjee, Sayanti, Pallavi Choudekar, and M. K. Muju. "Real time car parking system using image processing." *Electronics Computer Technology (ICECT), 2011 3rd International Conference on*. Vol. 2. IEEE, 2011.
- [13] Shaaban, Khaled, and Houweida Tounsi. "Parking Space Detection System Using Video Images." *Transportation Research Record: Journal of the Transportation Research Board* 2537 (2015): 137-147.
- [14] Singh, Himal Pratap, Om Prakash Uniyal, and Kireet Joshi. "An Approach to Implement Cost Efficient Space Detection Technology with Lower Complexity for Smart Parking System." *Indonesian Journal of Electrical Engineering and Computer Science* 15.3 (2015): 415-419.
- [15] S. Saleh Al-Amri, N. V. Kalyankar, and Khamitkar S, "Image segmentation by using threshold techniques," *Journal of Computing*. vol 2, Issue 5. MAY 2010, ISSN 2151-9617.
- [16] Li, Shiqiang, Hussain Dawood, and Ping Guo. "Comparison of linear dimensionality reduction methods in image annotation." *Advanced Computational Intelligence (ICACI), 2015 Seventh International Conference on*. IEEE, 2015.
- [17] Mehmood, Rashid, Rongfang Bie, Hussain Dawood, and Haseeb Ahmad. "Fuzzy Clustering by Fast Search and Find of Density Peaks." In *2015 International Conference on Identification, Information, and Knowledge in the Internet of Things (IIKI)*, pp. 258-261. IEEE, 2015.