REFERENCE REPORT

1. Explaining Optical Flow scenerios
   a) Describe a scenario where the object is not moving but the optical flow field is not zero. Scenarios like these are extremely typical when photographing i experienced them many times when doing it.. For example, when taking a photograph when the camera suffers shaking or vibrations. In such cases, the optical flow field may appear to move even though the object or person is motionless. The optical flow field reflects the observed motion of objects in the picture generated by camera movement.

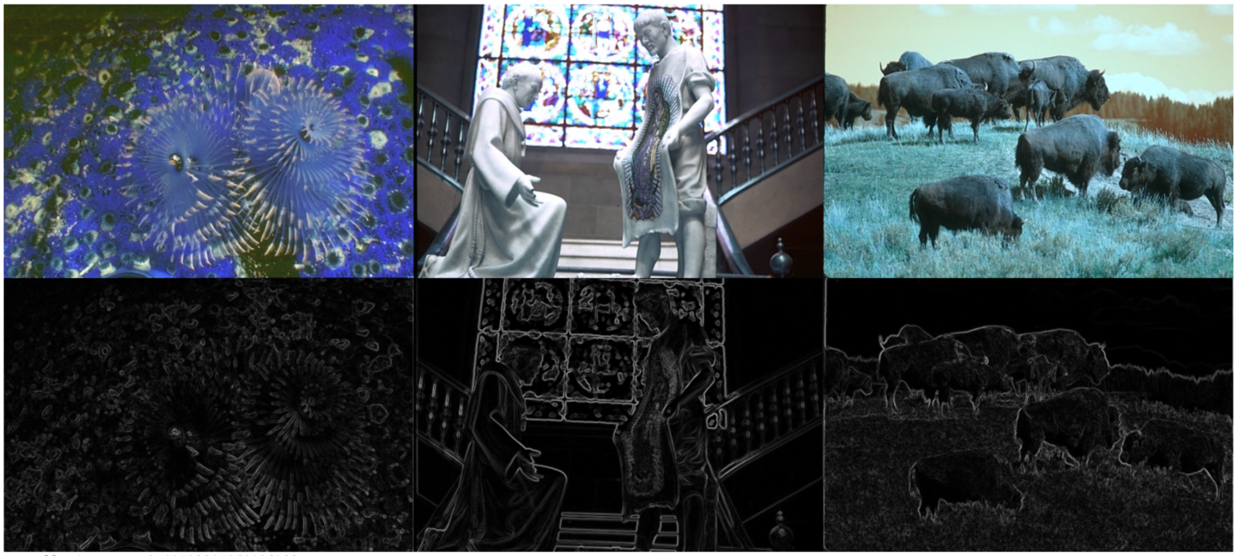
b) The Constant Brightness Assumption (CBA) is used in the Lucas and Kanade Algorithm. Describe how the algorithm to handles the fact that the assumption might be violated.

To lessen the impact of pixels that violate the CBA, a technique known as local image alignment and a weighting function are used. If the CBA is local, this calls for picking a small neighborhood around each pixel and fitting a linear model to the intensity values of the pixels in the area. This linear model's coefficients are used to calculate the displacement vector between the two frames. When calculating the optical flow, errors may occur because the linear model may not accurately reflect the pixel intensity values in a region where the CBA is broken. The accuracy of the optical flow estimation is further increased by the employment of a multi-scale method to manage significant displacements and motion blur.

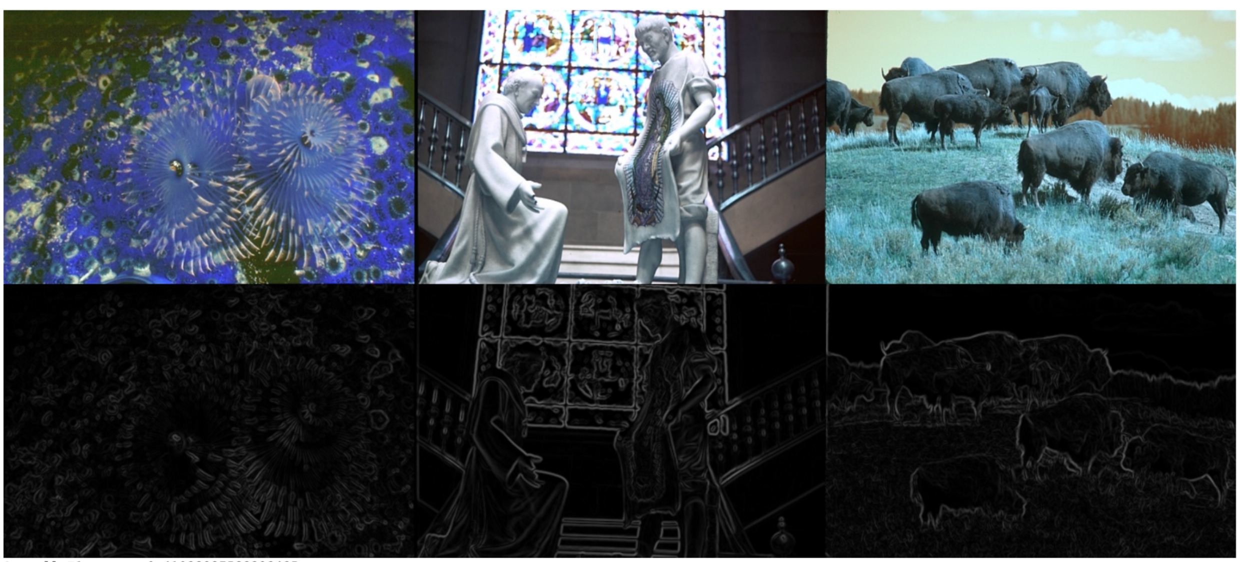
c)Why does the first order talor series provide a reasonable approximation for estimating optical flow?
Because it gives a linear approximation of the image intensity function with respect to spatial coordinates, the first-order Taylor series provides an acceptable approximation for calculating optical flow. The assumption is that a pixel's brightness remains constant between consecutive frames and that its intensity varies linearly with tiny pixel displacements in the picture plane. This approximation works effectively for tiny displacements or sluggish motion with minimum intensity change.This approximation, however, has limits. If the distance between frames grows, or if the brightness of a pixel changes dramatically between frames owing to variables such as illumination, occlusions, or reflections, the first-order Taylor series approximation may become less accurate. To overcome these constraints, the Lucas-Kanade method employs additional techniques such as multi-scale approaches and robust statistics.

2. In this Section i could Archive almost the same F1 scores as that given.

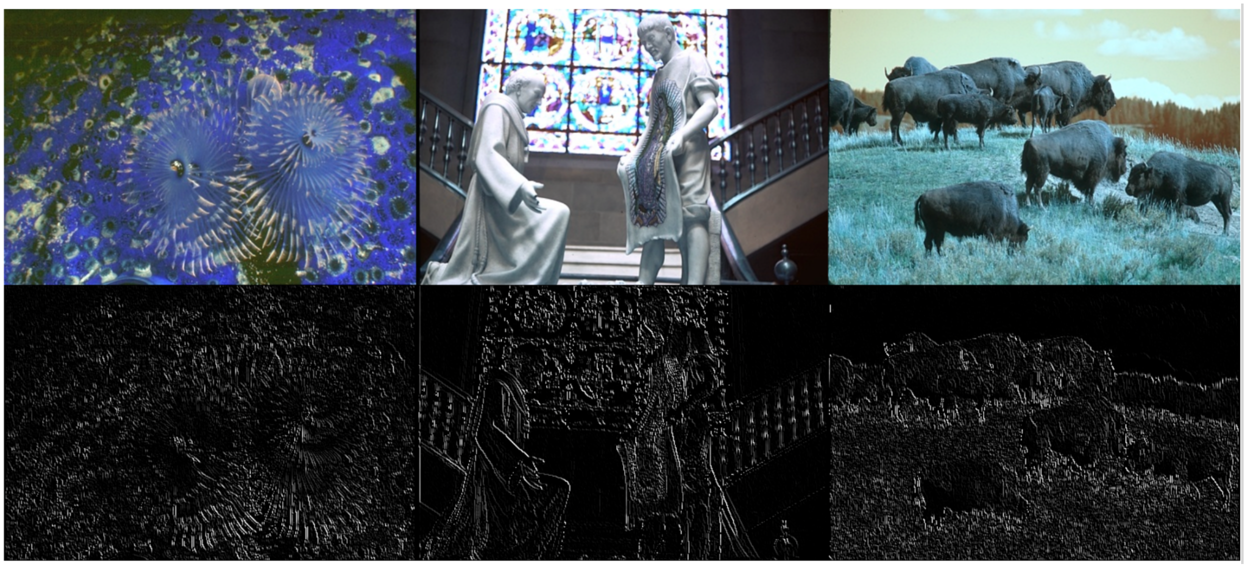
a) This part has been very easy to implement for with the given code from before
F1 score: `0.41708345464106783`



b) Even this part was kind of easy but took a bit time to get the edges correct. Most of the time i had a black output .`sigma=1.5`
F1 score: `0.41038987582293435`



c) My image either was white or black, couldnt figure out the mistake i did. With the help of TA i have overcome this situation
F1 Score: 0.4349993907608115



3. Image Stitching is done almost perfectly here:

a)

b) `Inliers: 275`

c)

d) Bonus: