Computer Vision
Fall-2019
Problem Set #5

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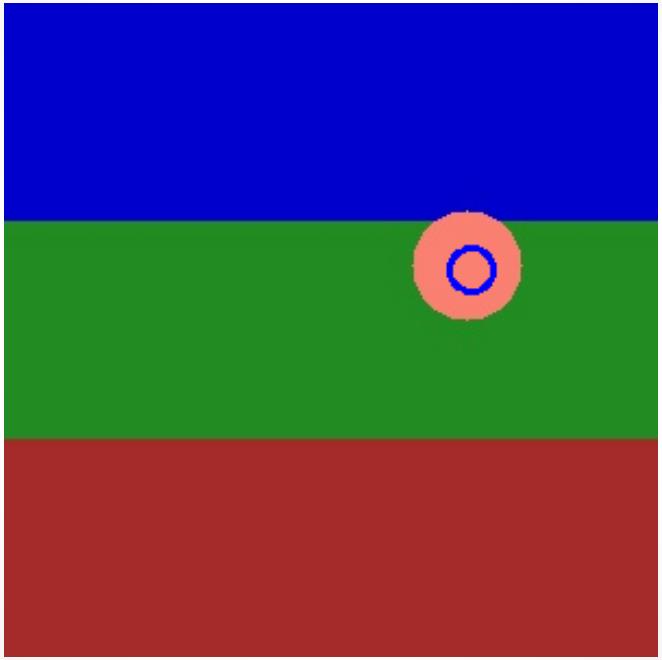
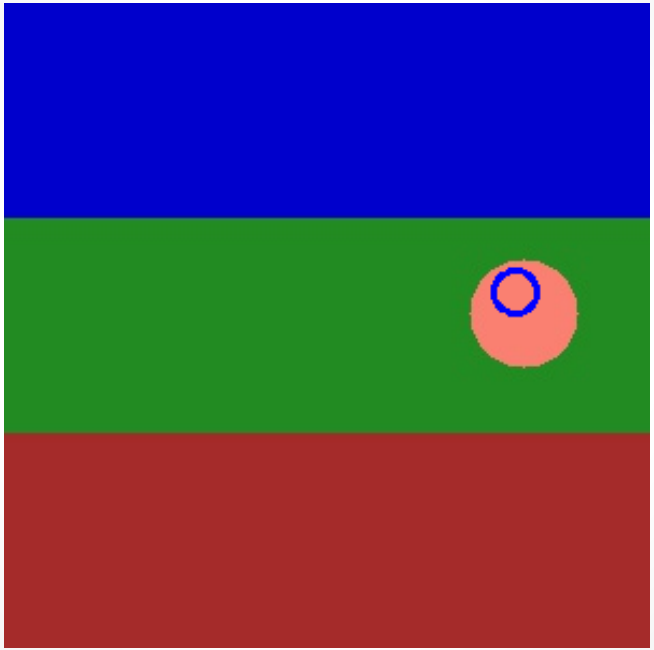
1b: KF Tracking a circle



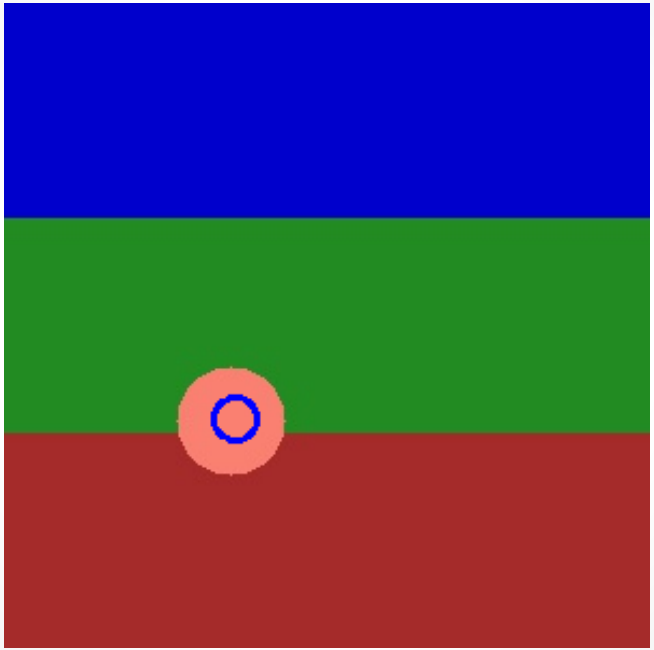
ps5-1-b-1

1b: KF Tracking a circle (cont.)



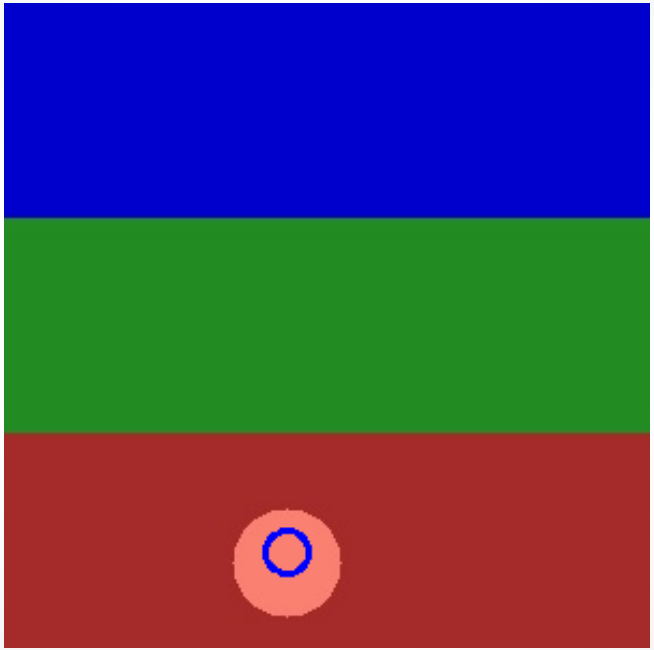
ps5-1-b-2

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

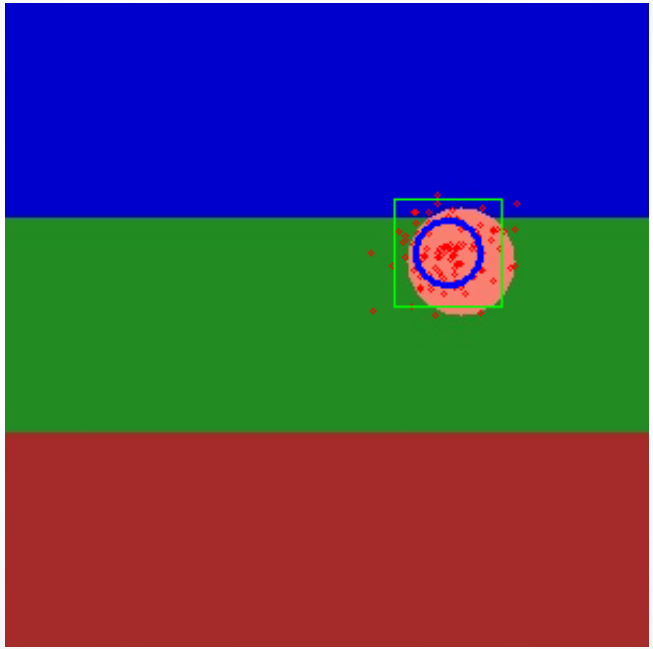
1c: KF Tracking pedestrians

ps5-1-c-3

1c: KF Tracking pedestrians

ps5-1-c-4

2a: PF Tracking a circle

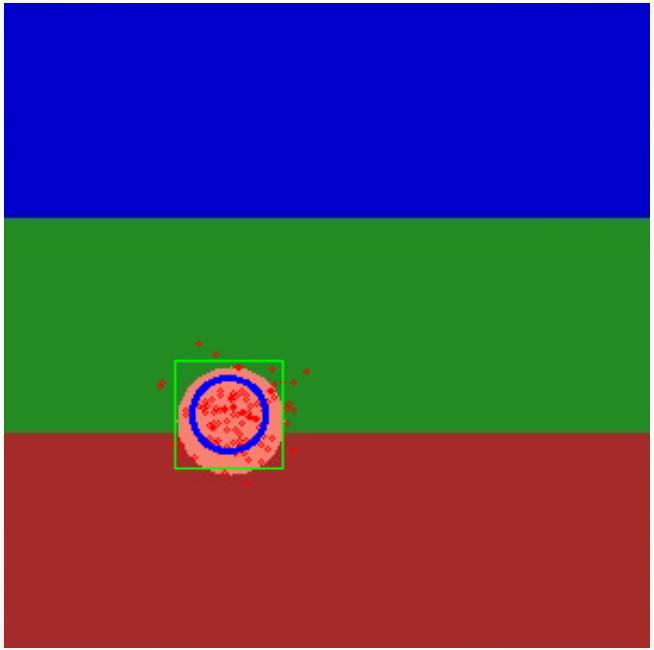


ps5-2-a-1

2a: PF Tracking a circle (cont.)

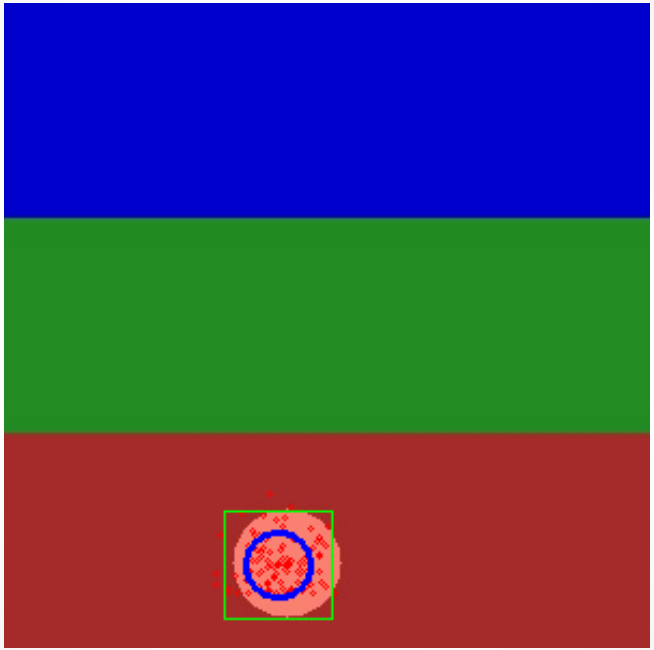
ps5-2-a-2

2a: PF Tracking a circle (cont.)



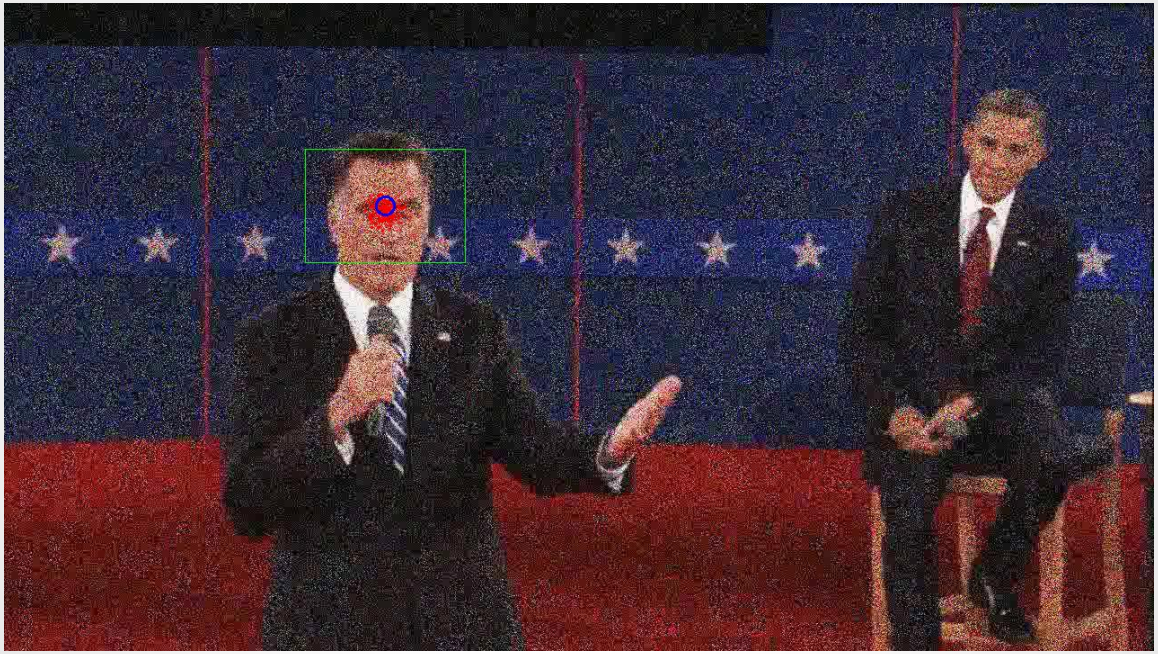
ps5-2-a-3

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

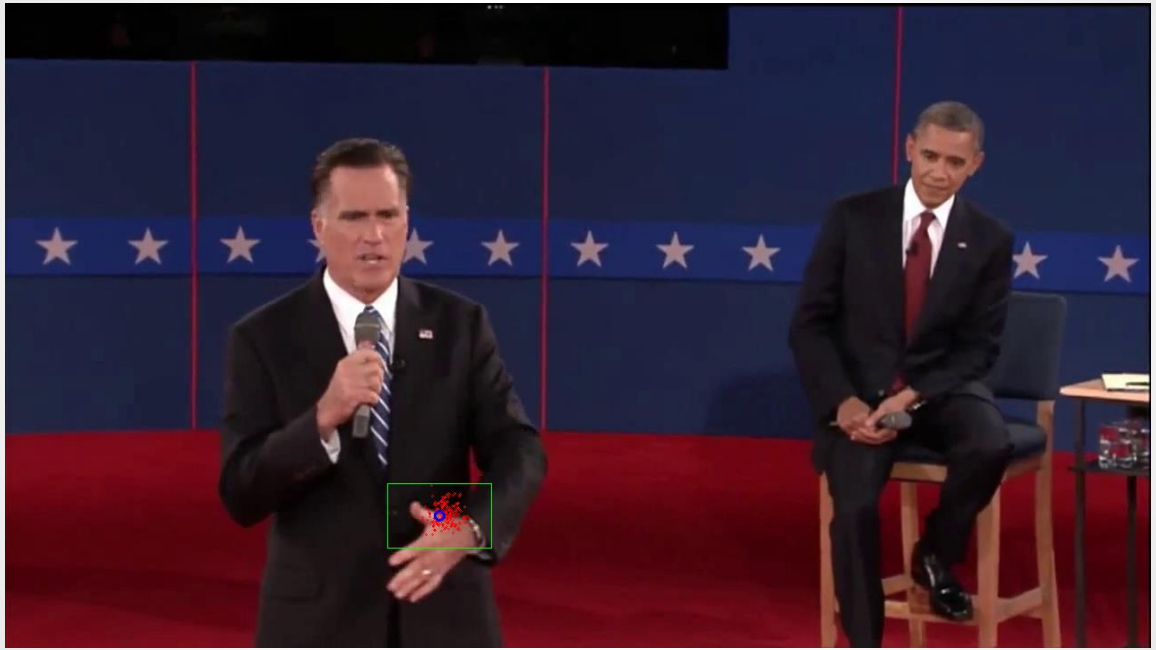
2b: PF Tracking noisy video (cont.)

ps5-2-b-3

2b: PF Tracking noisy video (cont.)

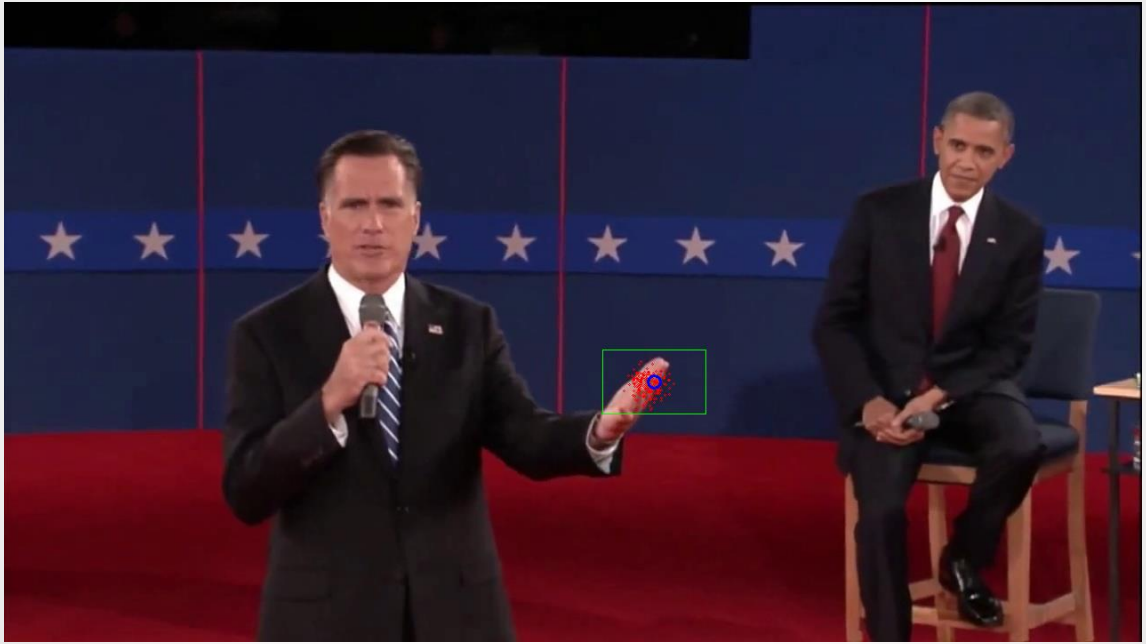
ps5-2-b-4

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.)

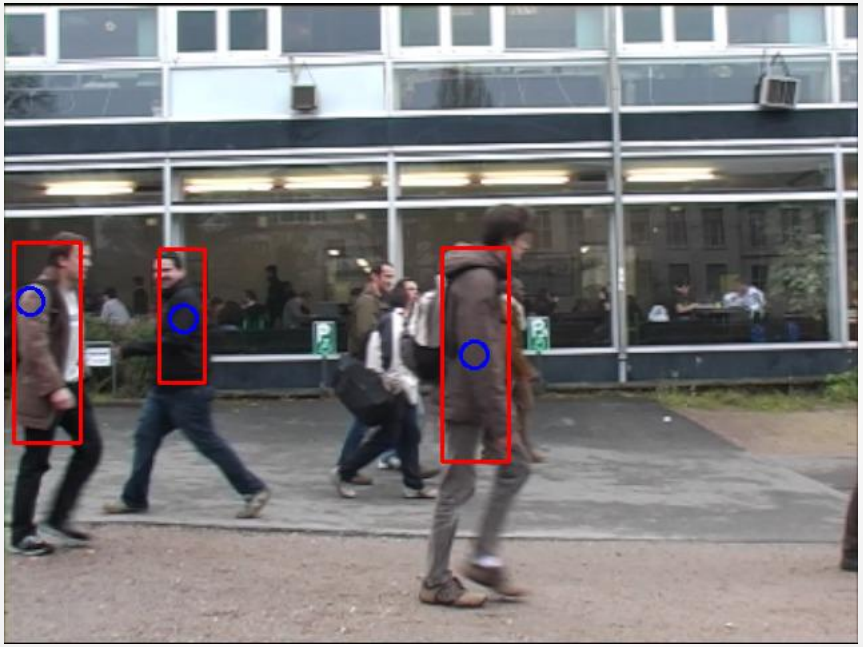
ps5-3-a-3

4: Text response

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

To avoid updates while occlusions are in frame, the dynamic movement sigma needs to be low. I tried using a gaussian distribution of scaling factor while updating the template.

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 this problem, I used 3 different KFs to track the 3 targets in frame and started/stopped tracking them as soon as they moved in/out of frame. To handle multiple targets, the template had to be chosen carefully, as two of the targets looked similar in terms of colour composition of their dresses and measurements of the filter were prone to be different from that intended.
KF worked better than PF as it used a value derived from its prediction and the measurements keeping track of the motion dynamics of individual targets.

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.

For this problem, I used an Appearance PF with alpha=0.2 and large sigma for movement dynamics. The size and appearance of the template is changing significantly, with occlusions as well. But a simple Appearance PF was able to track the target fairly well, by using a larger sigma for movement dynamics..