iShape: A First Step Towards Irregular Shape Instance Segmentation

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Abstract

In this paper, we introduce a brand new dataset to promote the study of instance segmentation for objects with irregular shapes. Our key observation is that though irregularly shaped objects widely exist in daily life and industrial scenarios, they received little attention in the instance segmentation field due to the lack of corresponding datasets. To fill this gap, we propose iShape, an irregular shape dataset for instance segmentation. Unlike most existing instance segmentation datasets of regular objects, iShape has many characteristics that challenge existing instance segmentation algorithms, such as large overlaps between bounding boxes of instances, extreme aspect ratios, and large numbers of connected components per instance. We benchmark popular instance segmentation methods on iShape and find their performance drop dramatically. Hence, we propose an affinity-based instance segmentation algorithm, called ASIS, as a stronger baseline. ASIS explicitly combines perception and reasoning to solve **A**rbitrary **S**hape **I**nstance **S**egmentation including irregular objects. Experimental results show that ASIS outperforms the state-of-the-art on iShape. Dataset and code are available at http://ishape.github.io

1 Introduction

Instance segmentation aims to predict the semantic and instance labels of each image pixel. Compared to object detection [1, 2, 3, 4, 5, 6, 7, 8] and semantic segmentation [9, 10, 11], instance segmentation provides more fine-grained information but is more challenging and attracts more and more research interests of the community. Many methods [12, 13, 14, 15] and datasets [16, 17, 18] continue to emerge in this field. However, most of them focus on regularly shaped objects and only a few [19, 18] study irregular ones, which are thin, curved, or having complex boundary and can not be well-represented by regularly rectangular boxes. A more clear definition of irregular shape is "the area of the bounding box is much larger than the area of instance mask
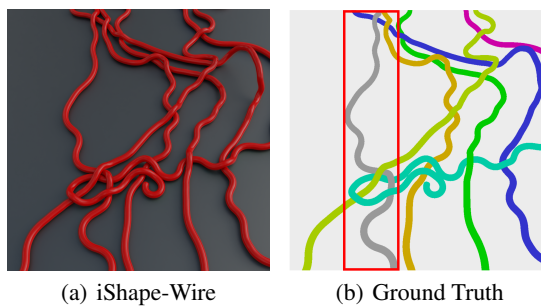

(a) iShape-Wire   (b) Ground Truth

Figure 1: A typical scene of objects with irregular shape and similar appearance. It has many characteristics that challenge instance segmentation algorithms, including the large overlaps between bounding boxes of objects, extreme aspect ratios (bounding box of the grey mask), and large numbers of connected components in one instance (green and blue masks).