**Computer Vision - 217**

**Homework 3**

**Chen Naveh - 301841664**

**Elad Wasserstein - 204499149**

**Answers for questions:**

**Part A: Computing OF using Lucas-Kanade**

Question 5:

I ran the function OF in several scenarios:

1. Several pairs from the video Slide.avi
2. W - Changing the window size of the region
3. K - The distance between frames
4. Sigma – the sigma of the gaussian

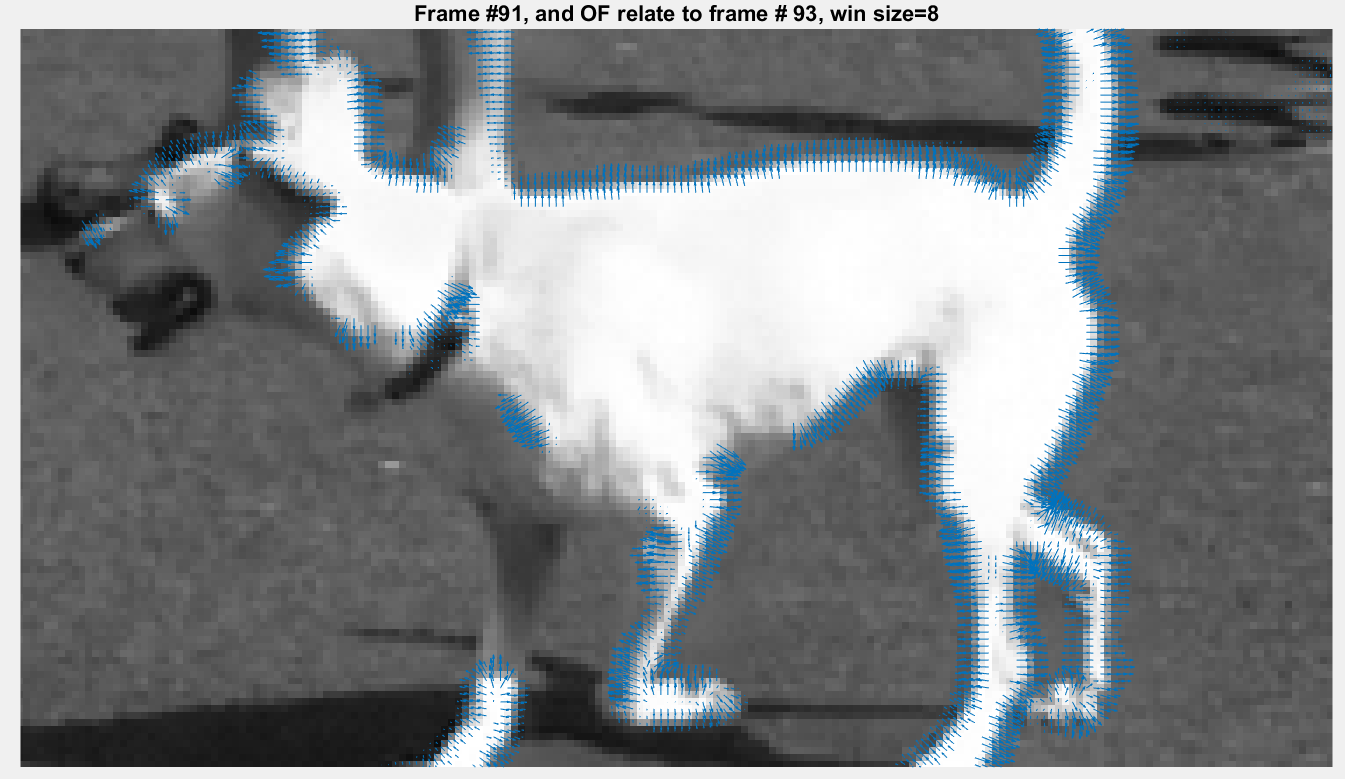
When using bigger window size each pixel has more influence on its neighbors, i.e. the algorithm can mark a pixel moving in an opposite direction or has a smaller magnitude because of its neighbors. Moreover, when using larger window, the construction of the optical flow formulas won't be correct especially when using Taylor series.

When increasing K (the distance between frames) and there is a fast motion we will miss those motion therefore for scenarios we want to segment background there is a chance we will mark moving objects as background.

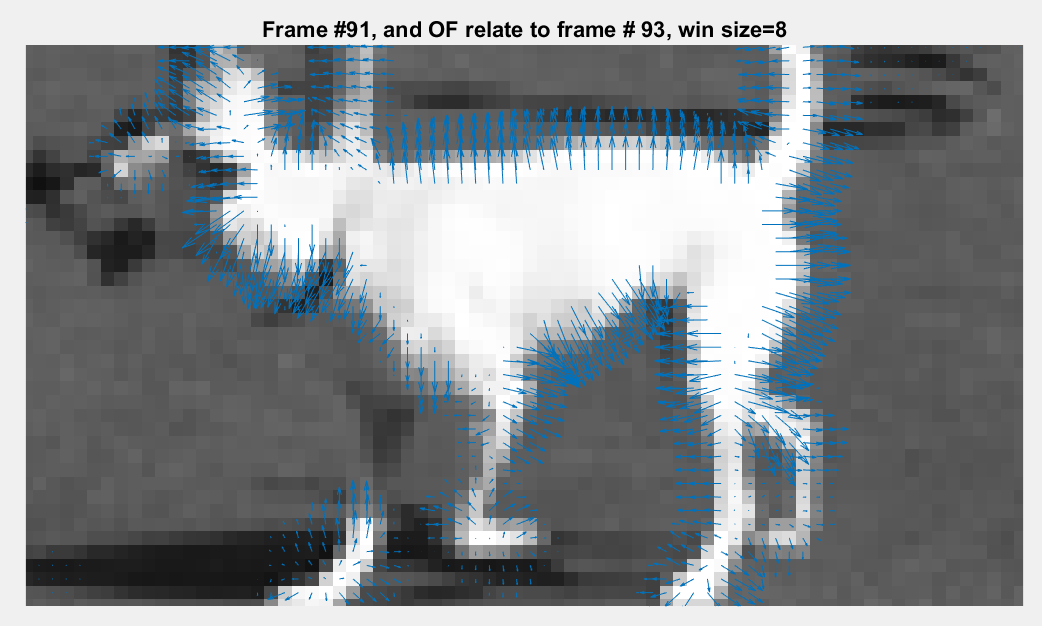
Question 8:

1. We chose to scale the image from 0.3 to 0.8. Here a sample example of 2 scales:

**1st picture with scale of 0.8:**



**2nd picture with scale of 0.8:**



1. If we use larger scale, then we have better accuracy in all pixels and if we use smaller scale then we will receive the optical flow of large motion

The right order to compute optical flow is to start from small scales (large optical flow) to large scales (small optical flow)

**Part B:**

* No question in this part

**Part C:**

Question 14:

* The OF has an advantage to recognize better edges in contrast to the median change detector where it has better performance on the objects itself.
* The median has better results to detect when there are fast changes because the median filter looks for the majority intense of each pixel. For instance, the median detector recognized great the fast-moving dog in the movie.
* A region OF works better is at the top of the slide region. Most of the video children are sitting on top of the slide and when they move the algorithm recognize the slide behind them we obviously the slide show be marked as background and not foreground. The reason it is like that in the median detector is because most of the video the pixels didn’t change and then when the top slide was revealed the detector thought it is a foreground

**Part D:**

Question 16:

The assumption we take into consideration when using optical flow are that the motion in the scene should be small and the intensity of the pixels should be consistency. Moreover, we will receive better results when each pixel is moving in the same directions as its neighbors

Question 17:

No, it does not necessarily imply that they are projections of two 3D points that move at the same speed and direction.

For instance assume two objects in the 3D world, one which is further away from the camera and move fast and the other which is closer and moves slower. both can be detected with the same optical flow.

assume two objects one which has vector component away from the camera (away from center of projection) and the other which doesn't. both can be detected with the same optical flow even though they move directionally different in the 3D world

Question 18:

In order to recognize if a scene is planar we can film the scene by moving slowly the camera and calculating the optical flow the video. If orientation of the optical flow is equal for most of the scene then we can assume the scene is planar

Question 19:

1. The expected orientation of the optical flow will be similar in all pixels and in the X axsis
2. In order to recognize if the object is far or close we can use the magnitude of the optical flow. While the large magnitude indicate that the object is close and small magnitude indicate the object is far from the camera.