UNIVERSITY OF MALTA
DEPARTMENT OF COMMUNICATIONS AND COMPUTER ENGINEERING

# Lab #4: Optical Flow

Course: *Computer Vision (CCE5205)* – Lecturer: *Dr. Reuben Farrugia*

The aim of this laboratory session is to implement and analyse the performance of the Horn and Schunck optical flow method [1]. Download the Data/ folder from the VLE. This folder contains a video file named `vtest.avi` that will be used in this evaluation.

**Question 1**: Use the `opencv` library to read the the first two frames from the video and display them next to each other using the `matlibplot` library.

(a) First Frame (b) Second Frame

Figure 1: First two frames of the video.

**Question 2**: Write a function that computes the gradients $f_x$, $f_y$ and $f_t$ . Compute these gradients when considering the first two frames.

(a) Gradient $f_x$ (b) Gradient $f_y$ (c) Gradient $f_t$

Figure 2: Computed gradients.

**Question 3**: Write a function that can be used to estimate the flow vectors **u** and **v** using the Horn and Schunck method [1].

(a) Flow Vector **u** (b) Flow Vector **v**

Figure 3: Flow vectors when considering the first two frames.

**Question 4**: Use the following script to visualize the flow when considering only the first two frames of the video. Explain what this script is doing and comment on the result.

```
mag, ang = cv2.cartToPolar(U,V)
hsv[...,0] = ang*180/np.pi/2
hsv[...,1] = 255
hsv[...,2] = cv2.normalize(mag,None,0,255,cv2.NORM_MINMAX)
rgb = cv2.cvtColor(hsv,cv2.COLOR_HSV2BGR)
```

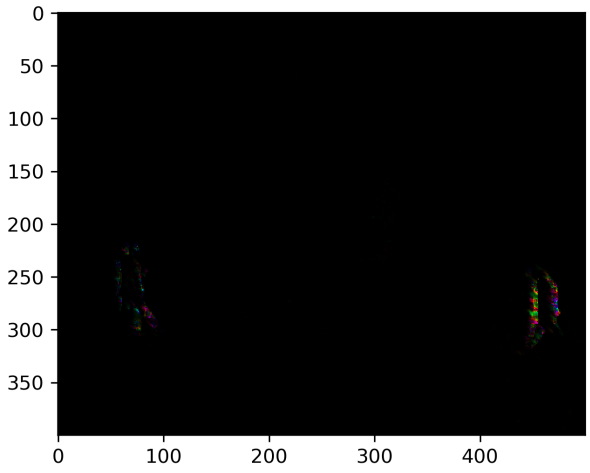


Figure 4: Visualization of the flow vector for the first two frames.

**Question 5**: Use the developed script to compute the flow of the first 100 frames of the video.

## References

[1] B. K. Horn and B. G. Schunck, "Determining optical flow," tech. rep., USA, 1980.