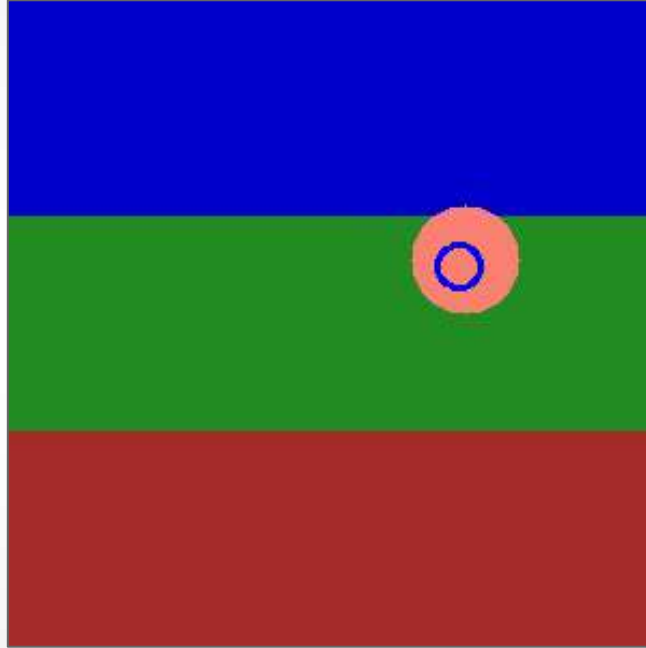# Computer Vision (Spring 2019) Problem Set #5
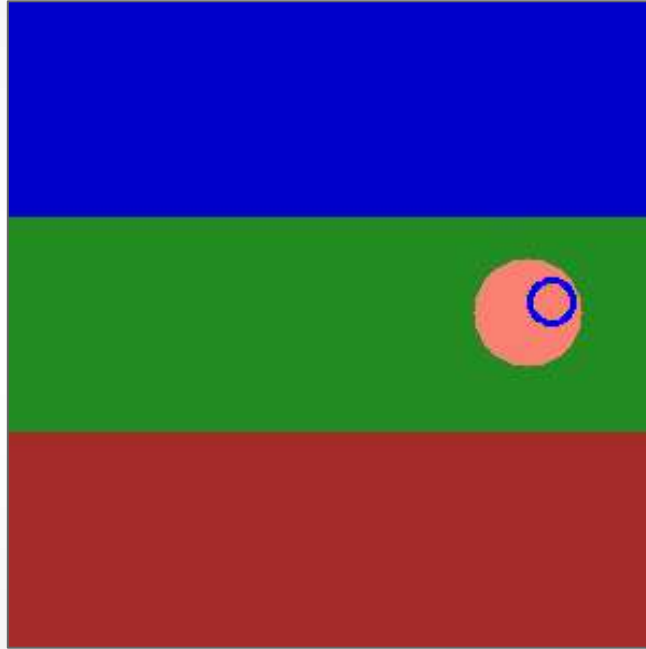
Chuqiao Dong
chdong@gatech.edu

1b: KF Tracking a circle
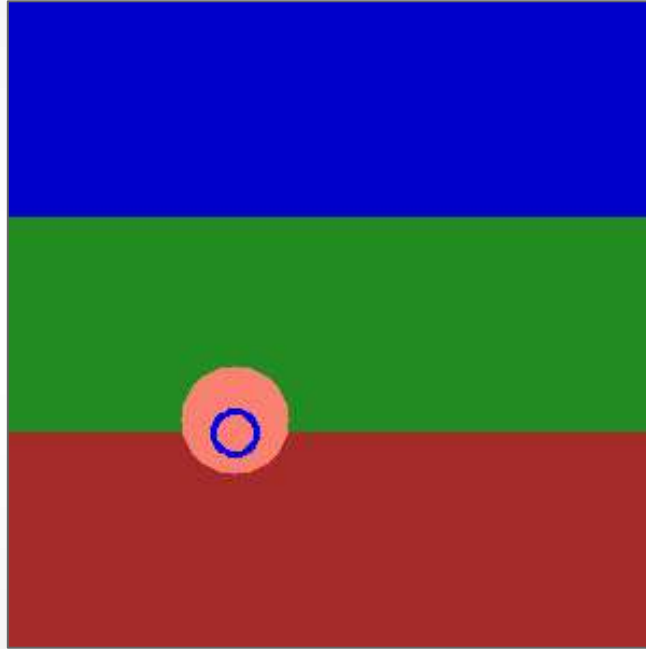

ps5-1-b-1
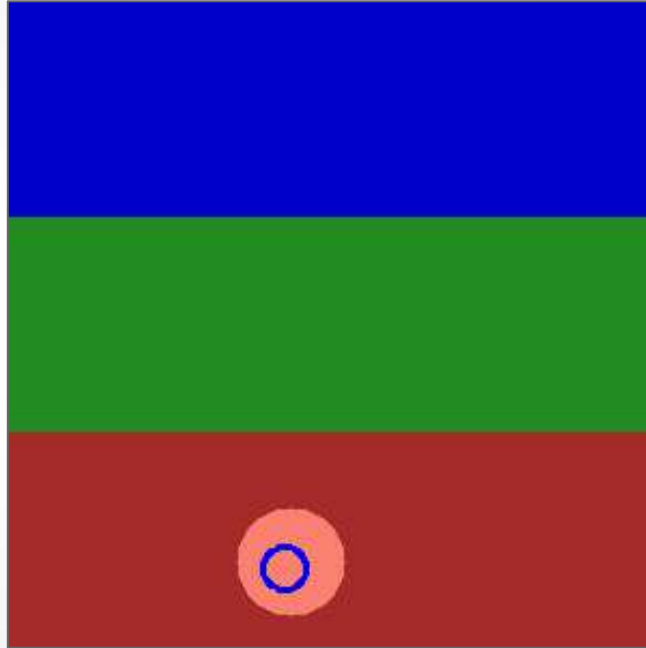
1b: KF Tracking a circle (cont.)

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

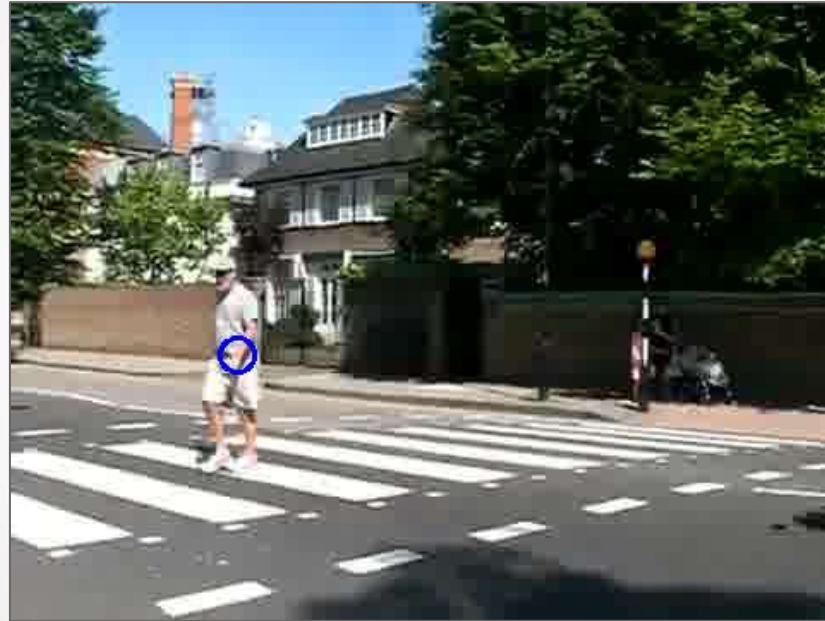# 1c: KF Tracking pedestrians

ps5-1-c-2

1c: KF Tracking pedestrians
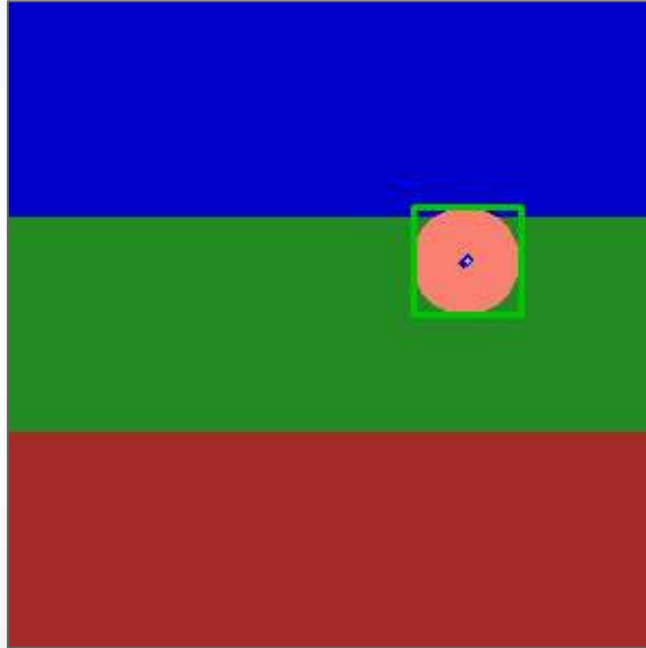

ps5-1-c-3

1c: KF Tracking pedestrians

ps5-1-c-4

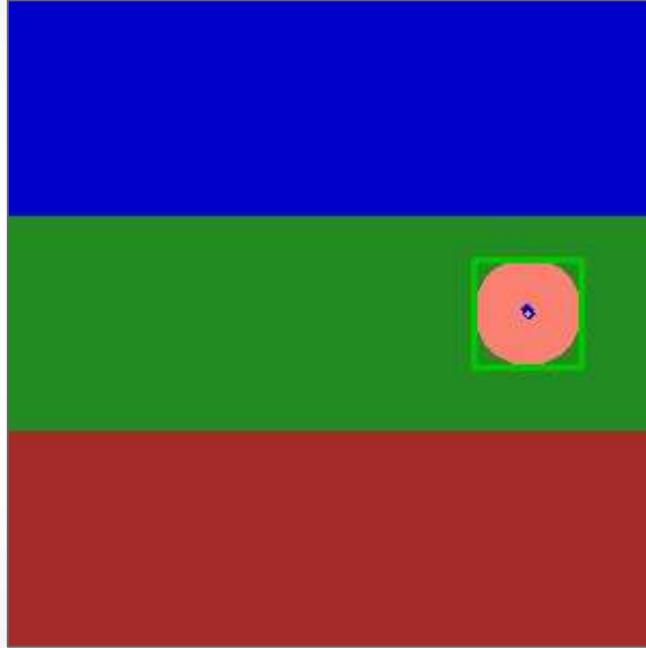# 2a: PF Tracking a circle

ps5-2-a-1

2a: PF Tracking a circle (cont.)

ps5-2-a-2

2a: PF Tracking a circle (cont.)
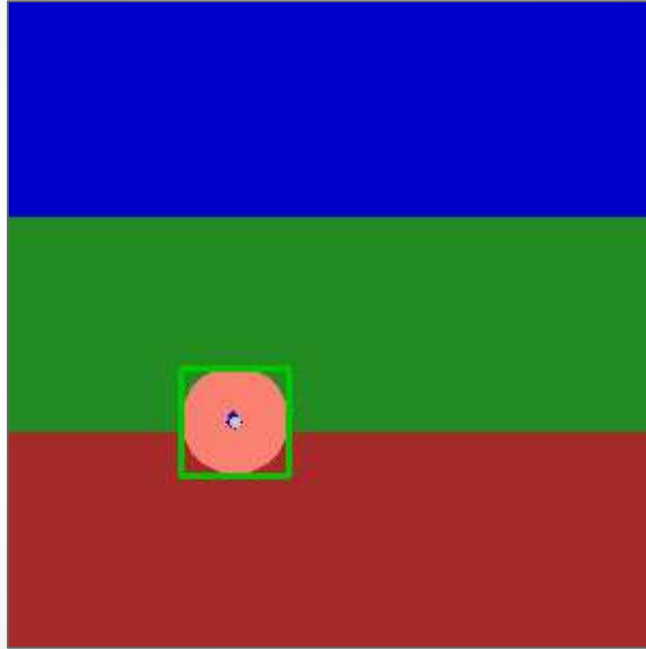
ps5-2-a-3

2a: PF Tracking a circle (cont.)
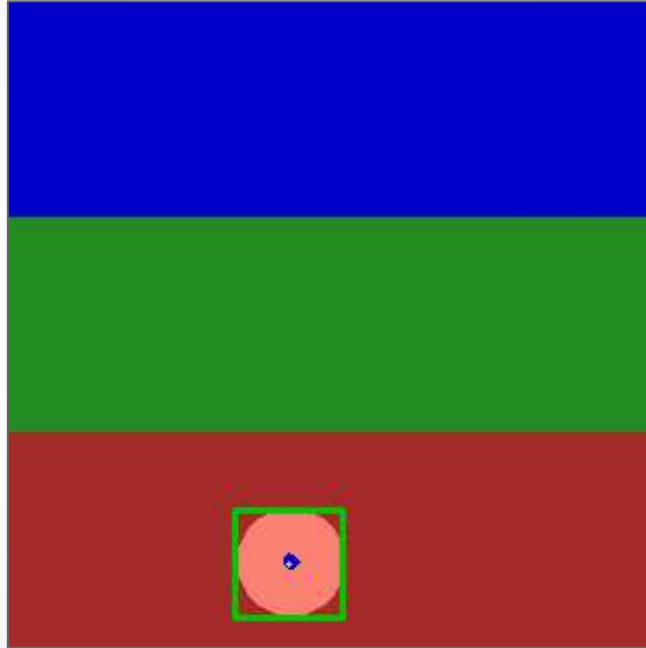
ps5-2-a-4

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.)
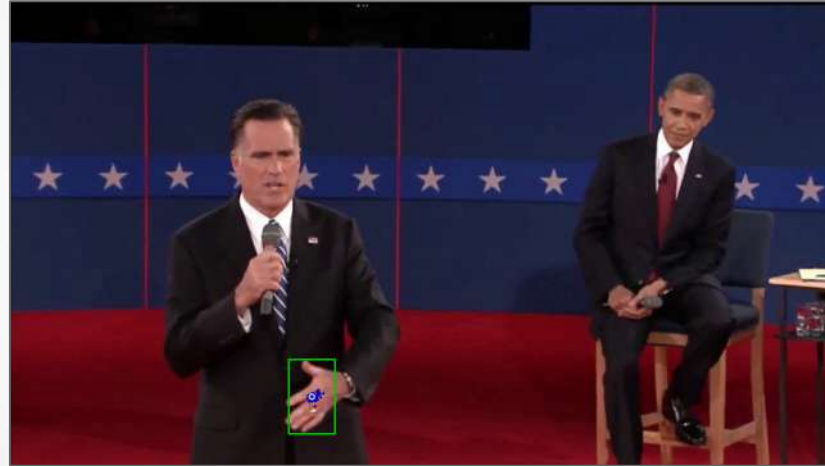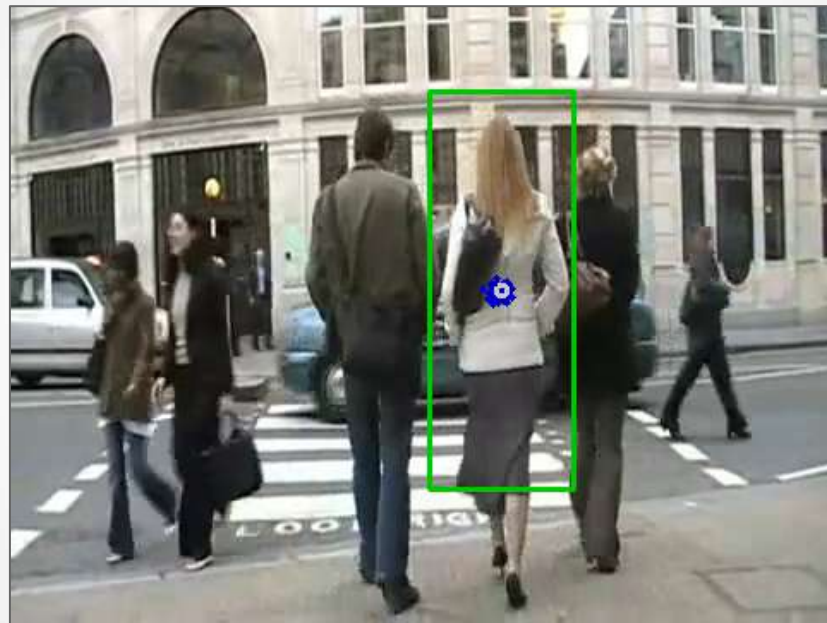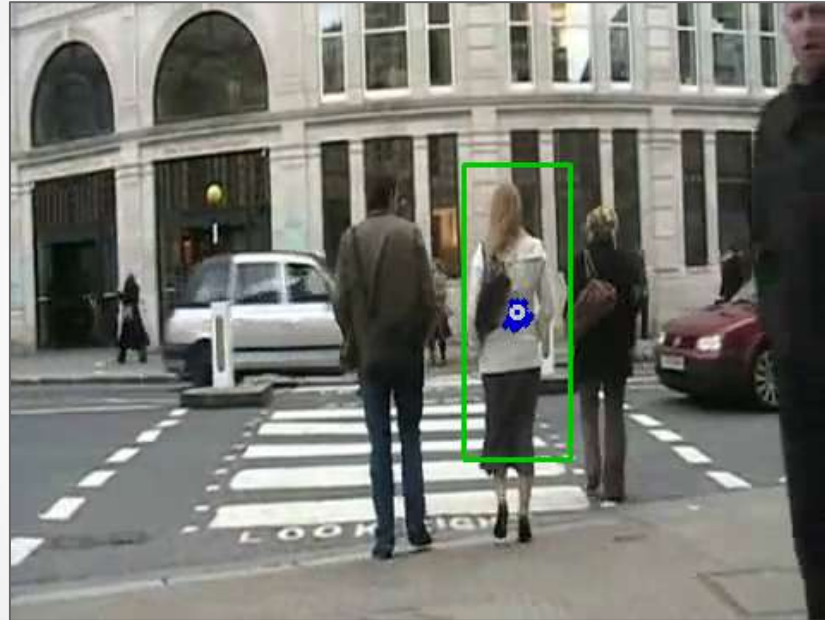

ps5-4-a-4

4: Text response

That woman will not have her center of body coordinates large change on the image, thus, I get the frame number of occlusions begin and end. And during the occlusions, I manually set the particles not to update. So after the occlusion, the center of particles would not have much difference from where they should be. But since the lady is still moving, this may cause the template not matching where it should match. Thus I add some little transition of the x-coordinates of all the particles while occlusions. And also, I tuned the ratio parameters of the template to get the best match.

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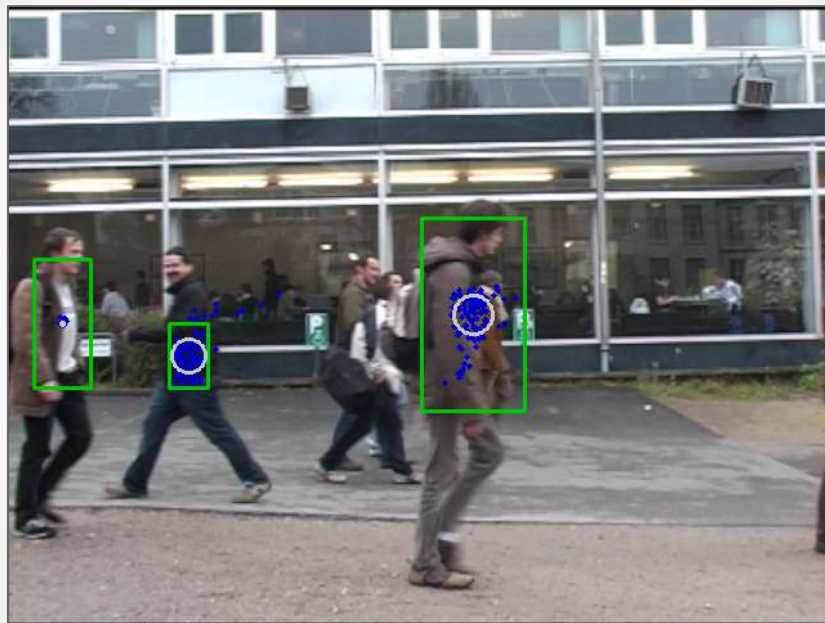
ps5-5-a-1

5: Tracking multiple targets (cont.)
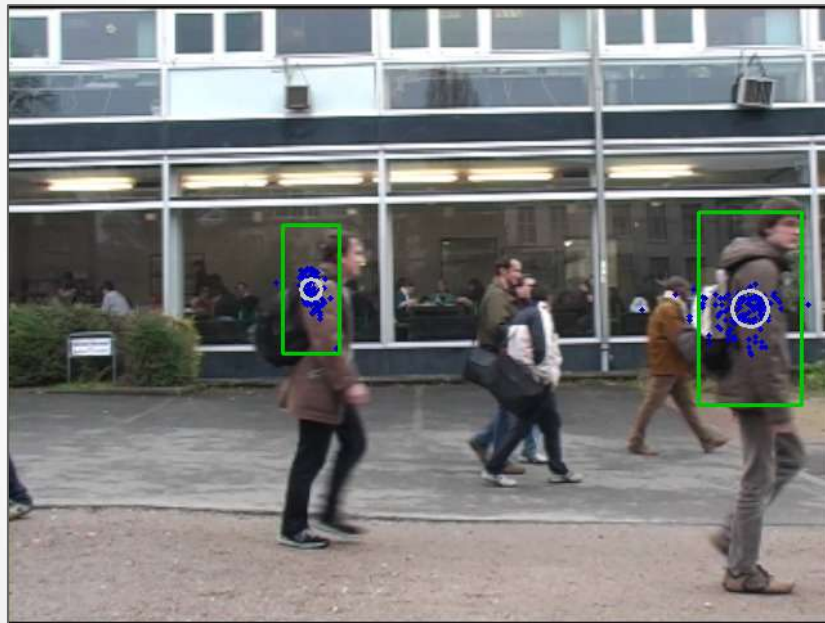
ps5-5-a-2

5: Tracking multiple targets (cont.)

ps5-5-a-3

5: Text response

Describe what you did. How different it was to use a KF vs PF? Which one worked best and why? Include details about any modifications you had to apply to handle multiple targets.

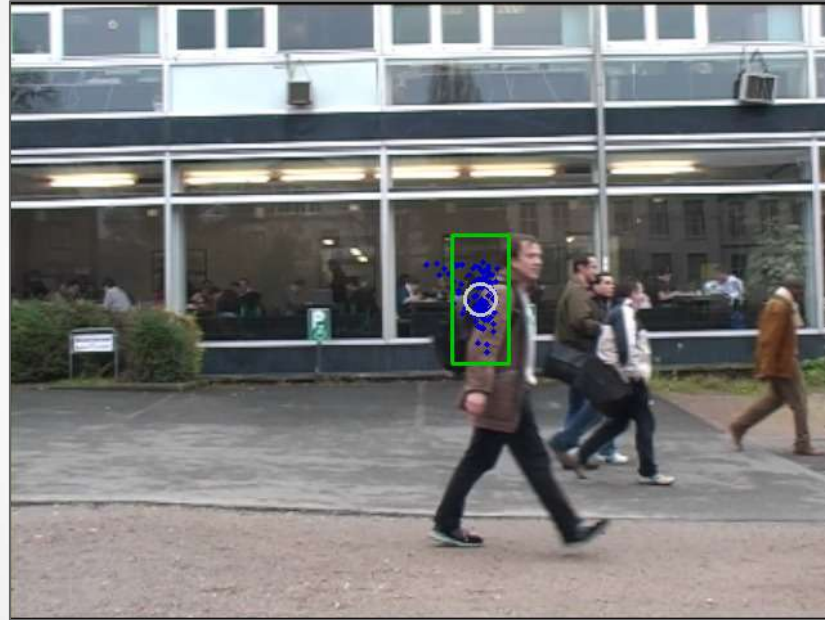For multiple targets, I set the template of each of them separately and run the filter independently by modifying the driver code. And it is interesting to point out that, not each of the target appear in the video all the time, so I manually get the starting and ending frame number of the target appear in the video and only apply the filter during his appearance.

By using KF, the matching always get confused which one is exactly the target it should match to. So I can saw sometimes it detect one person and sometimes it detect another. By using PF, it is more stable to detect each of the target at a time. So it seems PF works better than KF and to be specifically, Appearance Model PF worked best. Since the shape of walking man has some change but the scale is basically the same. Thus, adding some weight of the current template would help.

Also, it is hard to use the whole person as a template, so I used part of the person which is different from others for the detection. And after tuning a little bit of which part to choice, this method works well.

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.

I used part of the old man which is different from others as a template for detection. And since the old man has movement makes the template change all the time. Also, as he walked, it makes the template size also change. So this task is kind of combing Appearance Model PF and More Dynamic PF. But since the appearance change is more dramatic comparing with the scale change, thus I chose the Appearance Model PF method for detection. And to deal with the scale change, I chose to use only small part of the old man for the template which is the jacket and pants combined part. And I tuned the template size which is very sensitive to the detection as well as the alpha for the updating template. And finally, it works well.
There is also sometime when the old man is in occlusion with others, I also modified the driver code by not updating the particle position during these frames.