

Assignment 2: Retiming

for Video Analysis at TU Vienna 2016W

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a. What is the goal of Optical Flow Estimation, and what applications can it be used for?

The goal of Optical Flow Estimation is to measure the movement of objects in a scene, by measuring movement of similar patterns between images of the scene. The term object here loosely refers to anything that would behave as a coherent unit of patterning between consecutive frames.

Applications range from general movement detection e.g. for robotics, video compression, object tracking, to estimation of 3D structure of a scene.

b. Which assumption is causing problems when Block-Matching techniques are used for the Optical Flow Estimation?

The Constant Intensity/Brightness Assumption in combination with Block Matching means that we look for shifted blocks where all pixel intensities are as similar as possible. This effectively means that all pixels in the block have to move as one unit, so that they will be found again in the next frame. Needless to say however, the objects moving around are rarely all image plane aligned square blocks. Thus we will have a lot of wrong estimates between the centers of the uniform blocks.

c. What means “filling-in” in the context of the method by Horn & Schunck and what are the benefits of this effect?

If there is no flow data itself available at a position, and the region around is sufficiently smooth, the missing flow information for this homogenous regions is filled in from the surrounding pixels. Thus we cheaply get a higher density of flow vectors in homogenous regions.

d. What does it mean if the Data Term in the Horn & Schunck Energy Function is very large?

The data term models the direction of greatest change (the intensity gradient). We subtract it from our current solution to get more and more away from directions of greater change to directions where the Constant Intensity Assumption holds. If the Data Term is large it thus means we have high deviations from the Constant Intensity Assumption.