A Deep Learning Network for Vision-based Vacant Parking Space Detection System

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In the demonstration, we would show our live and real-time parking space detection system. The detection function is founded on a video surveillance system built in an outdoor parking lot. As we might know, it is challenging to implement a practical vision system in an outdoor environment owing to the dramatic lighting changes and uncontrollable variations from weather conditions. Based on a well-trained deep learning network, we hope to show the audiences the robustness of our vacant space detection system and its ability to handle the parking displacement problem, the non-unified car size problem, the inter-object occlusion problem, and the lighting variation problem. The system can infer the status of 71 parking spaces within 0.6 seconds on an Intel Core i5 3.2 GHz processor with an NVIDIA GeForce GTX TITAN X card. Moreover, the system upon our designed deep learning method has achieved promising detection accuracy in a wide variety of outdoor conditions. The novelty lies in the use of a convolutional spatial transformer network to adaptively transform the cropped local image patch so that the normalized patch could be less sensitive to different car sizes and parking displacement. Another novelty of our network is that it also takes the neighboring spaces into concern when estimating the status of the target space. Thereby, the inter-object occlusion problem could be well addressed. Finally, the robust features extracted by deep learning network help to overcome the lighting problem. To make our demonstration attractive, we plan to provide a website to show the live and real-time camera views, indicate the vacant space detection results, and illustrate our designed deep learning framework. In particular, we hope our system is able to attract the audience's eyes and demonstrate a practical vision application for the parking lot management.

Associated paper: ICIP 2017 Paper Submission #1711: A Multi-Task Convolutional Neural Network with Spatial Transform for Parking Space Detection