Faster R-CNN over Attention: Shared Bikes Detection in Surveillance Video

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Since the introduction of dockless shared bikes in 2016, there has been more than 16 million shared bikes in China, and illegal parking has become a serious social issue. However, the common management method of human inspection is ineffective to locate the bikes. The goal of this study is to design a new method for automatically detecting shared bikes in surveillance videos. In state-of-the-art detection networks, advances like Faster R-CNN have reduced the running time, yet there are limitations in processing consecutive images. In this study, I introduce the algorithm of “Faster R-CNN over Attention” (FoA), which can accomplish fine-grained detection of shared bikes in videos. In FoA, an “Attention Region Extraction” (ARE) is introduced to process videos into Attention Regions (defined as video’s background). Then Faster R-CNN would compute the location and brand of shared bikes. An “anchor box optimization” for the network is proposed to generate more specified and robust region proposals with a clustering operation. A dataset with 4,291 images and 12,697 labeled shared bikes is built for the experimentation. The optimized FoA has detection and recognition rates of 94.19% and 92.73% respectively. I generalize FoA into a framework of “Attention Region Extraction plus Region-Based Convolutional Neural Network” (ARE plus R-CNN), discussed as a baseline for specified object detection in videos, such as shopping car, animal, and landscape detection. This study proposes a new management method, expands the utilization of video resource, and provides a possibility to break bottlenecks in video detection.

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