

Video Object Segmentation for Automatic Image Annotation of Ethernet Connectors with Environment Mapping and 3D Projection

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Abstract : The creation of a dataset is time-consuming and often discourages researchers from pursuing their goals. To overcome this problem, we present and discuss two solutions adopted for the automation of this process. Both optimize valuable user time and resources and support video object segmentation with object tracking and 3D projection. In our scenario, we acquire images from a moving robotic arm and, for each approach, generate distinct annotated datasets. We evaluated the precision of the annotations by comparing these with a manually annotated dataset, as well as the efficiency in the context of detection and classification problems. For detection support, we used YOLO and obtained for the projection dataset an F1-Score, accuracy, and mAP values of 0.846, 0.924, and 0.875, respectively. Concerning the tracking dataset, we achieved an F1-Score of 0.861, an accuracy of 0.932, whereas mAP reached 0.894. In order to evaluate the quality of the annotated images used for classification problems, we employed deep learning architectures. We adopted metrics accuracy and F1-Score, for VGG, DenseNet, MobileNet, Inception, and ResNet. The VGG architecture outperformed the others for both projection and tracking datasets. It reached an accuracy and F1-score of 0.997 and 0.993, respectively. Similarly, for the tracking dataset, it achieved an accuracy of 0.991 and an F1-Score of 0.981.

Keywords : RJ45, automatic annotation, object tracking, 3D projection

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