DelftBikes - Visual Part Verification and Object Detection Dataset

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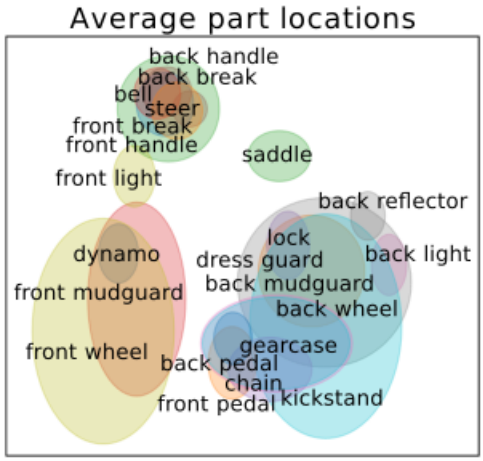
General Introduction

DelftBikes has **10,000** bike images annotated with bounding box locations of **22** different parts where each part is in one of four possible states: *intact*, *damaged*, *absent* and *occluded*. The dataset is designed to study visual part verification study. Because the dataset includes bounding box annotations and class labels, it can be used for object detection and multi-class multi-label classification tasks.

The image below shows that averaging position and size for all 22 parts in DelftBikes resembles a bicycle, illustrating the prior in absolute position and the contextual part relations.



Folder Content

DelftBikes.zip file includes:

- **train:** The folder contains 8000 bike images for training.
- **test:** The folder contains 1000 bike images for testing.
- **train_annotations.json:** The file includes all class, bounding box and object state labels for training set.

- **fake_test_annotations.json:** The file includes fake annotations of the test set, because the dataset will be used for the object detection challenge in 2nd Visual Inductive Priors for Data-Efficient Deep Learning Workshop, ICCV 2021. To check the performance of your method on the test set, you can submit your output to the evaluation server. The real test annotations will be shared later.

Different from other object detection datasets, DelftBikes contains object state labels for every possible parts of a bike as *intact*, *damaged*, *absent* and *occluded*.In the figure below, for instance, the saddle in (a) and the wheels in (e) are absent. The saddle of the bike is occluded by a plastic bag in (b).

The DelftBikes dataset underlays the following publication: Hallucination in Object Detection - A Study in Visual Part Verification, ICIP, 2021.

Hallucination in Object Detection - A Study in Visual Part Verification

Abstract

We show that object detectors can hallucinate and detect missing objects; potentially even accurately localized at their expected, but non-existing, position. This is particularly problematic for applications that rely on visual part verification: detecting if an object part is present or absent. We show how popular object detectors hallucinate objects in a visual part verification task and introduce the first visual part verification dataset: DelftBikes, which has 10,000 bike photographs, with 22 densely annotated parts per image, where some parts may be missing. We explicitly annotated an extra object state label for each part to reflect if a part is missing or intact. We propose to evaluate visual part verification by relying on recall and compare popular object detectors on DelftBikes.

How do the common object detectors hallucinate the objects?

The figure below shows some hallucination examples on DelftBikes for FasterRCNN, RetinaNet and YOLOv3. Faster RCNN and RetinaNet detect the front wheel and YOLOv3 predicts the saddle with a high IoU score. Deep object detectors may detect non-existent objects at their expected locations.

For more information about the dataset and the task, please check the paper.

Citation

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