

An Efficient Car Parking Slot Identification System Using Image Processing

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Abstract

In the model world, an automated car parking system plays a vital role. The model aims to achieve an automatic car parking system that degrades human power. In addition to that, in this model, the user interface will guide the user towards the parking space. Due to the heavy traffic and inadequate spaces, the parking spaces should be in a well-equipped manner. The efficient car parking slot identification system helps to identify each number of cars parked also the number of slots free in that parking space. The method uses image processing instead of electronic sensors to identify the presence of the vehicle also gives knowledge such as the number of free parking slots. A camera is installed in the parking slot. An empty image of the parking slot and the image of parking slots with cars is taken and subtracted. As a result, it gives the number of parking slots available. Based on the request made by the user via the user interface application, the data will send from the server to the user interface application.

Keywords:

CCTV Installation; Slot Identification; Image Processing; Edge Detection; Image Detection; User Interface.

1. Introduction

These days, the car becomes a necessity; and also, the users cannot deny the existence of vehicles in their daily lifestyles. Each time the user exit by using a car and some are facing problems locating a free parking place. If the user enters a particular car parking zone, the

primary idea that the user visits to see an available parking slot. A few signals which tell whether or not the car parking zone is filled, or Empty. Everyone seems not to know what number of parking openings are there and in which to discover a parking range for the transport. A number regarding each parking boundary can also endure blank Even if that entire occupation remains excessive. This makes inefficient usage of parking Boundaries as strongly as troubles throughout every path of automobile parking place.

Consequently, through a way of Granting operators related data on each automobile parking space at that same time entering the automobile parking space turns into a vital problem. When the user begins some parking zone, the individual user needs some extended time simply to discover a free parking place. Calculating the open parking slot is hard so the parking area uses image processing to solve the trouble. The system makes use of image processing to come across the lifestyles of the identification of the vehicle and also records consisting of a range regarding possible parking areas. The system catches video by utilizing CCTV cameras and also divides it into frames and the frames undergo the image processing techniques. The system uses image processing instead of electronic sensors to recognize this survival about the vehicle and further gives data before-mentioned as the sign of possible parking openings. This is a privilege to every one of the users when cars enter the parking zone. The model uses image processing because the entire location inside the car parking zone can continue located with noticeably some cameras. Additionally, the gadget is short and the value does not huge when compared to sensors. The remaining chapter of this paper describes as below:

First chapter describes the introduction of the efficient car parking slot identification system.

Second chapter deals with analysis of the previous paper.

Third Chapter deals with the implementation of slot identification system.

Fourth chapter explains about the performance analysis

Fifth Chapter is a conclusion of the car parking system.

2. Literature Review

This paper stated four samples of the applications that will be compare and listed below:

1. Car-Park Occupancy data system (COINS)
2. Locating Vehicle during an automobile parking space by Image Processing
3. Parking guidance device using RFID and Image Processing Technique in WSN Environment.
4. automobile parking space Vacancy Monitoring.

Comparison between Car-Park Occupancy data system (COINS) and Locating Vehicle in a very parking zone by Image Processing

Presently, motorists regularly encounter the problem like locating free automobile parking space while getting within an enormous lot. Each Car-Park Occupancy data system (COINS) [1] exists improved to signify some viable solution to scale back this quantity from your experience required to go looking to a free car-park area, particularly during an exceedingly immense park. Among the method, images taken through a monitoring camera are held prepared in real-time to spot the occupancies from those parking fields. Some motorists can simply locate a vacant automobile parking space supported by some data presented on these boards. A motive to improving the technique originated from the very point that the least charge occurs included because an image processing system is employed instead of sensor-based systems. While monitoring cameras stand easily achievable within most maximum vehicle lots, here method does far cost-effective than fixing a sensor toward all car parking zone [2].

Finding a Vehicle during any parking zone through Image Processing does larger attention to introduce a technique like identifying the presence of parked vehicles through concocting the image of a car parking zone captured through a monitoring camera [3]. Whenever a motorist requires to leave a vehicle near an automobile parking space, the way to get a correct parking section where begins a heavy difficulty. A specific target like this

current article continues during giving motorists such information because every field denotes completely owned conversely approximately free, wherever empty parking partitions are detected, and so on. These photographs are used for every space within that vehicle parking place will be seen by nearly some cameras, this method implies small, and therefore those charge isn't costly. Each image of an automobile parking space is used through each monitoring camera installed at any altitude within each automobile parking space [4].

Comparison between Parking system using RFID and Image Processing Techniques in WSN Environment and automobile parking space Vacancy Monitoring

Parking supervision device applying RFID and Image Processing Methods under WSN Environment [5] defines a unique way of improving a Parking supervision device in the parking area inside an exceedingly Wireless Sensor Network (WSN) environment to assist mitigate some difficulty and difficulty to find the unoccupied parking lot.

This method uses the prevailing CCTVs placed within these lot including the FPGA method during identifying those empty areas which can successively remain attached on each client working the shortest path algorithm supported both the purpose of the entry to the parking area and architecture [6]. Every client is later led toward a specific required location near the map marked on the ticket. Besides this, an RFID chip is additionally added on the ticket to uniquely recognize the specified automobile parking area of the clients and can obtain accustomed to remind clients of the parking location during payment.

Whereas, car parking zone Opening Monitoring is proposed a stereo-vision based system that panders to instances with close vehicular occlusion. During the way, various cameras are accustomed to watching the vacancy status of the P502 parking areas on the University of California, San Diego (UCSD) campus [7].

Inside this system, a way for monitoring vacancies within parking areas employing a stereo camera system offered to make a 3D reconstruction of the view, which allows us to work out the vacancy status from a specific automobile parking area below vehicular occlusion [8].

This system is in a position to spot openings while changing among places for various license owners (staff versus pupils). Ideally, each system additionally available to present an actual calculation of the whole of accessible locations, although it must need to review to an analytical concept of opening, as individual points are also over densely closed by trees, other transports, etc. [9] to be controlled with extremely huge efficiency. This learning will eventually stay combined among a standing propagation tool, where operators are ready to ask the car parking zone state via mobile phone.

The previous implementation shows the various techniques of identifying vehicles while a park-like Magnetic sensor, radiolocation, Ultrasonic sensors, and image processing. Here outline addresses image processing. This can be practiced because cameras can catch multiple cars externally block offering them effective and inexpensive and this also continues to add security in parking lots that will check crime and destruction of the transports [10].

There occur a couple of ways for functioning this process either by implementing the bite detection with limits position method for image exposure module or applying point exposure with canny operative method [11]. Through this design, the car parking region detection is achieved by recognizing the green rounded image represented at various parking zone.

Chapter 2 briefly describes about the existing implementation. Chapter 3 defines the implementation of the car parking system.

3. Implementation

Fig.1 presents the architecture of car parking slot identification. Every video is capture by the CCTV camera fixed at the parking space. The video is divided into frames. Then the frame undergoes image processing techniques.

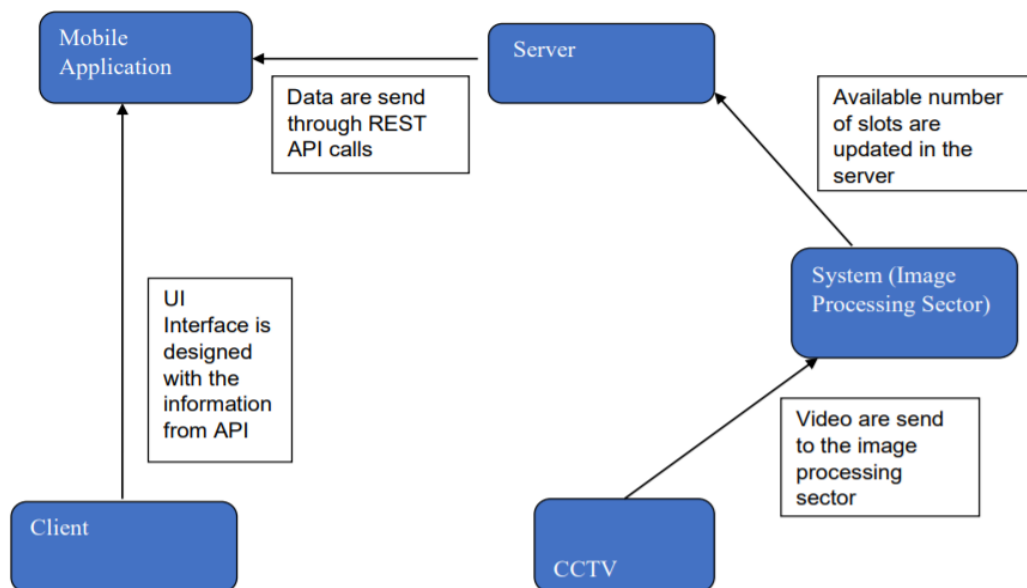


Fig.1 Architecture of car parking slot identification

3.1CCTV Installation

In the primary step, a video is captured through a steady CCTV camera fixed at the parking zone. Initially, the frame does not include any car. Fig. 2 shows the empty slots of car parking.

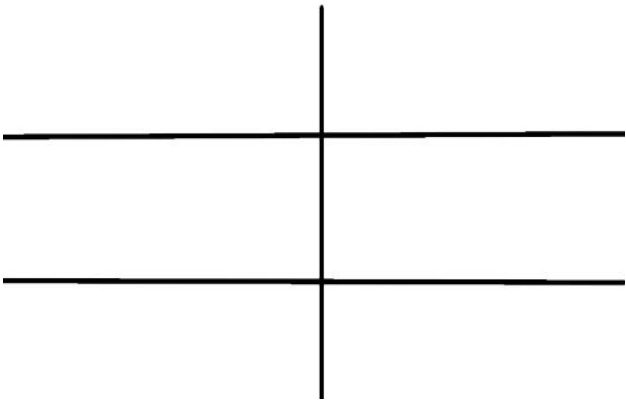


Fig.2 Empty slots

3.2Image processing sector

The following Fig. 3 shows the block diagram for process involved in image processing techniques.

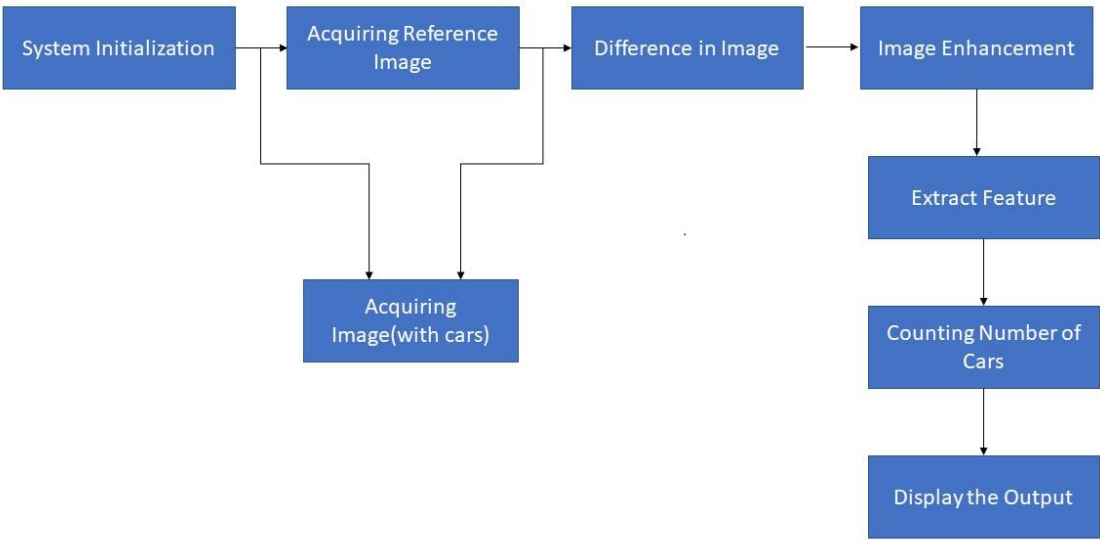


Fig. 3 Block diagram for process involved in image processing techniques

3.2.1Acquiring image with cars and difference in image

An empty image of the parking slot and the model about parking slots including vehicles is recorded and subtracted. Fig. 4 shows the acquiring image with the car from the CCTV camera.

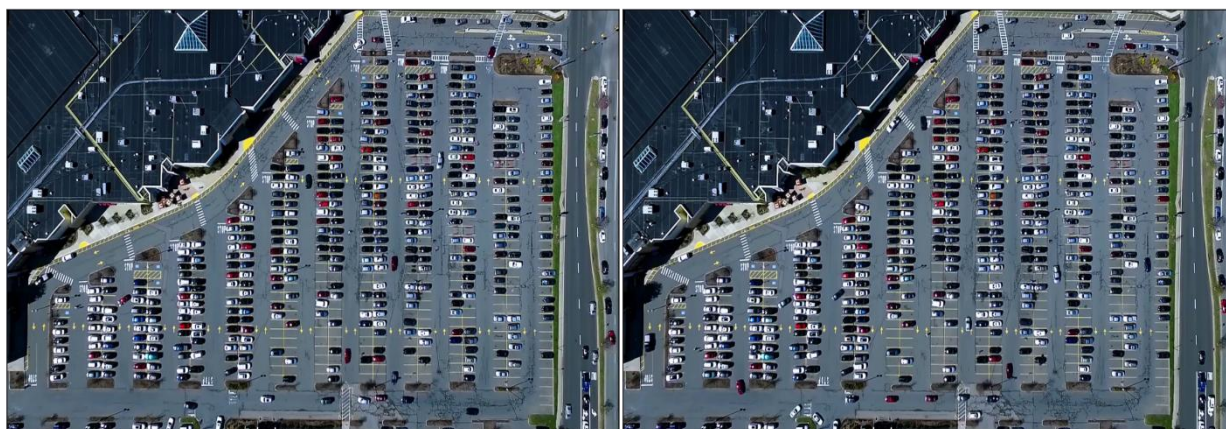


Fig.4 Image of parking slots with cars

3.2.2 Converting RBC images to binary

The RGB model taken is later turned into the gray-scale picture so the binary picture is formed within a specific picture segmentation module. The equation applied during the transformation on the gray-scale picture is

$$\text{Gray}=229R+0.587G+0.11B \quad (1)$$

The equation (1) is used to convert the RCB image to a binary image.

The grayscale picture of the parking position including cars. From the resulting gray-scale image, the binary copy is achieved using the thresholding procedure. In which the paired copy carries the knowledge regarding the location and appearance of interest. The entrance level is concerning in such a method that the things of concern are proceeded into white and therefore the remainder of the picture black. Fig. 5 shows that converted binary image with noise.

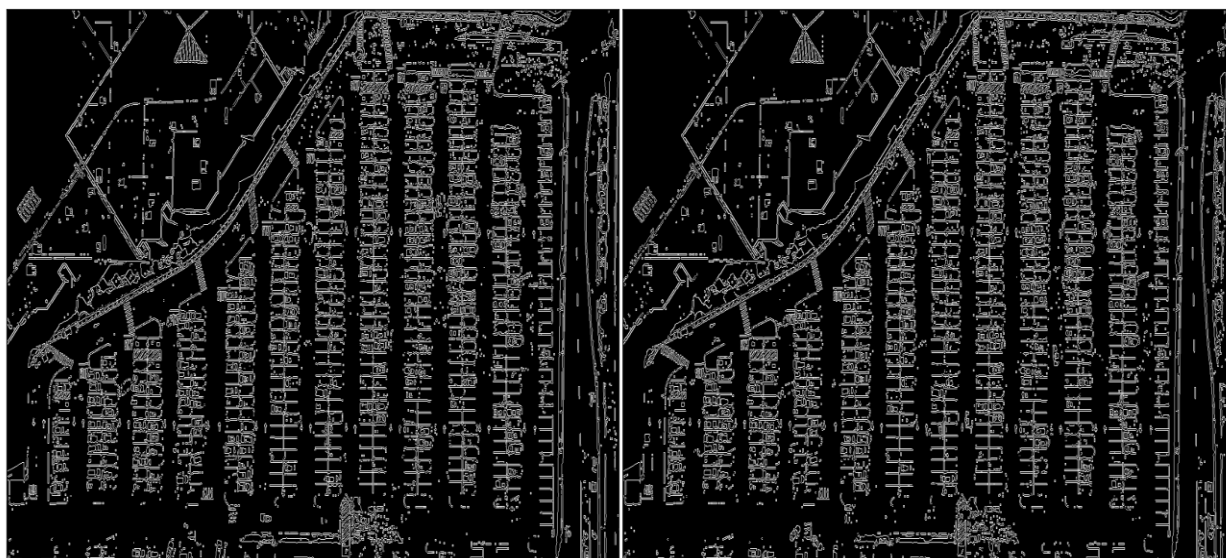


Fig.5 Gray-scale image

3.2.3 Image enhancement

This binary image comprises lots of noise which is handled by morphological operations also cleans like the Weiner filter. These openings are discharged among the support of in-fill also beware of an open function. Fig. 6 shows that converted binary image without noise through image enhancement.

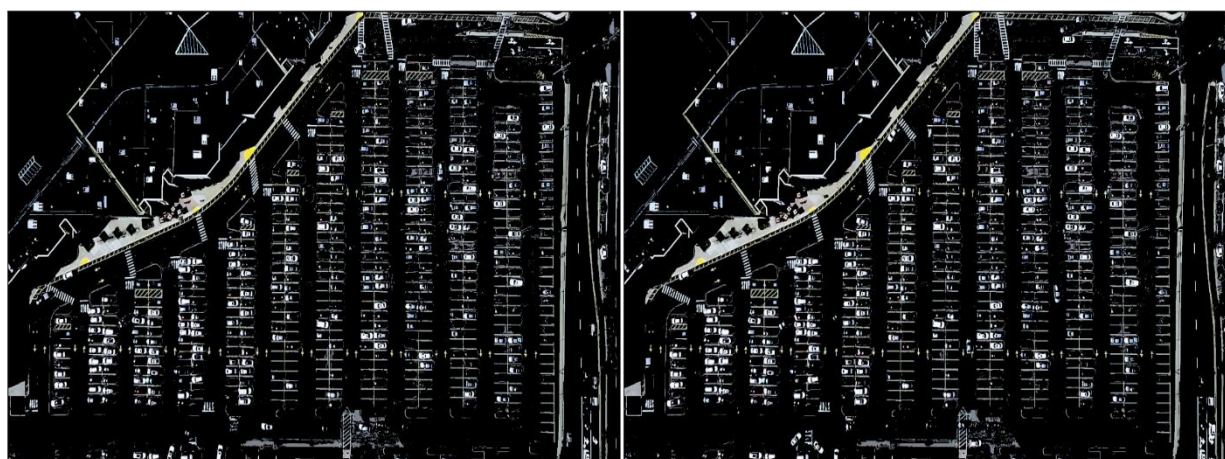


Fig.6 Image after the noise filtration

3.2.4 Edge detection

The key characteristics of a picture i.e., edges, lines, including points, that are applied edge in the existing work may be distinguished from the sudden transition within the gray level. An edge differentiates between two distinct regions, which implies that an edge is that the boundary within pair of different regions. Fig. 7 shows the edge detection of car parking slots.

The edge detection classification for image matching:

- Edge detection techniques determine the pixels within each image that resemble the perimeters from these things seen in this image.
- This result's a binary image including those exposed edge pixels.



Fig. 7 Edge detection

3.2.5 Image detection

An edge-based method is a process during which two edges of identical things are paired unitedly. An edge that approximately represents one image does compare and estimated upon the collection of the edges on this opposing image. Edge detection of text and real-time models should be done using the Prewitt operator. Later those edge-detected images are equaled and subsequently, the cars are permitted to enter that parking slot. In fig. 8 empty slots are identified through image detection.



Fig. 8 Empty slots identification

3.2.6 User interface

Through the image, the available parking slot is identified and their slot number gets updated within the server. Then, within the server, through the backend language, the information is converted to the remainder API format. The server is chargeable for requests and responses for the User Interface. The User Interface is developed by using a framework and also the data are got through the API call. The response data are displayed within the User Interface with comfort program as shown in the Fig. 10. Fig. 9 shows the login page of the user interface application.

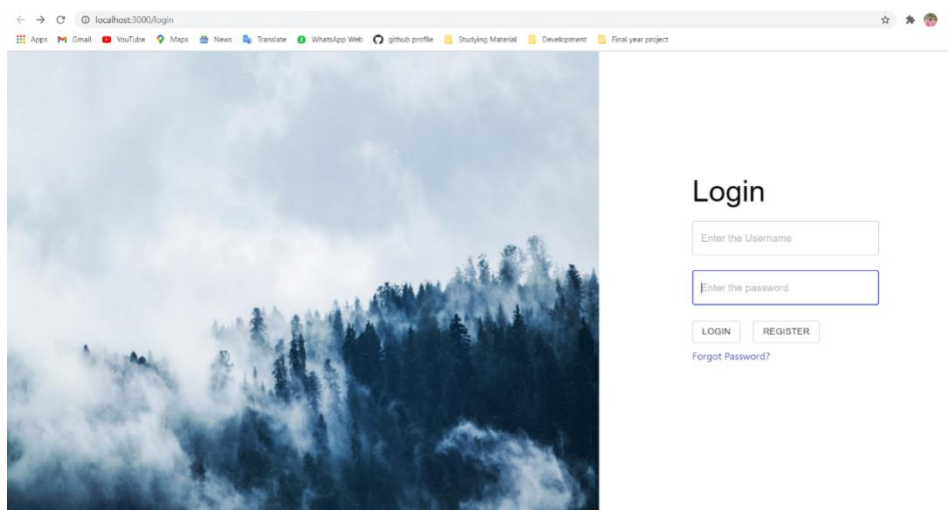


Fig. 9 Login Page of User Interface



Fig. 10 Home page of User Interface

3.2.7 Algorithm of The Efficient Car Parking Slot Identification

The levels of the introduced algorithm for parking place detection are:

1. This method can make a real video of the automobile parking area from the monitoring camera.
2. Pictures do capture once an automotive inscribes the automobile parking area.
3. RGB pictures do regenerate into Binary pictures.
4. This block is cropped lane-wise also thought of as consecutive including on an individual basis within a ring.
5. Unoccupied lots including their track identified by counting each number of cars.
6. Next this offers correct travel to the car.

Fig. 11 shows the flow of the smart car parking slot identification using image processing.

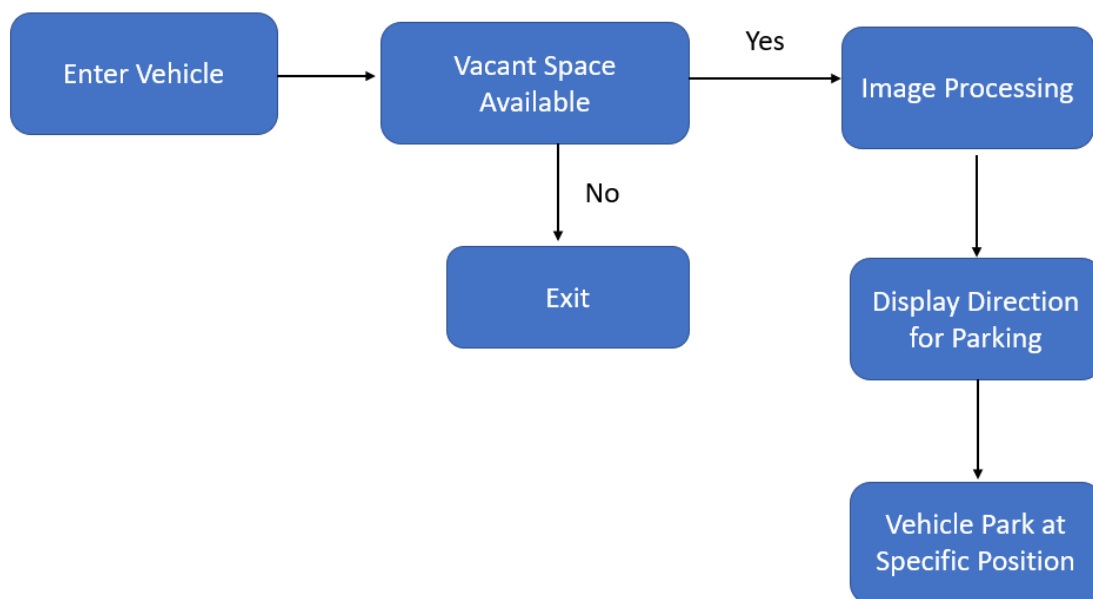


Fig. 11 Flow of the proposed system

Chapter 3 discussed about the implementation of the system. Chapter 4 shows the performance analysis of the system.

4. Performance Analysis

Throughedge detection 94% of accuracy has been obtained. An effective car parking system will be more accurate at the parking slot where all the parking slot is visible to the camera. The trained model will identify all the varieties of car with more accuracy. It will detect the empty parking slots within the 30 seconds. It will give empty parking slots more accurate because it will compare the initial image and present image.

The trained model will detect the parking slot through the drawn parking line. The performance of the model will be dropped where the parking line is not proper.

5. Conclusion

There remain numerous automatic car parking systems then available using technology such as GSM, wireless transmitter, and so on. The mission changed into specially chosen for the reason of getting to know extra regarding image processing since this remains an example of the maximum applicable technologies regarding our instances furthermore utilized against various extra programs. This parking area detection gadget is primarily based upon image processing. The image can be obtained by using several CCTV in the parking zone. This implies consistency in identifying incoming vehicles as it practices real automobile pictures. It's far cheap and clean-established because of the easy gadget. Users can make parking lot facts from this gadget via the user interface which displays the data based on the request. The other users also get the awareness of the registration of particular slot when the users registered from online parking control machine. This method allows to easily identify the available parking slot and also it is the cost-efficient method. Through this method, sensors are removed. The car should be placed within the car parking slot area. The cars cannot be parked crossly or exit from the parking line.

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