Part A – General Questions:

1. From Bayes’ theorem :

The posterior probability of a random event or an uncertain proposition is the conditional probability that is assigned after the relevant evidence or background is taken into account.

The prior probability of a random event or an uncertain proposition is the unconditional probability that is assigned before any relevant evidence is taken into account.

The likelihood function measures the goodness of fit of a statistical model to a sample of data for given values of the unknown parameters.

The Kalman/Particle filter is a process that helps us combine a model and measurements to provide better estimation. The filter uses prior data and model to estimate the observed state vector value in real time – If the input data is very noisy, the estimation would be based more on the model and if the model prediction produces a large error when compared to the real time samples, , the estimation would be based more on the input data.

1. For the measurement step in the particle filter, we used the histogram of the two patches:
2. We use the histogram to create more particles in the areas where the probability was higher in the previous step. The histogram shows us how close the pixel values were between different patches. The advantage of using the histogram to score the patches

Advantage: Assuming there was not too much movement, we modeled more than the area where the object was. We are more likely to find a more accurate location of the requested object in the new image

חסרון: במצב של under-sampling ייתכן ואובייקט שע"פ פונקצית המשקלים רוב הסיכויים יימצא במיקום

1. When using SSD we just calculate the sum of the squared difference value for each pixel, so for matching images the SSD will be small.
2. Particle filter will work when the tracked object changes it scale if we use dynamic update rules.

For a person walking towards and away from the camera we should update the height and width of the object which change as the person walks. We will need to keep update the state vector (location (x,y), height and width) for each step.

For a person dancing when the viewpoint of the object changes we will need to add rotation parameters to the state vector. In addition, we can choose the center of the person as the object and by that improve the algorithm chances of success.

1. Using Markov assumption we can assume that all the data we need can be taken from last frame.