

Optimization Of Image Processing Techniques In Developing Of Smart Parking System

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Abstract - A parking system is currently a necessity and a common facility found in the campus area of buildings and shops, the management and supervision of this parking lot generally uses third party assistance both in terms of technology and facilities used. At first the parking lot system was still conventional based by using guards in front of the gate and manually recording the entry and exit of the vehicle, a more sophisticated technology was using a camera that was combined with ticketing assistance, officers would check with photos when the car entered and left and strengthened with the use parking tickets, the two technologies have been implemented in many places, the weakness of the system is that there is a need for more than one operator to record and criminal acts will be difficult to detect if a type of vehicle of the same color is stolen because the data from the photos are indistinguishable, To solve this problem, a parking system was created with the help of image processing techniques by recording different types of vehicles even though they were of the same type and color, this system worked using computer vision algorithm rocks with a combination of OCR a Algorithm and surf algorithm, these two algorithms will help record vehicle number-plates while the surf algorithm will record the unique characteristics of the vehicle object in detail so that it will not be change.

Keywords: *Parking system, OCR algorithm, Image Processing*

I. INTRODUCTION

Parking area is a major needed that especially in urban areas and dense areas, in these areas the level of mobility will be higher because the human need to move places at the same time for activities whether it is work, school or shopping. Each office agency or building will be equipped with a parking system with a capacity which of course continues to increase along with the number of motorized and four-wheeled vehicles, this makes parking developers to improve the quality of service and security, in a small parking area the security system will be easy if it has one door in and out. This system will be different if the parking area has many entrances and levels where the placement of sensors and security cameras will continue to be added as well as the assistance of security personnel, in this system the vehicle data collection process will be more complex and setting the capacity of the parking area is increasingly difficult to solve this problem, several studies have been carried out by developing smart parking systems based on sensor technology and intelligence imaging, vehicle recording based on OCR algorithms that will read vehicle plates automatically with the help of computerized and image processing.

Crime in parking areas usually occurs by exchanging tickets or changing vehicle number-plates that are difficult to detect manually, OCR algorithms and Surf are able to detect objects and recognize unique features of objects, the advantages of this technology can be used in parking

systems with examples of two vehicles with colors and the same type, each object will have a unique feature that cannot be seen with the naked eye, the data from the algorithm will be stored in a parking system database and become an additional feature of the parking system, the accuracy of this surf algorithm is up to 80%, accuracy itself depends on the first shot which will have a lot of noise, when the data taken from the video format will be converted into several frames, so the installation of this parking system requires an image processing technique and a calibration process on the image so that the accuracy process becomes even higher.

II. LITERATURE REVIEW

In a large area and there is a dense population it will definitely be followed by an increase in the number of vehicles, the side effect of this is an increase in the number of traffic densities where people will mobilize by vehicle at the same time and hour, problems will arise if a vehicle parking area that does not have sufficient capacity, a large parking area will use many sensors combined with image processing technology, image processing technology will be difficult to detect a vehicle if the area is not sufficiently lit or used at night, another way is to use sensors on parking area technology can even be used to detect empty spaces in parking areas [1].

The increase in the number of vehicles will also increase the capacity of the existing parking area, increase the number of vehicles and the availability of parking areas must be followed by security guarantees which are the responsibility of institutions, organizations or private parties, the function of this monitoring is how a parking system can be used to detect a illegal vehicles and able to count the number of vehicles entering, this method will be difficult if done directly on a large road with a large number of vehicles, in the modern era the vehicle detection system can use a machine learning technology that is implemented to detect vehicles automatically, the vehicle identification process this is very important, especially in the era of modern transportation today [2].

A parking system must have a reliable security system and this method has been developed over the years, many parking lots are adopting artificial intelligence systems either implemented on vehicles or on access to parking areas, image processing technology in this system has a role. The important thing is that the incoming vehicle will be recorded through a number-plate with the help of the OCR algorithm, the steps of the algorithm are the preprocessing process, plate detection, identification and object characteristics, noise is often encountered at the beginning of the image-taking process so that a color calibration process is required and the image size so that it has the same pattern [3].

In modern parking lots, parking lot technology must be able to provide information about the parking area, capacity, type of vehicle as well as the number and characteristics of the vehicle, this technology has been implemented with a thermal imaging camera that can detect heat and read the license plate from the vehicle, but the camera thermal imaging is very expensive, so it is necessary to apply the same technology, namely the application of a gradual histogram with a neural network algorithm whose system works closer to thermal imaging[4].

An automatic parking system is used to make the parking system easier and more efficient and reduce the way conventional parking systems work which is more complicated and complex, the development of a modern parking lot requires support and hardware, software and sensors, other support is mechanical and electrical design and other combinations. is to use image processing assistance with a combination of surveillance cameras so that in addition to this system vehicle can also be used to detect empty parking areas, the first image processing-based parking area identification process is how an image or image provides information on an empty parking area, an image data Initially with RGB and HSV values then converted using a saturation process, the next process converts the image into a binary number by changing it to a threshold of up to 40%, the function of HSV is to convert colors in greyscale mode so that the color is not only compatible converted to two colors black and white [5].

Modern smart parking systems that use applications require server space with large capacity so that vehicle data can be recorded and read by the server, server data is stored in cloud computing where the data will increase every hour both vehicle data and capacity [6].

In general, the process of calculating the number of vehicles uses a sensor that is installed at the bottom and top of the parking lot, the sensor is used because it is cheap and easy to assemble and configure and is not affected by ambient temperature conditions, but if the installation process is carried out on the highway then this sensor will be very it is difficult both from the installation process or the maintenance process if there is a damaged sensor [7].

Detecting a vehicle through a vehicle number-plate is the easiest way with the help of image processing techniques, the accuracy of the reading is influenced by several factors, namely lighting factors and the form of writing such as handwriting, the type of type in italics etc. Another challenge with this plate detection system is the distance between reading the text from the camera used and from different positions, after the image reading is complete, the next process will be converted with an OCR algorithm by converting the image into text [8].

In previous research, a parking system has been developed using image processing techniques using a camera and taking pictures of different objects, the way this camera works is by taking car images and converting from videos into several image frames, from that frame each data is carried out a the color segmentation process then in each calibration process on each image and to reduce the computational process that is too long and this method can be used on moving cars, this algorithm system can still do image capture [9].

III. RESEARCH MODEL

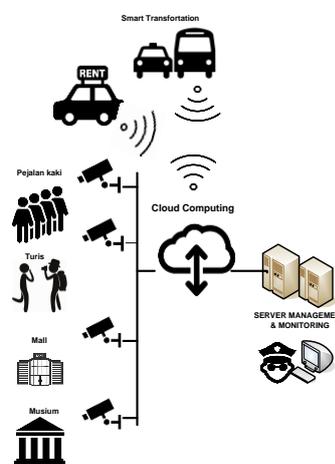


Figure 1.1 How the Smart Parking System Works

Information:

In Figure 1.1 is the design of a smart parking system. In this part, there are cameras installed in several places that can be used as support for the smart parking system, cameras are easy to install and easy to do the installation process, the surveillance cameras themselves can be connected to cable or wireless system if applied. in the smart parking system, the security system is not only at the main entrance but at the same time in other parking areas and the OCR algorithm can read the vehicle number-plate data in detail and save its directly in the database system.

IV. IMPLEMENTATION AND TESTING

In this system, a test method is carried out on the OCR algorithm that will recognize the vehicle license plate number and the surf algorithm which will recognize the unique characteristics of the vehicle.



Figure 1.2 Implementation of OCR Algorithm in Small Parking Areas

Information :

In figure 1.2 is the license plate detection process with a combination of OCR algorithms and image processing techniques, the data input is taken from the camera in the parking lot, the vehicle data which have been registered already are then displayed visually and receives a tagging of mark, the process which indicates that the vehicle is registered already by the system.



Figure 1.3 Implementation of the OCR Algorithm in a motorized vehicle area

Information:

In Figure 1.3, the results of the OCR method experiment in a larger parking area, in the second experiment, the reading of vehicle license plates should using by a camera with more high degree of magnification and resolution of the object, the marking is displayed with a yellow line at the right on the vehicle plate data object which has been changed using by the OCR algorithm when entering a parking lot.



Figure 1.4 parking system in the car area

Information :

In Figure 1.4 above is a parking lot system with the same brand and type of vehicle, in an ordinary vehicle recognition system it will be difficult because in ordinary cases, crimes have occurred by replacing vehicle number-plates with the same number-plate of type and therefore, the system does not learn and recognize its.



Figure 1.5 feature detection systems on vehicles

Information :

In Figure 1.5, the recognition system and characteristics of each vehicle that enter is exemplified using the same type and color, it will be difficult to distinguish with the naked eye, however the surf algorithm will deep read of the difference by reading the vehicle characteristic's data at the front, side and top of the vehicle in detail and meticulous. In advanced, every details of the vehicle data will be stored in a database system.

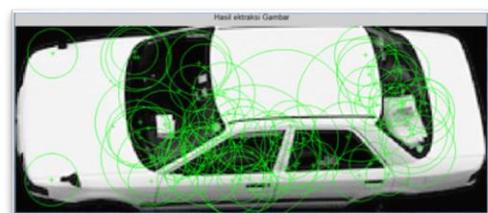


Figure 1.6 Implementation of OCR feature detection on vehicles

Information:

In Figure 1.6 above is the detection process with a surf algorithm, the characteristics of the vehicle will be read by the system from this data which will become information about parked vehicles so that the vehicle will not be

confused, the accuracy of this algorithm reaches 80% and is still reliable in recognizing patterns

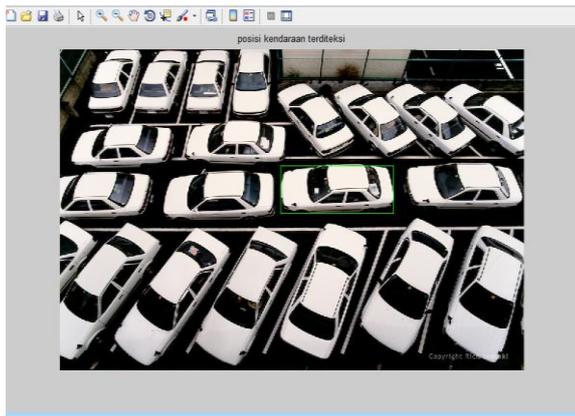


Figure 1.7 Characteristics Detection System on Vehicles

Information :

In Figure 1.7 above is the result of the detection process with a surf algorithm on the same type and vehicle, where the process results are detected by conventional parking is very difficult, the surf algorithm will continue to read every data and unique pattern on each form of vehicle, monitoring the parking area will continue to take advantage of the use of the camera. In Figure 1.7 above, you can see that there is a green box object on one of the vehicles which indicates that the vehicle is one that has a unique pattern and is readable by the surf algorithm.

V. CONCLUSIONS

From the results of the experiment, it can be concluded that the parking system in a conventional way, namely by distributing tickets and photographing incoming vehicles, still has weaknesses, but these weaknesses can be reduced by using the help of image processing techniques that are used to read patterns of types of shapes and colors in each vehicle pattern. The accuracy of this algorithm able to up to 80%, in the usual system of securing vehicles of the same type and shape it will be difficult because the crime gap will usually use the same number-plates and attach it to the targeted vehicle, this smart parking system does not change the previous smart parking system however could add a security systems and can be implemented on any kind of software and hardware's. Internet of things is one of development models which could embedded in this system and could be developing in many cloud platform also can deep developed in advanced algorithm of deep learning that currently time reliable.

VI. REFERECES

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