Question 1

Normal optical flow

1. Create a 101x101 image with a black (0) background and a white (255) box of size 21x21, placing the upper-left corner at pixel (row=40, col=6). Create another new box image, but shift the box 1-pixel to the right and 1-pixel down. Compute the normal flow between the images. Draw the flow direction on the four corners, and randomly sample 10 points on the four edges and draw the flows. Is the result what you expected? Why or why not? Comment on the flow for the 4 sides of the box and also the 4 corners.
2. **Submission**: 1. Submit your code. 2. Write a report (pdf file), which includes the result image and your comments.

Question 2

Particle filter tracking

1. Implmente particle filter and track the red cloth in the video.
2. **Testing videos**: Use the attached video, person.wmv, to test you tracking algorithm.
3. **Hint**: Use the following equation as the likelihood of particles.

   $P(Z_n|X_n^k) = \frac{1}{\sqrt{2\pi}\sigma} * exp(\frac{-d^2}{2\sigma^2})$

   $d = \sqrt{(r-255)^2 + g^2 + b^2}$

   r,g,b are the pixel color and you can choose the σ.
4. **Submission**: 1. Submit your code 2. submit the video of the tracking result 3. write a report to discuss what your state vector is and why you define this state vector. Do you assign the prediction noise? If so, what your prediction noise is and how do you define it?