

Automated Parking Entrance System Using Different Approaches

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Abstract—Automatic license plate identification in today's world plays a vital role in vehicle tracking and organization. Our proposed model of automation in the detection and recognizing vehicles through the use of number plate computerization is expected to create a new scope of evolution for large cities. The machine can be used for the parking system of motor vehicles, as well as to collect tolls. The detection of the Bangla license plates from different cities and multi-class vehicles is the first step of the proposed system. The license plate detection has been performed with mathematical morphological approach and the Faster R-CNN architecture. Next, the Tesseract Optical Character Recognition system, in conjunction with the Bangla character recognition model, has been used for vehicle indexing. We are also planning to make an application for the parking lot system. That will manage all the information about the parking lot system. Numerical results demonstrate that the accuracies of license plate detection for the computer vision and Faster R-CNN are 95% with limitation and 98% without any limitation, respectively. Finally, our model achieved an accuracy of 96% for character recognition with some limitation.

Keywords—convolutional neural network, license plate detection, machine learning, morphological analysis, optical character recognition, Tesseract.

I. INTRODUCTION

Bangladesh is a country with a population of 163 million. In 2018, there were a total of 497,374,000 units of the registered motor vehicles in Bangladesh, which is still growing with proportional to the economic development. We need the right amount of human resources to monitor these vehicles, which is extremely expensive as well as time-consuming work. In this work, we have developed a system that can do the same job without any hassle using only the images of the vehicles. It will be easy for everyone to park in the parking lot as insignificant time will be needed to detect the license plate during parking entry and exit. The users of the proposed system don't have to suffer and wait for the next car to enter the garage as it will take a small time to process the data. Also, it will make a great impact on the 5th industrial revolution, where machine will do the maximum of the human work and all the systems will be free of human interaction. The utilization of this system can also be used for automated toll collection, analysis of city traffic conditions, and could also be used for tracking and identifying stolen vehicles. It can also be used to enforce different traffic rules in busy megacities, e.g., if there is a person who is violating any traffic rules (not wearing a helmet or seat belt) in the motor vehicle, then it can fine the person by detecting the number plate of the specific vehicle.

In the following paper, the authors focused on automatic number plate detection using computer vision and some morphological operation to detect the Bengali characters efficiently and effectively as well as showed less computational complexity using the component analysis method **Error! Reference source not found.** In this paper, they used some algorithms to mark and detect the portion of the vehicle's number plate from an image, and using the correlation coefficient they compared it to the prerecorded database. The proposed algorithm consists of five parts. First is preprocessing or resizing the image which is in RGB format then converting the image to grayscale. Next, the image is converted from three-dimensional pixel to two-dimensional one to reduce the computational complexity. The second part of this paper is the morphological operation, where it divides an image in small parts known as the structuring element. This test used the 'strel' functions of MATLAB. The third part of the algorithm is the edge detection, which uses the two-dimensional convolution operation to exaggerate the contrast of the image. Image binarization is applied subsequently. The MATLAB has a function named 'imfill' which is used to fill in the new images of characters. The fourth part is the localization of number plate and segmentation of the characters from the number plate, i.e., the border of the detected boxes is formed between the connected components and the green color was used for this purpose. The character recognition is the final part, where they have used image segmentation to segment the characters from the number plate. The last action is to match these characters with the images that are stored in the database. The depth of the image is 1 unit. The algorithm takes only 0.75 seconds to find the average execution and recognition which is reported to be faster compared to the generalized symmetry transformation method. The detection accuracy is nearly about 100% in the 30-50cm distance. The proposed algorithm cannot give perfect results of the distance increases.

Character classification has been done by using the forward background feed method in [2]. The back-propagation is used to develop the neural network. In the preprocessing scale, normalization and edge detection are included to achieve higher accuracy. To address the problem of character recognition, component survey, in addition to horizontal and vertical graph is used.

Prathamesh Kulkarni used another method where through connected component and binarization characters areas are selected [3]. The unwanted points are removed using the analysis of point method and splitting the points and also combining the split points. A combined 97.2% accuracy of character recognition is achieved from this unit, and it has 90.9% reliability of the character detection. In this paper, the analysis of the related component bad processes is