Multi Angle Parking Space Analysis of Outdoor Parking Lot by Image Recognition

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Artificial intelligence (AI) is a concept that has acquired a wide range of definitions. However, it can essentially be attributed to any human-like intelligence exhibited by a computer or other machines. AI offers numerous advantages. For instance, it enables multi-tasking and eases the workload for existing resources. It enables the execution of complex tasks without significant cost outlays. It augments the capabilities of differently abled individuals. Most importantly, it has mass market potential, it can be deployed across industries. Many domains use Artificial Intelligence to introduce improvement in efficiency and reliability. One of those fields is automotive industry and related domains. In this research, we are going to develop an algorithm that will process the image of a parking lot. The aim is to recognize the existence or not of a vehicle in a parking lot . Finding a free spot especially in a big parking space can be difficult and time consuming. By introducing this technology, we are going to make this task less difficult. We will apply the recognition from different angles and see if the accuracy is maintained in a satisfactory level. In the previous research applied to single view images, we could achieve less than 0.01 of error rate. In the current application related to multi-view images, the error rate will vary according the time in which the image is taken (sunset time and nighttime).

Finding a parking spot has become increasingly challenging in modern times due to the rapid growth in the number of automobiles, particularly in big parking locations like airports, railway stations, and shopping malls. Due to the size of the parking lots, certain parts may be actively utilized while others may have a huge number of empty spaces.

In our research, we will work on images taken during different time of the day particularly sunset time and night time. These situation offer a good study case where the brightness is reduced and uneven.

In the previous study, we mainly focused on aerial view photos of parking space taken during daytime with almost even brightness.

The accuracy of detection achieved got higher as much as we increased the number of samples.

For our research we used the "You Only Look Once" or YOLO algorithm. In fact, it is one of the popular algorithms in object detection used by the researchers around the globe. The unified architecture of YOLO is extremely fast in manner.

We also used ImageAI is a Python library built to empower developers to build applications and systems with self-contained deep learning and Computer Vision capabilities using a few lines of straight forward code. ImageAI contains a Python implementation of deep learning. The ObjectDetection class of the ImageAI library contains functions to perform object detection on any image or set of images, using pre-trained models. With ImageAI, we can detect and recognize 80 different kinds of common, everyday objects.

We took different pictures of parking spaces from different angles and during daytime and night time. We then evaluate the accuracy and error rate in thise cases.
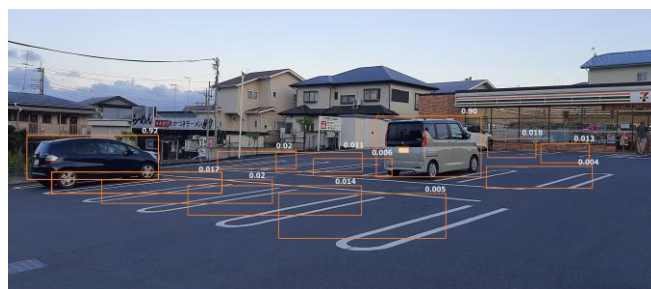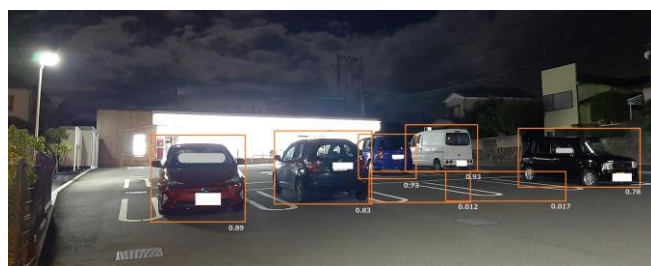

Fig.1 Photo taken during sunset time after treatment

Fig.2 Photo taken during night time after treatment