

Exercise: Tracking by Detection

1. Learning goal

In the lecture we have talked about two approaches for object-based environment models for ADAS: *Tracking-by-Detection* and *Detection-by-Tracking*. In this exercise you shall deepen your understanding of the first approach by writing an own person tracker that uses the input from a very unstable person detector (the HOG person detector).

2. Download a video showing a person that we can track

Download the video

http://www.juergenbrauer.org/teaching/multimodal_sensor_systems/exercises/zebra3d.mp4

It is the sequence shown at the end of the video:

“3D Zebra Crossing Stuns Villagers”

<https://www.youtube.com/watch?v=LxdgKDSOIEY>

3. Write a person detector and a person tracker

Tracking-by-Detection in the context of person tracking is the approach where individual detection results are used to generate new person hypotheses or update existing ones.

For this, first think about which data a person hypothesis (that is tracked over many frames) shall store and use a corresponding class to store the data items.

Then, write a class `tracker` with a method `feed()` where you feed in the detection results from a HOG person detector (an implementation is provided in the OpenCV): a list of rectangles (= person bounding boxes).

Loop through all detection bounding boxes `B` and for each `B` loop through all person hypotheses `H`. Check whether the bounding box `B` and person hypothesis rectangle `H` can be considered similar: do they correspond? (→ correspondence problem). If yes, update the person hypothesis based on the rectangle `B`.

For each bounding box `B`, where no corresponding person hypothesis could be found, create a new person hypothesis.

Also think about how you could give each person hypothesis a confidence value: a value that represents how sure we are that there really is a person.

Finally, visualize the person hypotheses. A tracking result could look similar like this:

<https://www.youtube.com/watch?v=JeWmeYupsk4>