02502 Image Analysis
Exercise 08 - The DTU Sign Finder Challenge

2018

Introduction

The goal of this exercise is to create a program that can automatically locate DTU signs in standard street photos.

The algorithm will can be based on RGB pixel classification, morphology and BLOB analysis. A set of photos are provided. They can be divided into a training set and a validation set. Finally, your algorithm should be uploaded and it will be used on a set of challenge photos and a score will be computed.

The code for the challenge should be delivered latest **November 20.** using CampusNet. You can deliver in groups of 1 to 4 persons.

The data for the exercise can be downloaded from

`http://courses.compute.dtu.dk/02502/`

Goal of the exercise

The goal of the exercise is to create a Matlab function that can automatically locate signs in the photo. The output of the function should be a label image (label map), where the background has value 0 and the first sign has value 1 and the next has value 2 and so on. An example function called `MyDTUSignFinder.m` is supplied. You should rename this function and use that as a basis for you own function. Remember to give the function a catchy name: **IHaveSeenTheSign**, **SignMeUp**, **SignAlong**...

Data

The data for this exercise consist of 34 photos where there are one or more DTU signs present. For each photo there is also a text file with coordinates of the corners of the signs in the photo. A function (`CreateLabelMapFromAnnotations.m`) is supplied that can create a label image (label map) from the annotations. In the label image/map the background has value 0 and the first sign has value 1, the next value 2 and so on.

Performance evaluation

In order to measure the performance of the algorithm an overlap of the results found by the algorithm and the ground truth is computed. We use the DICE score to measure that overlap. The DICE score ranges from 0 (no overlap) to 1 (full overlap). For each ground truth label (a sign) the label with the largest DICE score in the found results is used. A combined DICE score, that is the average DICE score of all matching ground truth and found signs is computed using `CombinedDiceScore.m`.

Supplied scripts and functions

We have supplied you with a set of scripts and functions to get you started. Start by looking at these scripts and get a good understanding of how they work.

Training

A script called `training.m` is supplied. Here you find a skeleton to read an image and its annotations and learn from it. You can use this script to experiment with different tools and approaches.

Test on one image

You can test your own function on one image using the script called `TestOnOneImage.m`. The script will compute the combined DICE score and also plot the ground truth and the script output.

Test on validation set

Using the `TestOnValidationSet.m` you can test your function on a set of validation images. You can choose which images you want to include in the validation set. The goal is to get as low a combined DICE score as possible and to avoid having too many false detections (objects found that are not signs).

How we test your function

We test your function on a separate test set of photos using a script very much like `TestOnValidationSet.m`. Your function should therefore:

- Take as input a photo
- The output should be a label image (0 - background, 1 - sign 1, 2 - sign 2...)

- It must not require any any user/manual input
- It should not show any image or dump a lot of numbers

Proposed Strategy

A suggested strategy for finding signs:

- Use pixel classification (like exercise 7) to find suitable pixel value ranges and create a binary image
- Use morphological operations (like exercise 5) to remove small objects, close holes and separate objects
- Use BLOB analysis (like exercise 6) to find good sign candidates.
- You can try to learn the optimal BLOB features by using a set of the supplied photos