首届致远学术节
学生科研成果展示

Annotation-Free One-Shot Learning for Homogeneous Clustered Instance Segmentation

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Keywords: computer vision, instance segmentation

Motivation:

Fig 1. Typical scenarios of homogeneous objects in clusters

Homogeneous object clusters are ubiquitous. Segmentation of homogeneous objects from cluster allows us to give an accurate estimate of the number of objects, which enables many important applications. For example, in medicine, various blood cells count give crucial information on a patient's health. However, recent Convolutional Neural Network (CNN) based methods require many annotated images. Pixel-wise labeling these objects is extremely time-consuming.

Method:

We propose a annotation-free one-shot learning method to tackle instance segmentation of HOC. The main framework is as follows:

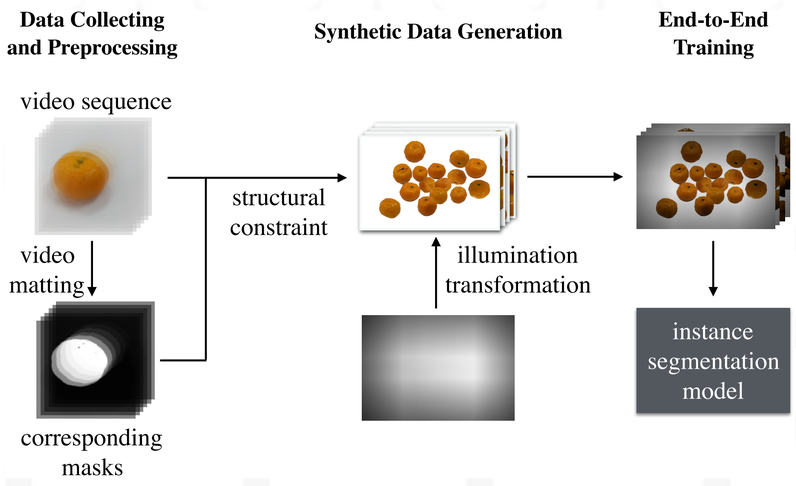

Fig 2. Typical scenarios of homogeneous objects in clusters

The core part of our method is synthetic image gene-ration, which can be divided into two steps:

Step 1. Data Collection and Preprocessing

We take videos for single object. Then the videos are processed to extract each frame. We obtain corres-ponding masks of each frame by performing KNN matting, as shown in Fig 3.

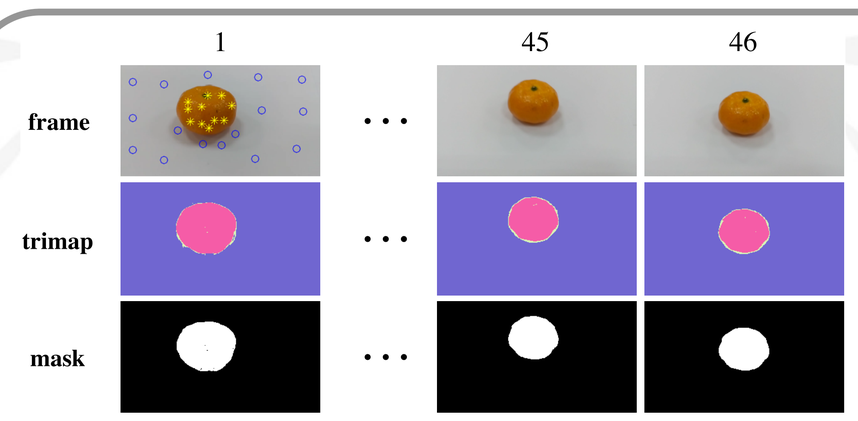

Fig 3. Example of our data preprocessing method.

Step 2. Synthetic Data Generation

As shown in Fig 4, we place N chosen objects on a white background sequentially in an iterative manner. We start by placing one object directly onto the background in iteration 1. For iteration k (1<k<N), we use bayesian optimization to approximate an optimal way to place the object guided by the structure likelihood function we construct.

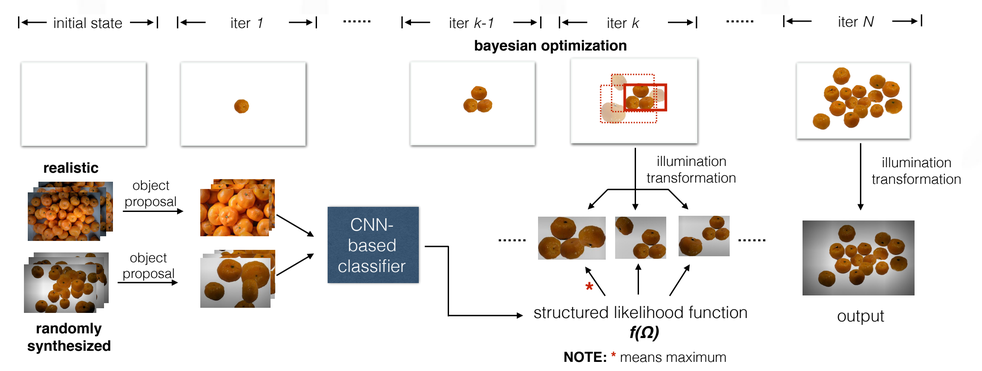

Fig 4. Our method of generating synthetic images.

Experimental Results and Conclusion:

Qualitative segmentation results on our collected dataset are shown in Fig 5.

Fig 5. Our experimental results. C is our method. A and B are baseline methods.

We propose a typical task that segments out homo-geneous clustered objects at the instance level. Experimental results proved efficiency of our frame-work.

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