

E9 208 Digital Video: Perception and Algorithms

Assignment 1

(Due Sep 17, 2021)

Note: The assignment needs to be uploaded on Teams. Late submissions will be penalized.

Video Interpolation using Optical Flow

In the given video sequences, you are required to interpolate a video frame in between two alternate frames using optical flow. In particular, you are required to estimate the forward optical flow (flow from Frame n to Frame $n + 2$) and the backward flow (flow from Frame $n + 2$ to n) and use both of them to estimate the intermediate Frame n . Compare the performance of the following optical flow algorithms in terms of the quality of the estimated intermediate frame (the reference intermediate frame is already available for this comparison):

1. Multiscale Lucas-Kanade optical flow: If you prefer, you can use any library functions for the single scale flow, provided they implement the algorithm discussed in class for dense flow. But you need to implement the multi-scale flow yourself.
2. Multiscale Discrete Horn-Schunck optical flow: Again, you can use library functions for the single scale. You need to implement the multi-scale version.

You can choose a maximum of 3-5 scales in your analysis depending on the frame resolution. Upload the code and a report on the questions:

1. Show the interpolated frames and comment on the visual performance.
2. Include the numerical performance comparisons for interpolation according to the two methods.
3. Does the multiscale approach improve over the single scale estimates in terms of interpolation? When does this happen? Compare the numerical performances with variation in the number of scales.
4. While estimating the interpolated frame, there could be pixels which do not map to any location to either the forward or the backward frame. Present simple heuristics to resolve such situations.