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MP5 report

a1.

Equations for doing iterative computation (x = mean, P = variance)

Time update

$$\hat{x}_k^- = A\hat{x}_{k-1} + Bu_{k-1}$$
$$P_k^- = AP_{k-1}A^T + Q$$

Measurement update

zk is from sensor

$$\hat{x}_k = \hat{x}_k^- + K_k(z_k - H\hat{x}_k^-)$$
$$K_k = \frac{P_k^- H^T}{HP_k^- H^T + R}$$
$$P_k = (I - K_k H)P_k^-$$

x_{k-1}: the previous state

u_{k-1}: is the previous control that has applied

A: is the linear transition model as a matrix

P_k : is the error in estimate

H: is the sensor model, as a matrix.

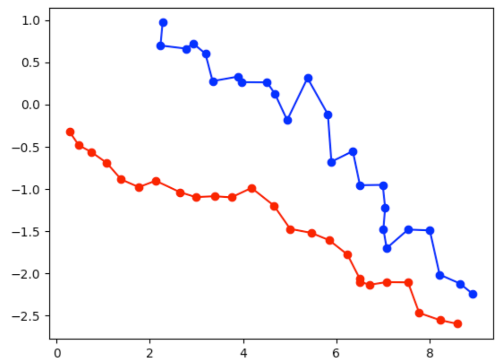
Q: is the system noise

K: is the Kalman Gain usually by the estimated error divide by the sum of estimated error and measurement error, which are the transition noise and measurement noise. If error in measurement is small, which will make the KG importance large.

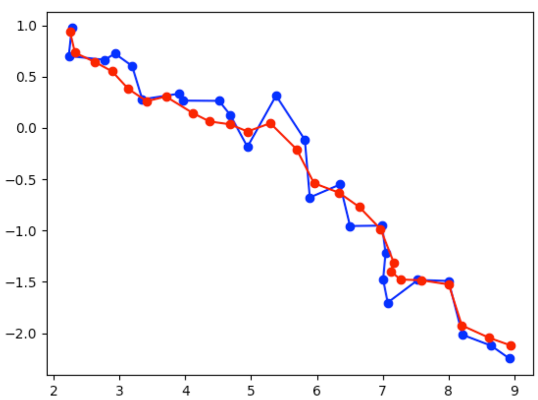
The time update equation is calculated by adding the previous measurement update and the previous control.

The measurement update equation is calculated by the current time update + the kalman gain importance a4.

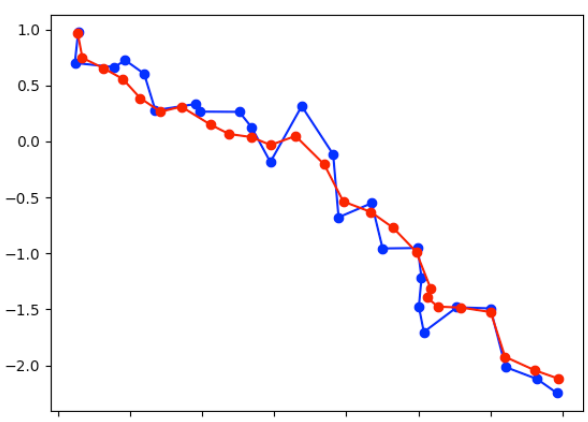
λ =0.000001:



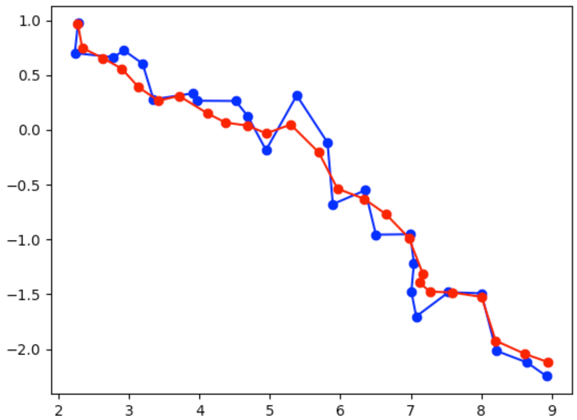
λ =1:



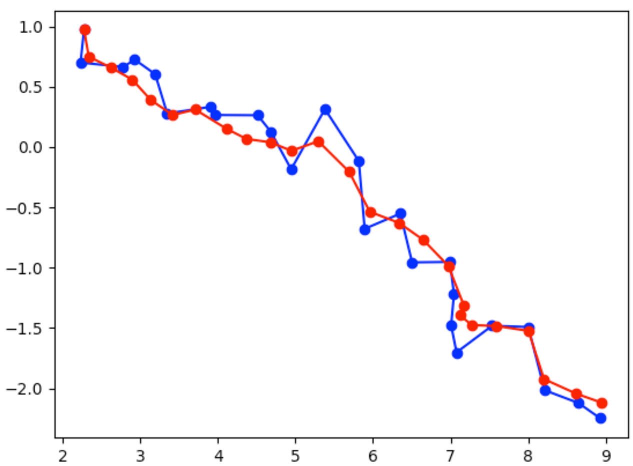
λ =5:



λ =10:



λ = 100000000



By comparing the first dots in all the graphs, It looks like the greater the λ value is, the closer the prediction matches.

b.2.

If we only care about accuracy but not time. we decided to shoot at the last iteration that is allowed. Because more data collected improves the accuracy.