CSE571_HW1_Yao-Chung Liang_1826630

5.

(a)

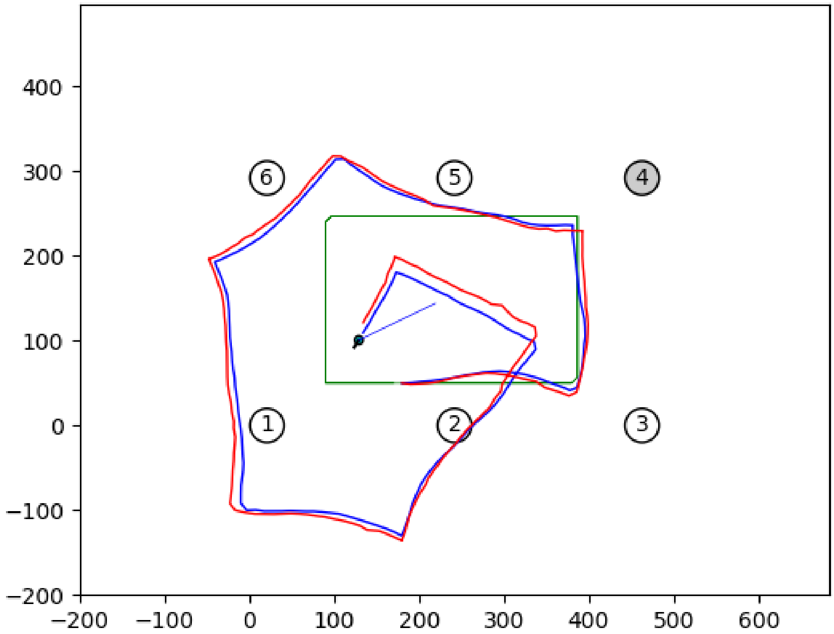

Fig.1 Result of extended Kalman filter with default parameters

(b)

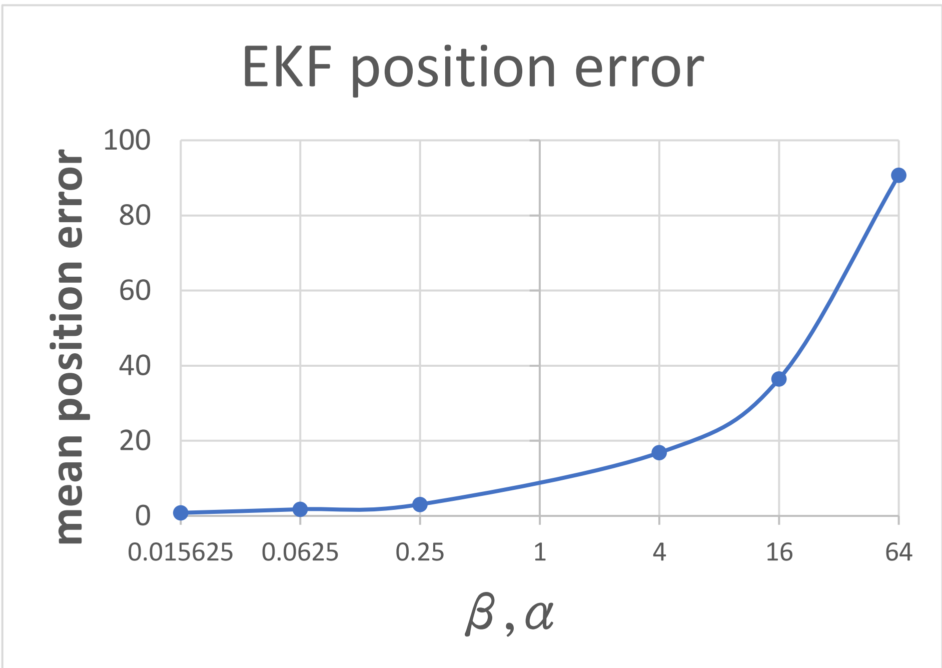

Fig.2 Mean position error with respect to different pairs of filter and data factor

I found that as α , β grows, the mean position error of extended Kalman filter also follow up in a order of n square. It's quite reasonable as the error from data grows, this will only makes observe harder.

(c)

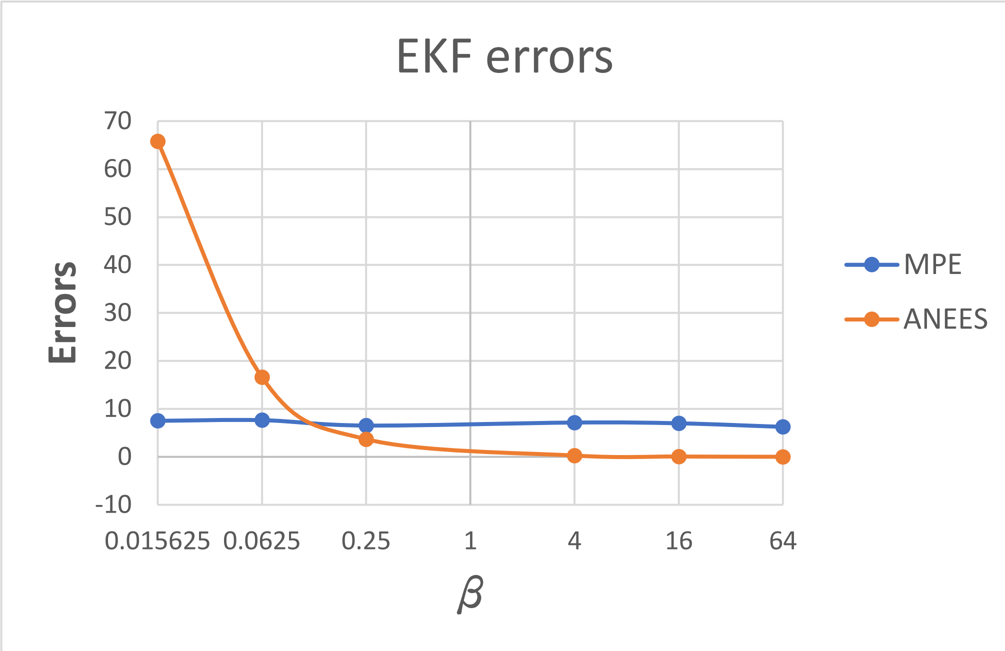

Fig.3 Mean position error and average normalized estimation error squared with respect to β and α =1

Noise of data doesn't change so it's easy for estimation and also keeps the mean position error at the same order. However, for Average normalized estimation error squared (ANEES), it measures the distance between a x and the center of gaussian distribution and then divided by standard deviation. So, when it encounters a peaky Gaussian distribution with a quite small value of standard deviation, and divided by it, sometimes we will encounter this tricky situation.

6.

(a)

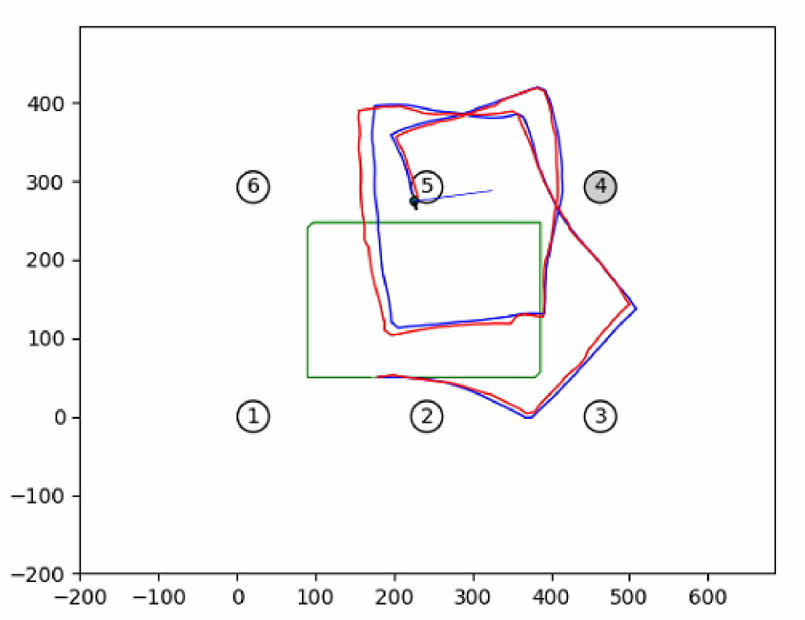

Fig.4 Result of particle filter with default parameters

(b)

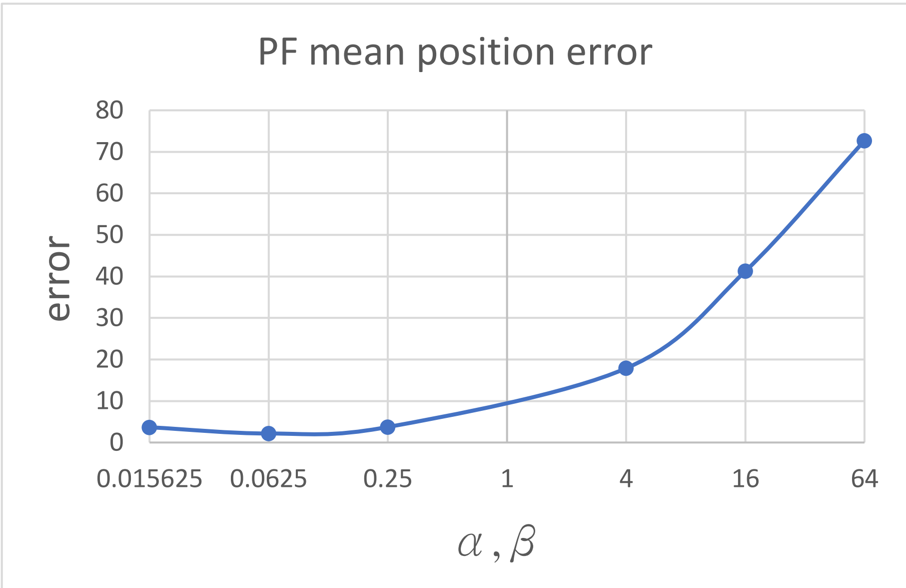

Fig.5 Mean position error of particle filter with respect to α , β factors

As the uncertainty of models grows, it cannot estimate its position easily, so the mean position error grows as well.

(c)

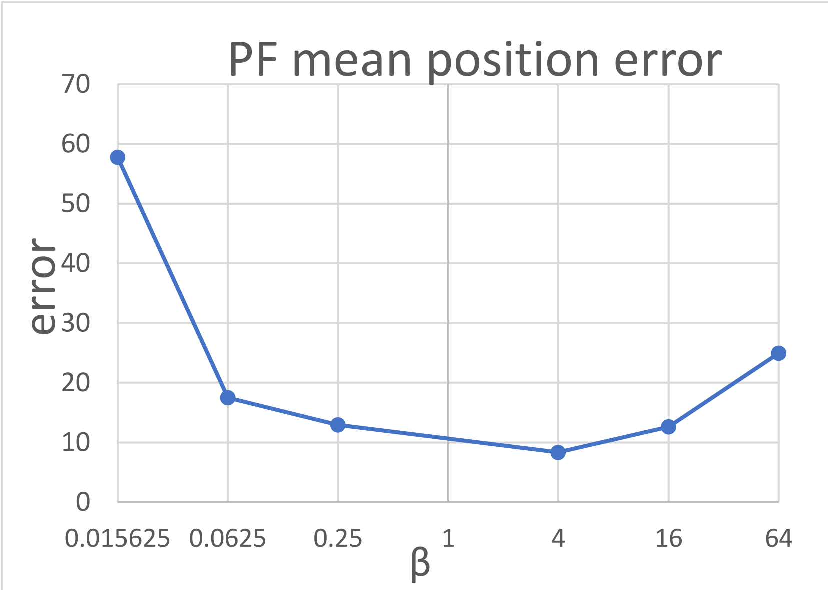

Fig.6 Mean position error of particle filter with respect to β and $\alpha=1$.

When the deviation between α , β grows, which means your model doesn't really estimate the real distribution of data of the environment. And for particle filters, when the distribution is too converging which means your diversity of distribution of particles will be not enough. In this situation, the mean position error also grows fast.

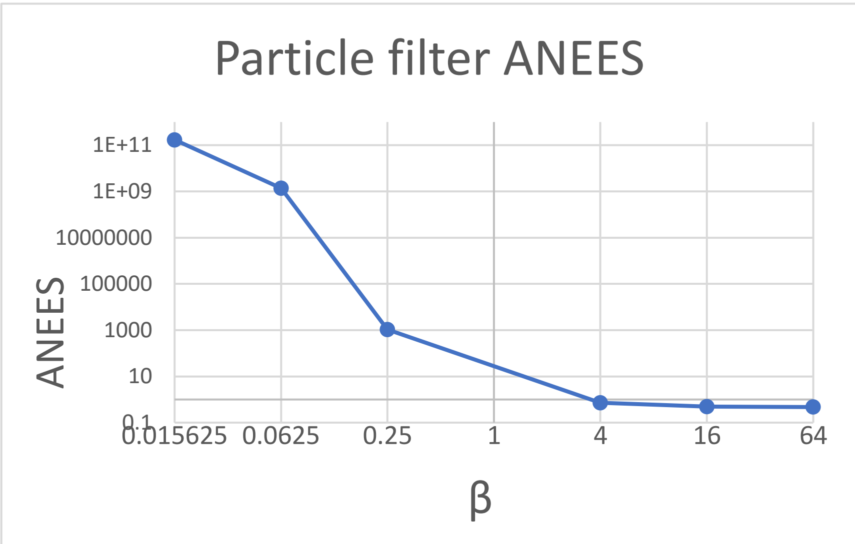

Fig.7 Average normalized estimation error squared (ANEES) position error of particle filter with respect to β .

Just like what I mentioned above, when your diversity of distribution of particles is not enough, the position error grows fast. And when it comes to combine with ANEES, it even goes bad, because the ANEES is to determine the distance between a point and the center of distribution and divided by standard deviation. So when you encounter a peaky Gaussian, it will result in large value divided by small value, which also make error grows to an unlimited scale.

(d)

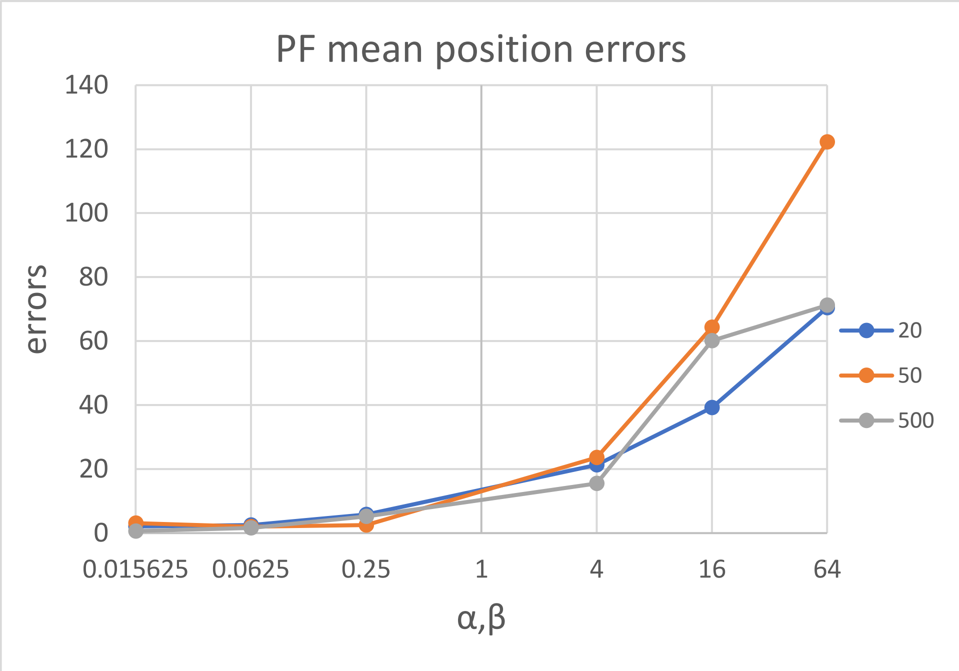

Fig.8 Average normalized estimation error squared (ANEES) and mean position error of particle filter with respect to number of particles With respect to α , β .

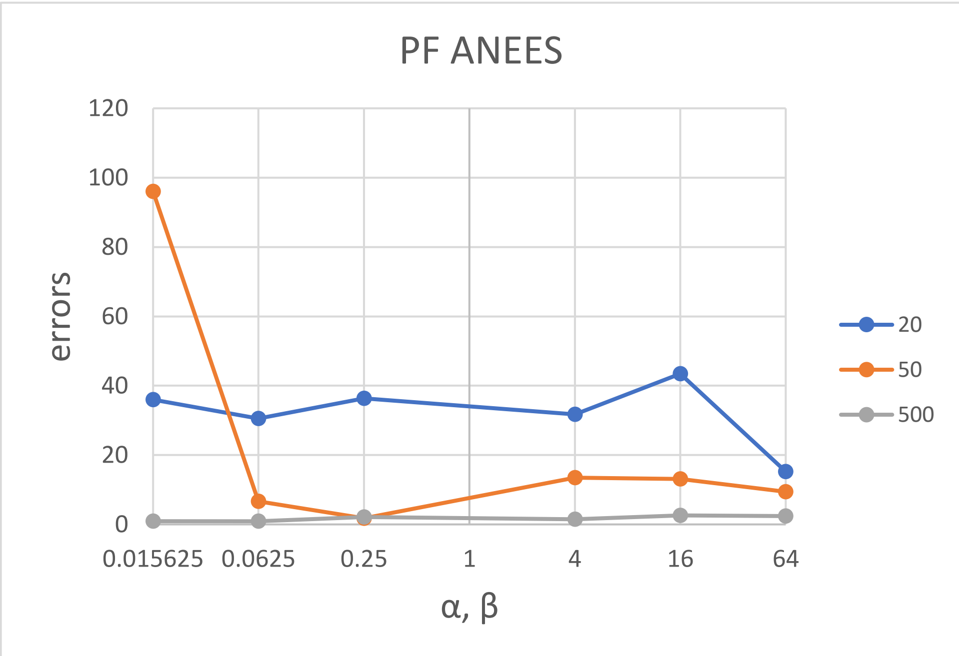

Fig.9 Average normalized estimation error squared (ANEES) and mean position error of particle filter with respect to number of particles With respect to α , β .