

Question 1

Particle filter tracking

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

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

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

r,g,b are the pixel color and you can choose the σ .

4. You can not directly call particle filter related functions. Any other functions are welcome.
5. **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?

Question 2

NCC template matching

1. There is an elephant in the room. Can you find it? Search for the template template.png in the search image search.png using color-based NCC. Assume the origin is in the center of the template image for each approach (Note: there should be a border around the search image where the metrics cannot be computed).
2. Sort the resulting scores from best to worst. Plot all of the sorted scores and show the patches corresponding to the 1st, 2nd, 5th, 10th, 100th, and 500th closest matches. Compare the results and shortly discuss them.
3. You can not directly call template matching functions. Any other functions are welcome.
4. **Submission:** 1. Submit your code. 2. Write a report (pdf file), which includes the result image and your comments, comparison and discussion.