

ECCE 633 – Machine Vision and Image Understanding

Assignment 3

Announced: **11 Nov. 2021**

Submission deadline: **22 Nov. 2021**

Acceptable forms of submission:

Online (using E-Learn) –ZIP, or DOC(X)/PDF files that includes the source code

OPTICAL FLOW

In this assignment you will implement the Lukas-Kanade algorithm and use it to compute the optical flow between two frames

1. Choose two consecutive images from a video sequence. Convert images to grayscale.
2. Smooth the two images using Gaussian filters.
3. Calculate the spatial derivatives $E_x = \partial E / \partial x$ and $E_y = \partial E / \partial y$
4. Calculate the time gradient by the difference between consecutive frames, simply subtracting the two frames as $E_t = I(x, y, t + 1) - I(x, y, t)$.
5. Display the original image and the spatial and time gradients.
6. Compute the flow vectors u and v . To compute these parameters, you need to select a neighborhood size and then solve the optical flow equation using points in the neighborhood.

$$\begin{bmatrix} u \\ v \end{bmatrix} = (A^T A)^{-1} A^T b$$

Where A is the spatial derivatives matrix and b is the negative of the matrix of time derivatives.

7. Display the computed flow vectors over the original image.
8. Discuss your results.