

User Manual of the Pose Annotation Tool

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1. Introduction

Object pose estimation is an important problem in computer vision. In order to understand 3D objects from 2D images, recognizing the poses of objects is critical. The state-of-the-art methods for object pose estimation [5, 3] resort to supervised learning techniques, where training images with annotated object poses are required. Fig. 1 illustrates the aspect layout estimation problem in [5]. However, obtaining the ground truth annotations for object poses is not a trivial task. For most of the recognition tasks, such as object classification or object detection, the ground truth annotations are provided by humans. But unlike specifying the category of object or delineating the bounding box of object, humans are not good at specifying the pose of object. For example, given an image of a car, humans can not tell the exact angles of the pose of the car. As a result, the current widely used datasets for object pose estimation provide either coarse discretized viewpoints [4, 1] annotated by humans or continuous viewpoints computed automatically from videos but limited object instances [2]. In order to benefit the research on object pose estimation, we believe that a large scale dataset with accurately annotated object poses is necessary. On one hand, supervised learning methods can benefit from more training data. On the other hand, it also poses challenges on the scalability of the existing methods, which can promote new researches on the pose estimation problem. To build a large scale dataset for object pose estimation, we need to design a mechanism to obtain the ground truth annotations of object pose. We have developed an algorithm to compute the pose of object based on human-annotated anchor points of the object. We also designed a MATLAB tool for annotating the anchor points of objects. Fig. 2 shows the interface of our pose annotation tool.

In this user manual, we describe the usage of the annotation tool we developed for annotating object pose. We present the step-by-step illustration of using the annotation tool and explain the principle behind the tool. We also describe guidelines for annotating different categories of objects based on our experiences of using the tool.

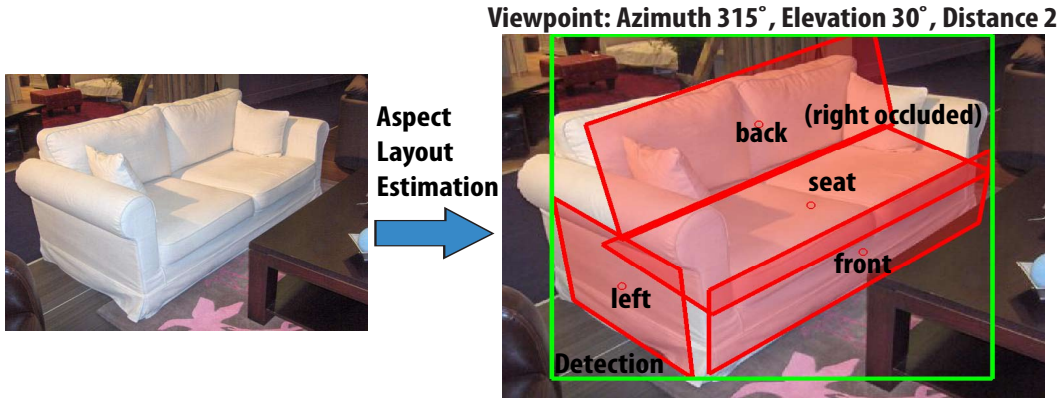


Figure 1. Aspect layout estimation in [5].



Figure 2. Interface of our pose annotation tool.

2. Using the Pose Annotation Tool

We developed the pose annotation tool using MATLAB. If you run the function “anchor_annotator.m” under MATLAB, you are going to see the interface showed in Fig. 2 but with some buttons disabled. In the following, we explain the step-by-step annotation instruction for using the tool.

1. **Load CAD model.** The CAD models define the geometry of object category. There are multiple CAD models for one category in order to capture the intra-class variability. Anchor points are also specified for each CAD model.
2. **Open the directory containing the images to be annotated.**
3. **Open the directory containing the bounding box annotation of the objects to be annotated.** When annotating the PASCAL VOC dataset [1], the bounding boxes of objects are provided. After step 1-3, the annotation tool shows one object in the image bounded by its bounding box, which is the object to be annotated.
4. **Choose one CAD model and align coarse viewpoint.** The user first choose one CAD model which is most similar to the object by using the “Next CAD” or “Prev CAD” button. Then the user align the viewpoint of the CAD to the viewpoint of the object in the image using the four buttons “Left”, “right”, “Up” and “Down”. When this step is finished, click the “OK” button. The annotation tool then shows the anchor points to be annotated one by one.
5. **Annotate the anchor points.** The anchor point to be annotated in the image is also showed in the CAD model. So the user can identify it easily. We define five statuses an anchor point can possess, which is summarized in Table 1. According to different status of the anchor point, the user need to act differently, which is also described in Table 1.
6. **Save the annotation.** When the user finishes annotating all the anchor points, the annotation tool enables the “Save Annotation” button. Remember to click the button to save the annotated anchor points.

Table 1. Statuses of an anchor point.

Status	Explanation	Action
Visible	The anchor point is visible from the coarse viewpoint.	Annotate the anchor point in the image by using the button “Label Anchor Point”.
Self-occluded	The anchor point is occluded due to self-occlusion of the object.	Click the radio button “Self-occluded”.
Occluded-by	The anchor point is occluded by other objects. For example, a portion of a car is occluded by a tree.	Click the radio button “Occluded-by”.
Truncated	The anchor point is outside the image border.	Click the radio button “Truncated”.
Unknown	The anchor point does not belong to any of the above statuses.	Click the radio button “Unknown”.

3. Reminders and Useful Tips

To ensure the quality of the annotation, we summarize the following reminders and useful tips based on our experiences of designing and using the annotation tool.

1. Spend enough time to align the coarse viewpoint well.
2. Use the “zoom in” tool in the left corner of the annotation tool if the object in the image is small.
3. Try to annotate all the objects including small objects. If it is not possible to identify the anchor point, set the status of the anchor point to be “Unknown”.
4. If an anchor point is showed in the CAD model but it is self-occluded in the image, set the status of the anchor point to be “Self-occluded”. This often happens for the bicycle category.
5. If the user wrongly annotate the anchor point, either wrong position or wrong status, just annotate it again. The annotation tool can cover the previous annotation.
6. Set the status of anchor point to be “Unknown” if the user is not sure about its status.
7. Remember to save the annotation by clicking the “Save Annotation” button. The text “Annotation saved” would appear in the right corner of the image if the annotation is correctly saved.
8. For round objects such as bottle or round table, assume the azimuth of the object is always zero when annotating the anchor points.

4. Acknowledgement

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References

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