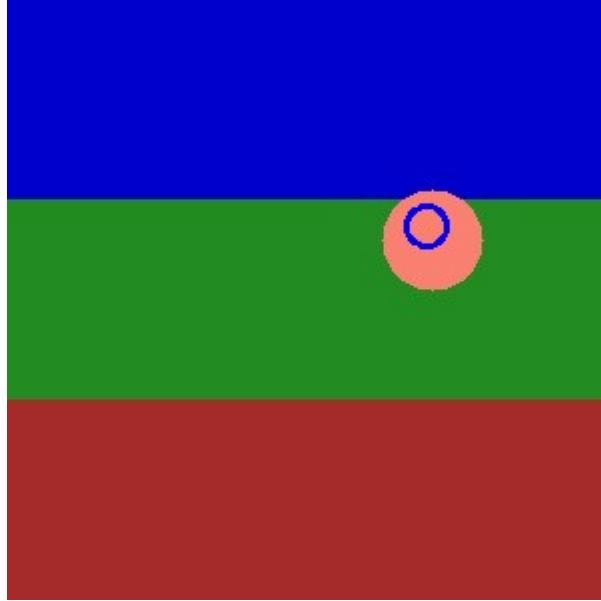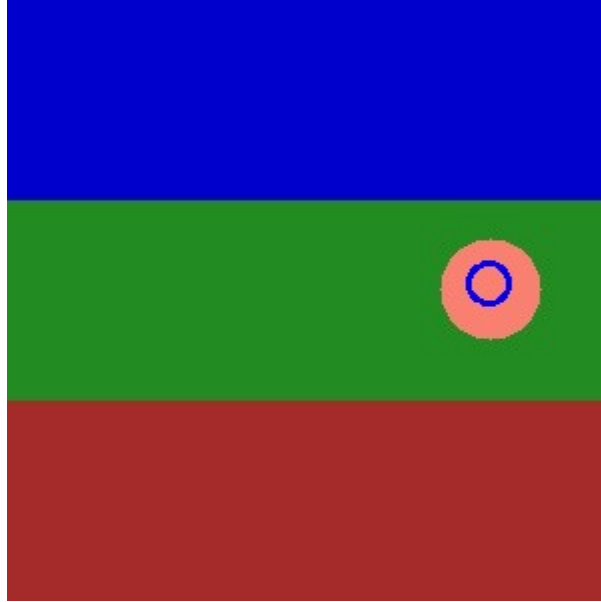# Computer Vision (Spring 2019) Problem Set #5

Jijun HU
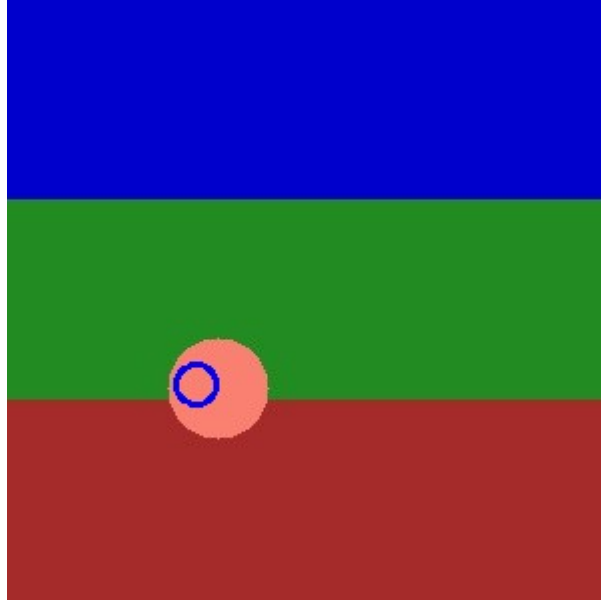jijun.hu.0930@gatech.edu

1b: KF Tracking a circle

ps5-1-b-1

1b: KF Tracking a circle (cont.)
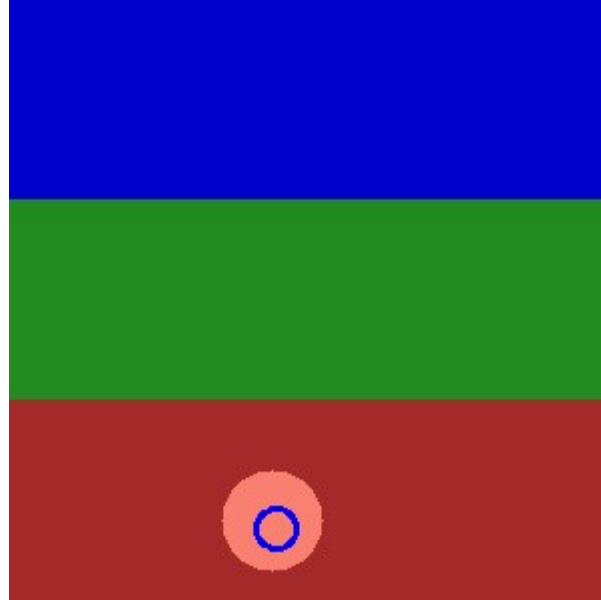

ps5-1-b-2

1b: KF Tracking a circle (cont.)

ps5-1-b-3

1b: KF Tracking a circle (cont.)

ps5-1-b-4

1c: KF Tracking pedestrians

ps5-1-c-1

1c: KF Tracking pedestrians

ps5-1-c-2
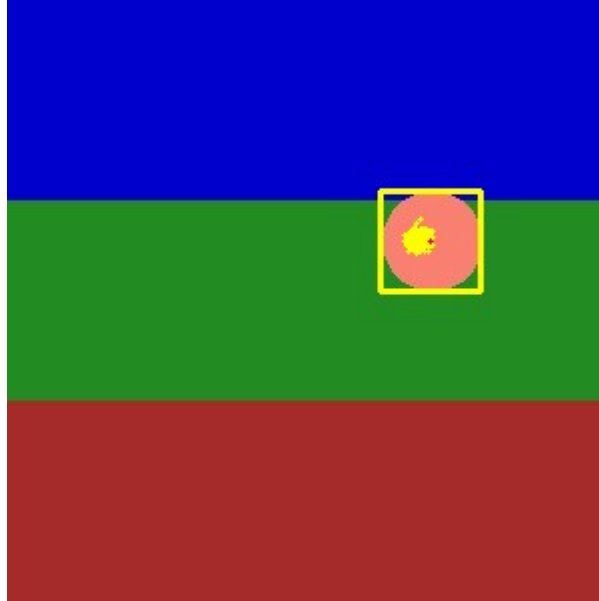
1c: KF Tracking pedestrians
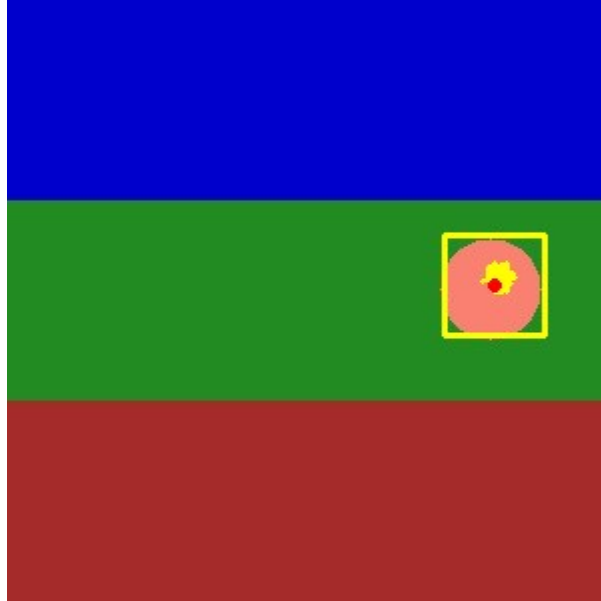

ps5-1-c-3

1c: KF Tracking pedestrians
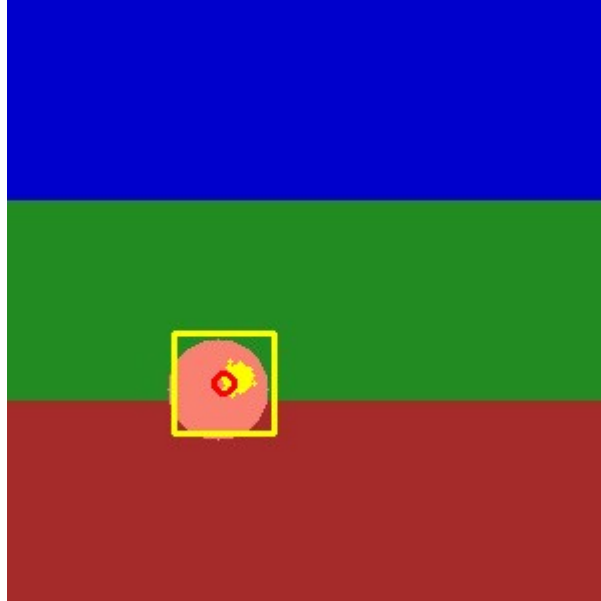

ps5-1-c-4

2a: PF Tracking a circle

ps5-2-a-1

2a: PF Tracking a circle (cont.)
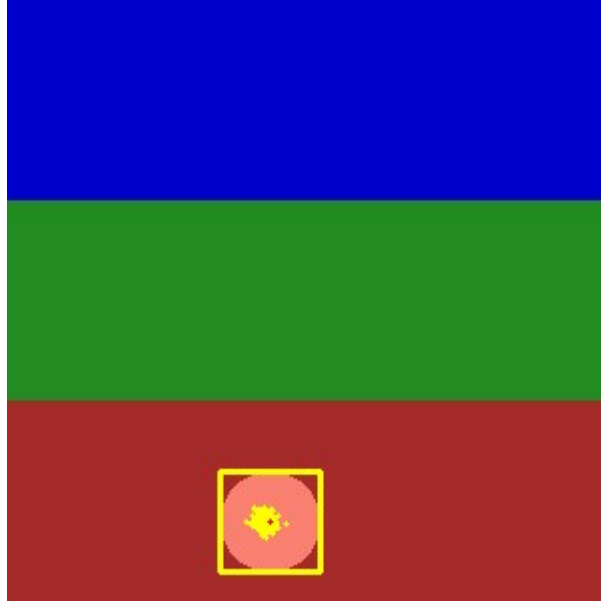

ps5-2-a-2

2a: PF Tracking a circle (cont.)

ps5-2-a-3

2a: PF Tracking a circle (cont.)

ps5-2-a-4

2b: PF Tracking noisy video

ps5-2-b-1
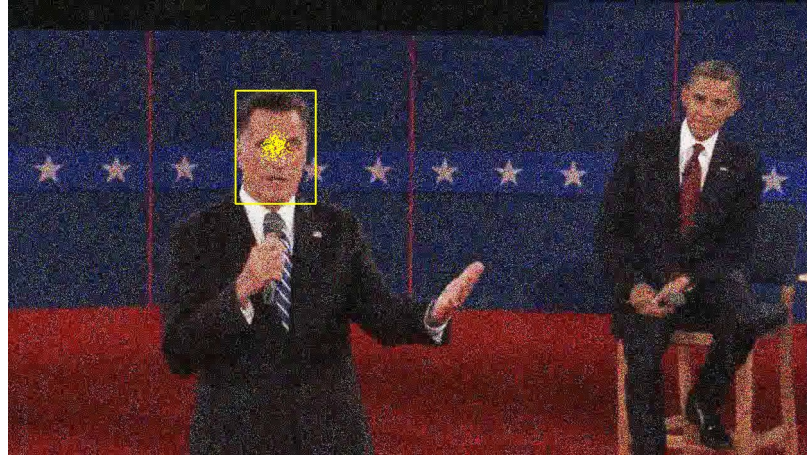
2b: PF Tracking noisy video (cont.)
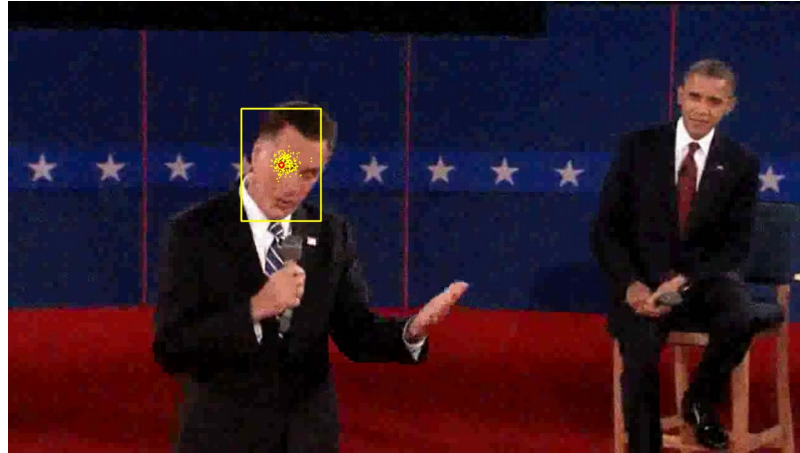
ps5-2-b-2

2b: PF Tracking noisy video (cont.)
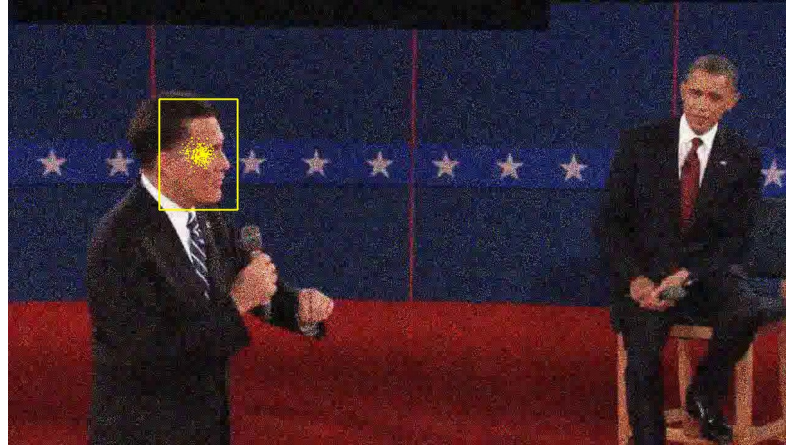
ps5-2-b-3

2b: PF Tracking noisy video (cont.)
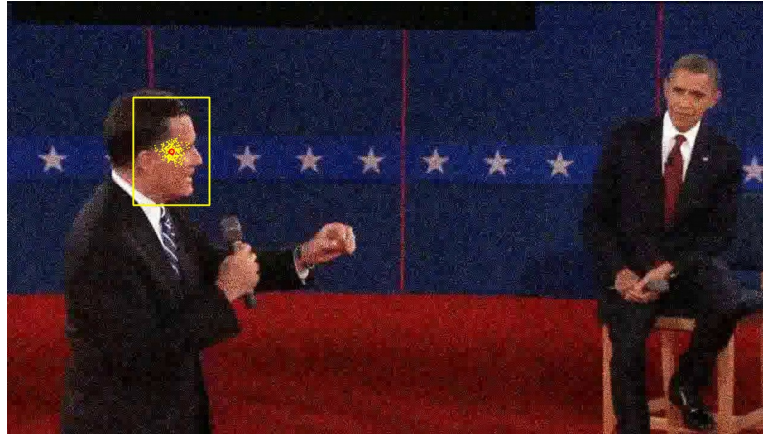
ps5-2-b-4

3a: PF Changes in Appearance

ps5-3-a-1

3a: PF Changes in Appearance (cont.)

ps5-3-a-2

3a: PF Changes in Appearance (cont.)

ps5-3-a-3

4a: PF Occlusions
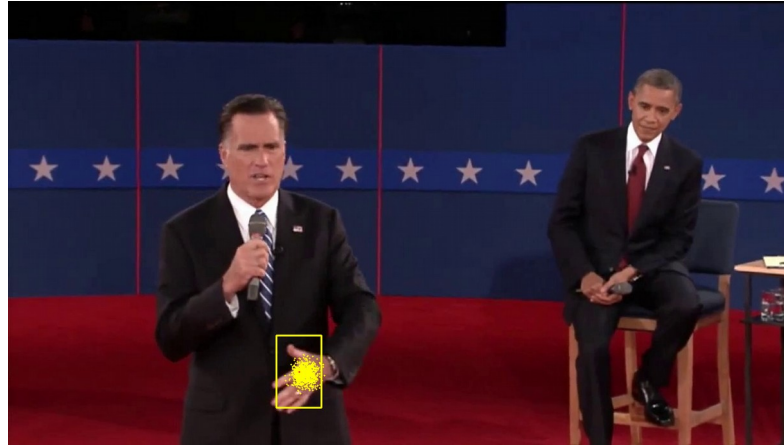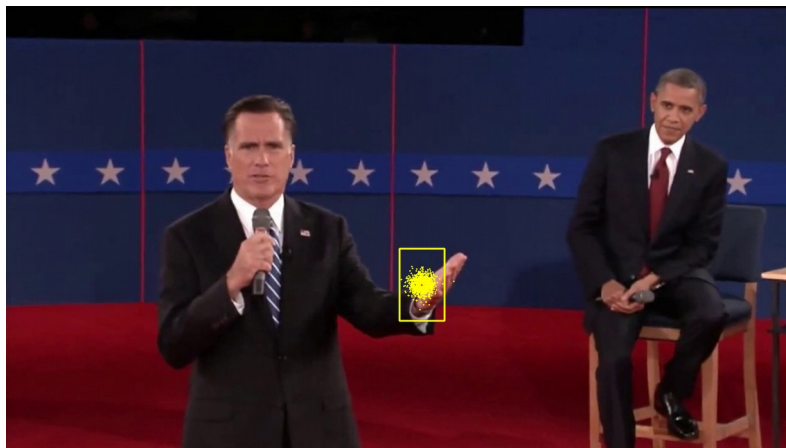

ps5-4-a-1

4a: PF Occlusions (cont.)

ps5-4-a-2

4a: PF Occlusions (cont.)

ps5-4-a-3

4a: PF Occlusions (cont.)

ps5-4-a-4

4: Text response

Describe what you did. How did you modify the Particle Filter class to continue tracking after occlusions?

First I added one more dimension to the particles, called scalar, to adjust the window size. Like what we did for the particle filters, I added some random noise to this scale factor, so this noise will be applied on the dynamics model allowing the scale factor become smaller and smaller. In terms of occlusions, what I did is thresholding, meaning I only run particle filters when the similarity score is larger or equal to my input threshold, or it would keep the parameter as it. Talking about the threshold, what I proposed here is to use the non zero median of all weights of previous iteration.

5: Tracking multiple targets
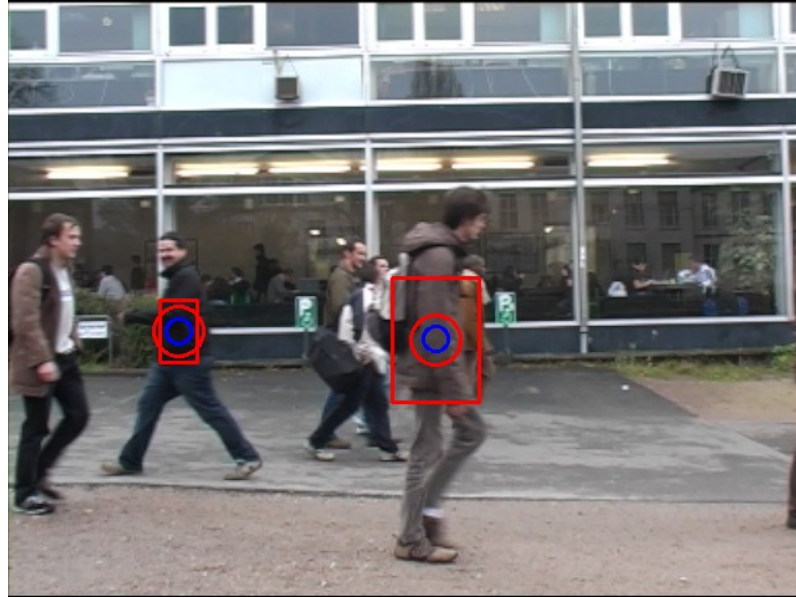
ps5-5-a-1

5: Tracking multiple targets (cont.)

ps5-5-a-2

5: Tracking multiple targets (cont.)

ps5-5-a-3

5: Text response

Based on what I have tried, I think KF works better than PF. I turned the parameters for PF a lot, but still cannot get ideal result.

In terms of working with KF, I did some exploration of all the frames, figuring out all three persons' entry point and exit point and use them as an input of my tracking inputs'.

Talking about these two models, I feel KF should perform better in this case, cause KF is more like a linear dynamical models with Gaussian noise, which is often optimal to track multiple targets in a relative simple situation, but particle filter is more like a sequential dynamic approach, which is more general and good for complex situations.

6: Challenge Problem

ps5-6-a-1

6: Challenge Problem (cont.)

ps5-6-a-2

6: Challenge Problem (cont.)

ps5-6-a-3

6: Challenge Problem Text response

Describe what you did. Did this task present any additional challenges compared to the previous sections? Include details about any modifications you had to apply.

The idea here is to combine both two method, I tried to run both filter individually and find the KF works good at the beginning while the PF works much better in later situation, so I break the video into two pieces, using KF to track first 60 frames and PF for the rest of them. Also, similar as problem 4, I used thresholding to handle the occlusion situation in the video.