IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

SMART SYSTEM FOR VEHICLE PARKING BASED ON IMAGE PROCESSING

A.N.Bhor , P.M.Kale , P.V.Nalawade, C.S.Aryan
Department of Computer Engineering, Jaihind College Of Engineering, Kuran,Pune, India

ABSTRACT

This paper discussed on smart parking system and electronic parking fee collection based on vehicle number plate recognition. The intend of this study is to develop and execute an smart parking system that will increase convenience and safety of the public parking set as well as collecting parking fee without hassles of using magnetic card. The smart parking system will able to have less communication of humans and use no magnetic card and its devices. Overall, the systems work with pre-programmed controller to make minimum human involvement in parking system and ensure access control in limited places. This paper presents algorithm knowledge based method for license plate extraction from vehicle images followed by the segmentation of characters and restructuring and also develop electronics parking fee collection system based on number plate information.This paper also classified the vehicles in two wheeler & four wheeler separately.

KEYWORDS: Smart parking system,classification of vehicles,billing system,parking space detection,image processing.

INTRODUCTION

Currently, most of the existing vehicle parks do not have a efficient system. Most of them are manually managed and a small uneconomical. The problem that always occurs at the vehicle park is time being wasted in searching for the available parking places. Users will keep on rotating the parking area until they found an blank parking spot. This problem usually comes in city areas, where number of vehicles is upper as compared to the availability of parking spaces .Various systems have been done to ensure softness of traffic in vehicle park areas. From manual implementations used in the old systems, they have evolved into fully programmed, computerized systems. vehicle park entrances are controlled by obstacle gates whereby parking tickets are used extensively for access purpose. With the increase of technology, these systems have been easy in many ways.

Now adays, there are many methods used in detecting the parking vehicles in parking spaces as listed in references. In this project, a web camera is used as a sensor for video image detection. This is due to its ability and comprehension cost. The similar project that used camera for video image detection was presented in. This project aims the edge recognition with boundary condition method for image detecting module while in used point recognition with canny operator method. The authors used a moving vehicles as a reference image to detect the parking spaces. The problem occurs when the entity is moving in high speed. It is difficult to capture its movement. Thus in this paper, the parking spaces recognition is done by identify the green rounded image drawn at each parking lot. In this project we used MATLAB as software platform.In this paper billing system provide for two wheeler and four wheeler separately.

Objective of project:
- To detect number plate area i.e. localization using edge features.
- Images of the incoming vehicles are captured in real time.
- Depending upon the status of car occupancy inside they are allowed to enter the parking lot.
- To display parking availability information for multiple zones car parks to drivers.

Problem statement of project:
- Hard to search for an available parking space.
- Time wasting in searching parking space.
- High frustration and stress level among driver.
- Traffic congestion.
- Parking space wastage .

SYSTEM OVERVIEW :

Detection of any License Plate detection system is the usefulness of its algorithms. Six primary algorithms are used for this License Plate detection system. .In order to design a system for vehicle parking, it is essential to first identify a vehicle image that uses the white line detection of road to distinguish between the road and a moving vehicle. Similarly, the car parks have a parking boundary line. Distinguishing between different classes of vehicles requires feature extraction from the binary image of the vehicles. The extracted features of a particular class of vehicles are expected to be similar and could be used to develop an algorithm to set different conditions for the motorists. The sizes of vehicles are class dependent; thus, some classes of vehicles could be categorized as being either big or small. Since the parking system has two conditions of either permitting a vehicle to park or not permitting, the dimension of the classes of vehicles needs to be reduced to two for classifying it as big or small. Some factors that might affect data collection from the images are environment conditions such as light and presence of impurities in the object used for the classification. This can be minimized with the use of some electronic devices to capture the images for classification. Taking images of   vehicles in a controlled environment will also give better results. Some basic features for recognizing a car are through determination of its length, width and height, measurement of the distance between the tires along with the size of the tires. Some suggest the use of fractal dimension techniques commonly used in pattern recognition.   The fractal dimension determines the irregularity of an object.

The classification of vehicles using a general applet or algorithm will make life easy for controlling traffic and illegal parking. Highly accurate vehicle recognition system will also help in automatic authorization in restricted areas. The classification and pattern recognition of an object requires basic knowledge of image processing and artificial intelligence (AI) and also requires computational approach and design. This paper discusses image pre-processing and capturing details including feature extraction techniques. The paper also presents experimentation, testing and analysis of results. An objective of the paper is to determine a vehicle's fitness for parking byconsidering the length and height of the vehicle and comparing the vehicle with its classes to verify the accuracy of the outcome. Parking lots have a standard length of 5.4 meters . The experimentation is necessary, since different classes of vehicles have varying lengths within 2 meters. To allow for such vehicles to park, their lengths and heights are a necessity in determining to which class of   vehicle they belong. By setting the maximum height and using experimentation put restrictions on heavy vehicles for parking

1)LICENSE PLATE LOCALIZATION:

First the vehicle image is captured. Then, the system should take out the number plate of the vehicle alone for the segmentation of character purpose. This plate localization algorithm is based on combine morphological operation responsive to specific shapes in the input image with a good entrance value by which the license plate is located. A big proportion of localization of License plates is achieved by this algorithm.This difference can further composite the complexity for an algorithm to as certain what area of a vehicle constitute a license plate and what area is not. Therefore, the algorithm must rule out a vehicle's mirror, headlight, shock absorber etc. In general, algorithms look for algebraic shapes of rectangular proportion. However, since a vehicle can have many rectangular items on it, further algorithms are needed to confirm that the identified object is definitely a license plate. To accomplish this, key components of the algorithm look for characteristics that would indicate that the object is a license plate. The algorithm search for a similar background color of integrated proportion and distinguish as a means to distinguish objects on a vehicle. Vehicles are moving objects and their rate of velocity must be accounted for in the algorithm's design. This speed generate further complication as a license plates image is angularly twisted and subjected to refractor issues from beam changes.

## 2)LICENSE PLATE SIZING AND ORIENTATION:

Contents of algorithms that change for the angular twist of the license plate image to precisely sample, correct, and proportionally recalculate to an most select size.

3)IMAGE CAPTURING AND PRE-PROCESSING :

   The images of different types of vehicles were taken with the same device which had all the features unchanged for all the captured images. This ensures successful training for a controlled environment. The images used for training data were obtained during daytime. The pictures were captured from an equidistant point from the vehicle so that the

size of the vehicle could be determined reliably. After obtaining the images with a set pixel of 1280x929,the background was removed for image processing. In works on two methods of segmentation are presented. For background subtraction, the image of the empty parking zone is used, with image processing being done using a median filter and other morphological operations. The red-green-blue (RGB) image is then changed to grey scale, which is further converted to black and white edge image. The image is then converted to indices to give a 1for white and a 0for black detection. The threshold for conversion from colored images to grey scale was set as default. The indices from binary images were converted back to pixel number.

A BLOCK DIAGRAM:
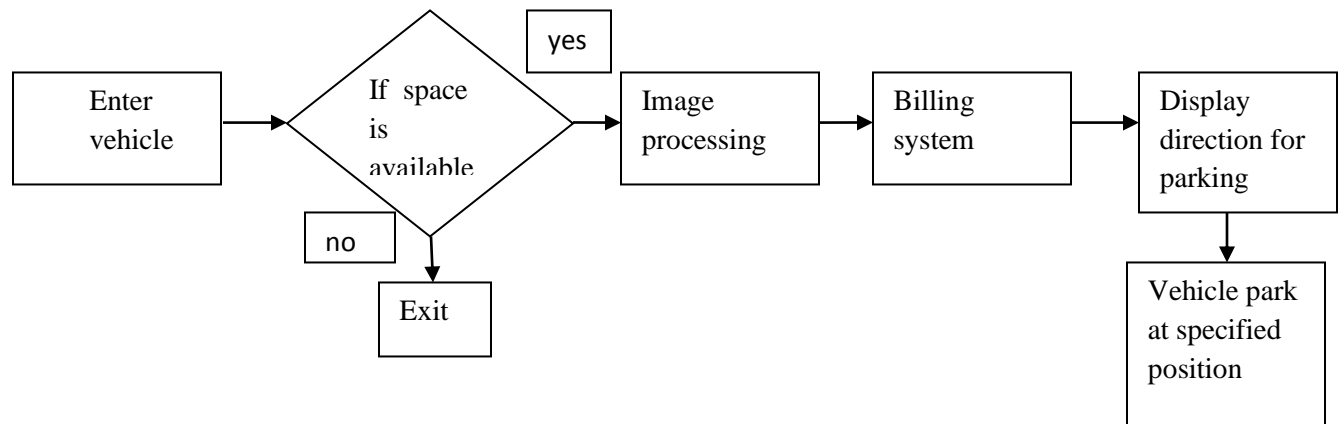
The Smart Parking System is designed to allow driver approaching a parking area to make an informed decision on where to park long before they arrive at each critical decision making point. Using efficient traffic and safety engineering, Intelligent Parking then guide the driver to these open bays with minimum attempt in the least time possible.

- The heart of the system is in the entity parking bays where a sensor is placed in each bay to determine if the bay is engaged or free.
- The parking area is then divided into slots which consist of groups of parking bays for which there are a limited number of entries and exits, and typically consists of a nearby row of parking bays. Each slots can contain up to 127 parking bays.
- Each slot is controlled by a slot controller which is linked to each sensor in the zone. The manager driver the position of each bay and displays this information on the Slot Display Boards which are located at each entry and exit of the zone. The Slot Display Boards display the current number of available bays, along with a green arrow (if there are any accessible bays) or a red X (if not).
- Each Slot Controller Board is connected to a c entral database running the Smart Parking software. The communications between the Slot Controller Boards and the Smart Parking database server is achieve via NTCIP over Ethernet.
- Smart Parking Software gives the client an effective tool to monitor, operate and maintain the entire parking facility successfully and efficiently.

Additional symbols such as Numeric Display Boards and Variable Message symbols can also be added to the system. Numeric Display boards can be used to display information such as the number of accessible parking bays on each parking level on multiple level parking facilities. These signs are typically used in coincidence with motionless symbols to further enhance their efficiency. changeable Message symbols are ideal for placing at parking entrances and on the roadway to provide driver with real time information on parking accessibility in different parking areas.

B.SYSTEM MODULES:
This system consists of five modules. The first module is system initialization as a process to automatically recognize location of every parking slot in the image. The second is image acquisition module, which involves capturing and store digital images taken from video camera. A vehicle park scene is the input acquired by this

module. This gaining device is connected to a handing out unit that runs in MATLAB program. The third module is image segmentation, which divide the objects from the background and distinguish the pixels having nearby values for improving the contrast. The thresholding method as a popular tool in the image segmentation is also used. The fourth module is image enhancement. In this module, the clatter is removing by using median filter, which adds pixels to the substance of interest. The edge of objects in image is tracing which is determined on the external boundaries. The last module is image detection, which is used to decide the spaces at the parking lot. The overall module is illustrated in Fig. The details of each module are described below:

System Initialization	→	Image Acquisition	→	Image Segmentation	→	Image Enhancement	→	Image Detection Module
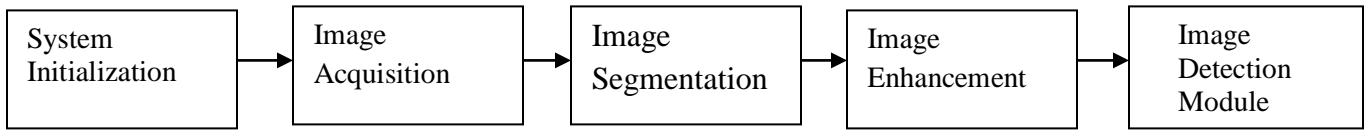
1) System Initialization:
The component runs only for the first time when this system is started. The purpose of this part is to automatically identify location of every parking slot in the image. It should be noted that the lines sorting out the parking slot have to be noticeable, clear and unhindered in the initialization process.

The camera is attached to be in a permanent position and facing a fixed direction all the time. This process will begin with the program searching for the space by detecting the shape of the image
2) Image Acquisition :
After system initialization, the image will be processed in image acquisition module. This component involves capturing and storing digital images from the cameras. The high definition camera used to obtain digital images is then associated to a processing unit. The software is running in real-time. The camera is positioned in side observation of parking lots, acquiring a fixed scene all the time. The height of the camera must be sufficient to obtain a clear, free top view of the parking slots.
3)Image Segmentation :
RGB Image acquired from the camera is then transformed to grey scale image and create the binary images in image segmentation unit. Following Equation is used to convert RGB image to grey scale image.
$Gray = 0.229R+0.587G+0.114B$…………………. [1]
From the gray scale image resulted, thresholding method can be used to create the binary image. The binary images include all of the essential information about the position and shape of the objects of interest .It reduces the complexity of the data and simplifies the process of detection and classification as an advantage. There are some types of thresholding technique like basic, two-band-tile, best and adaptive.
4)Image Enhancement:
After converting images into binary, the image has to eliminate the noise and copy the boundary of detected object. This process is done in image enhancement component. Images, taken by digital camera, will select up the noise from variety of sources. Thus, to eliminate the noise, a median filter is used. It removes the defect added during segmentation.
5) Image Detection Module :
When tracing the boundaries of item in images, the image detection module is implemented. This module uses edge recognition to approximate each object's area and perimeter.The discrimination process can be controlled by setting an suitable threshold. In this project uses a threshold cost of 0.044 for the picture. The available parking lot will be counted and displayed in display unit.

RESULTS AND DISCUSSION
As a result, smart parking system is able to recognize plate number, display free parking spaces and guidance parking system. This study output is a Matlab GUI which is an crossing point for users and drivers.Number plate detection results. To inspect the presentation there are 3 approaches have been discussed earlier, the performance analysis has been done to identify most suitable approach for characters detection algorithm.Smart parking slot detection system based on image segmentation have been experienced and projected in this paper. This results are included the sequences of the vehicle park detection from empty lot until the full parking lot.

CONCLUSION
In this paper the growth of an smart parking system with license plate recognition, parking slots status and direction parking system and billing system is effectively implemented. The performance of the

developed of algorithms for License Plate Localization and License Plate.Recognition is suitable range. The developed algorithms exactly localize and recognize in dissimilar location of the license plate. Electronic billing system performance is also acceptable and recommended for commercial use.

The smart system parking space detection system based on image segmentation was planned and tested. It makes the process of detecting picture as a reference more able compared to the use of a moving object. The conceptualization of this project is to discover the parking classification by using image segmentation instead of using sensor base. smart parking system is developed using an incorporated image segmentation approach to reduce cost of sensor and wiring hassle. Future study will be focused on security parking system as a complement of this smart parking space detection. Additional supervision devices such as light guidance to the accessible parking and placing LED at each car parking lot are also considered.

ACKNOWLEDGEMENTS

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