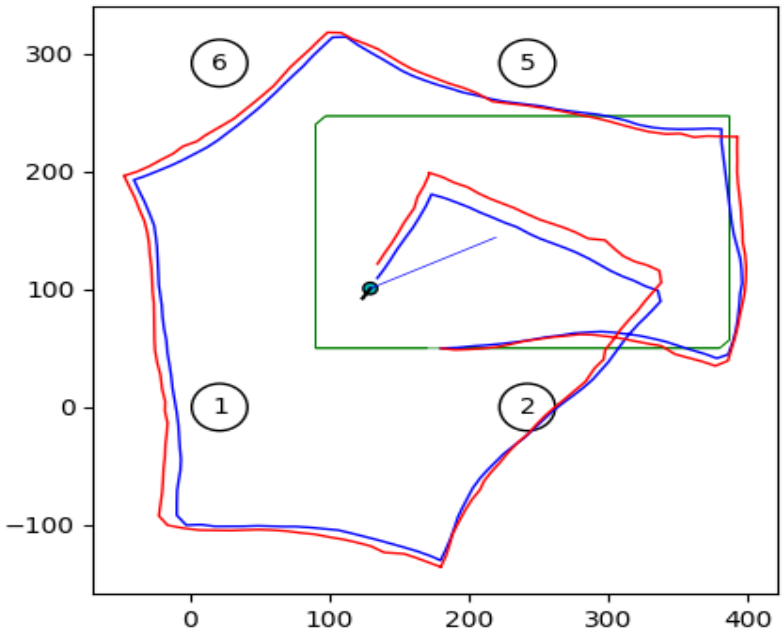
AGV Task 3
EKF and Particle Filters
Plots and Observations

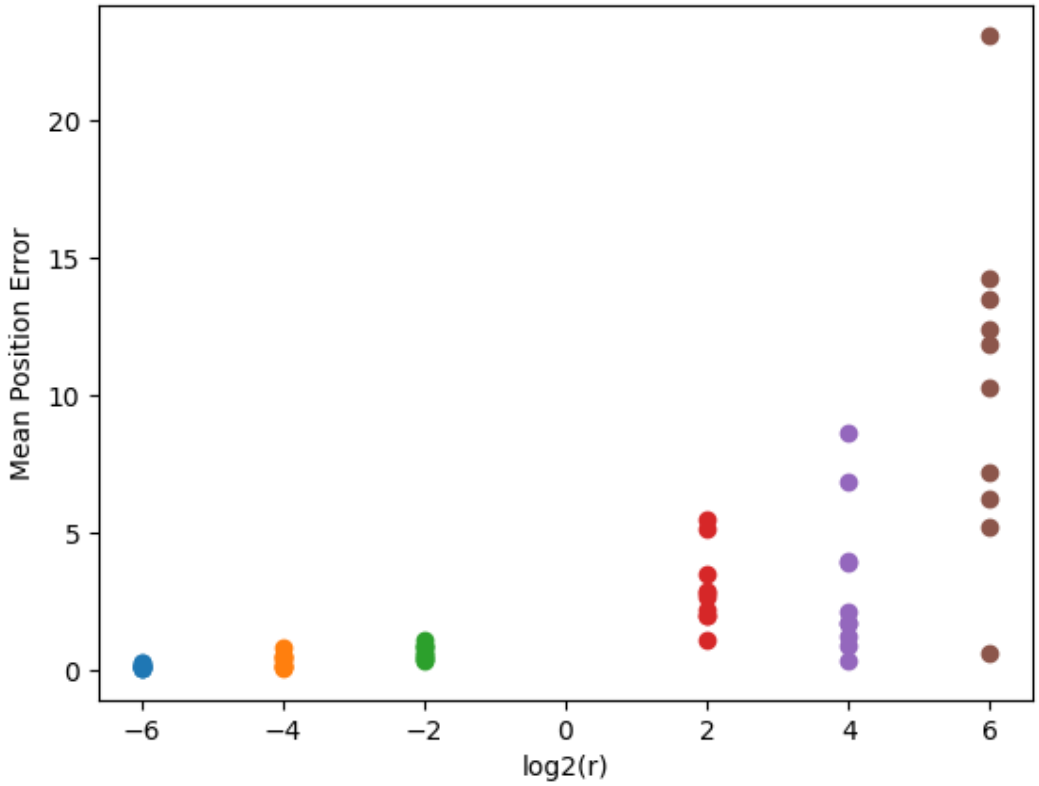
Extended Kalman Filter (EKF)

(A)Plot of Real robot path and filter path under default parameters



Mean position error: 8.9983675360847
Mean Mahalanobis error: 4.416418248584298
ANEES: 1.472139416194766

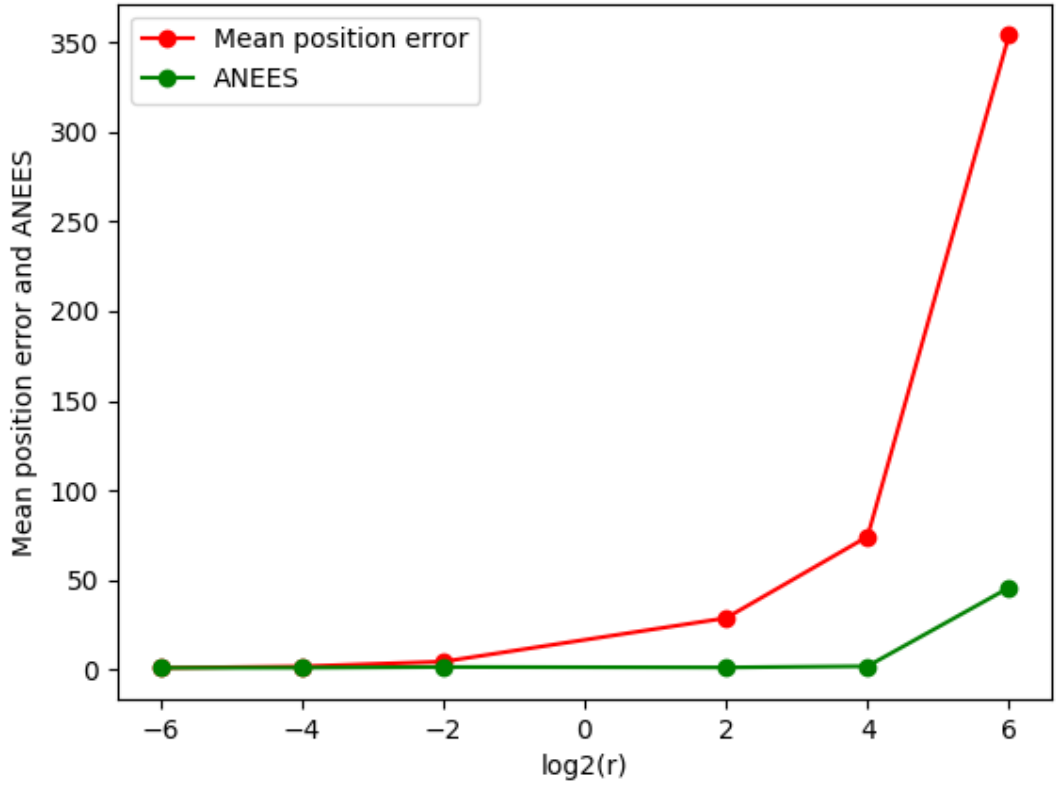
(B) Plot the mean position error as the α and β factors range over r = [1/64, 1/16, 1/4, 4, 16, 64] and discuss any interesting observations. Run 10 trials per value of r.



Observations:

The mean position error tends to increase as the data-factor and filter-factor are increased from 1/64 to 64 as their increase leads to increase in the noisy actions done by robot and observations received by it.

(C) Plot the mean position error and ANEES (average normalized estimation error squared) as the filter α, β factors vary over r (as above), while the data is generated with the default. Discuss any interesting observations.

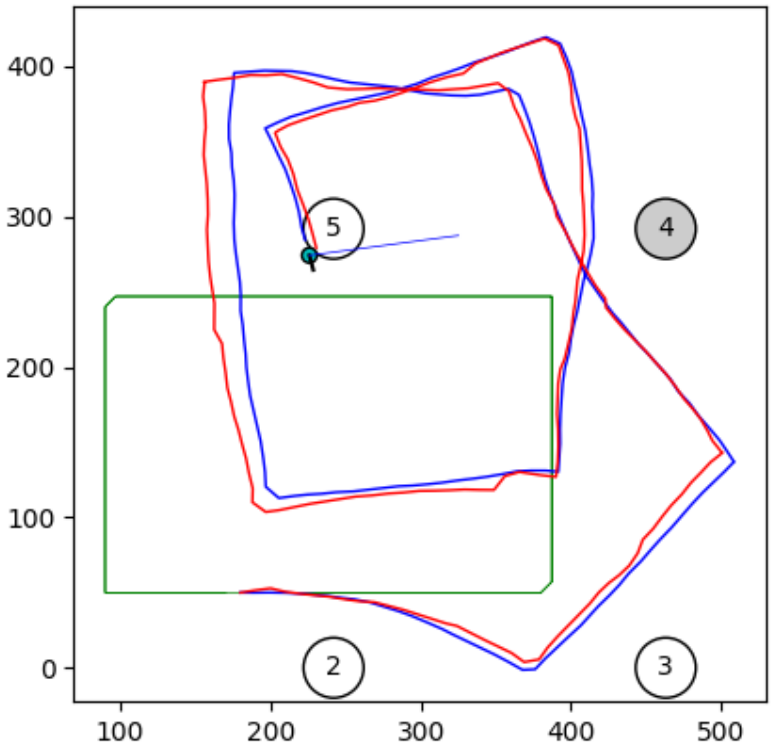


Observations:

1)Again, both mean position error and ANEES increase as we increase the data-factor because of the same reasons. Also, Mean-position error is always greater than ANEES.

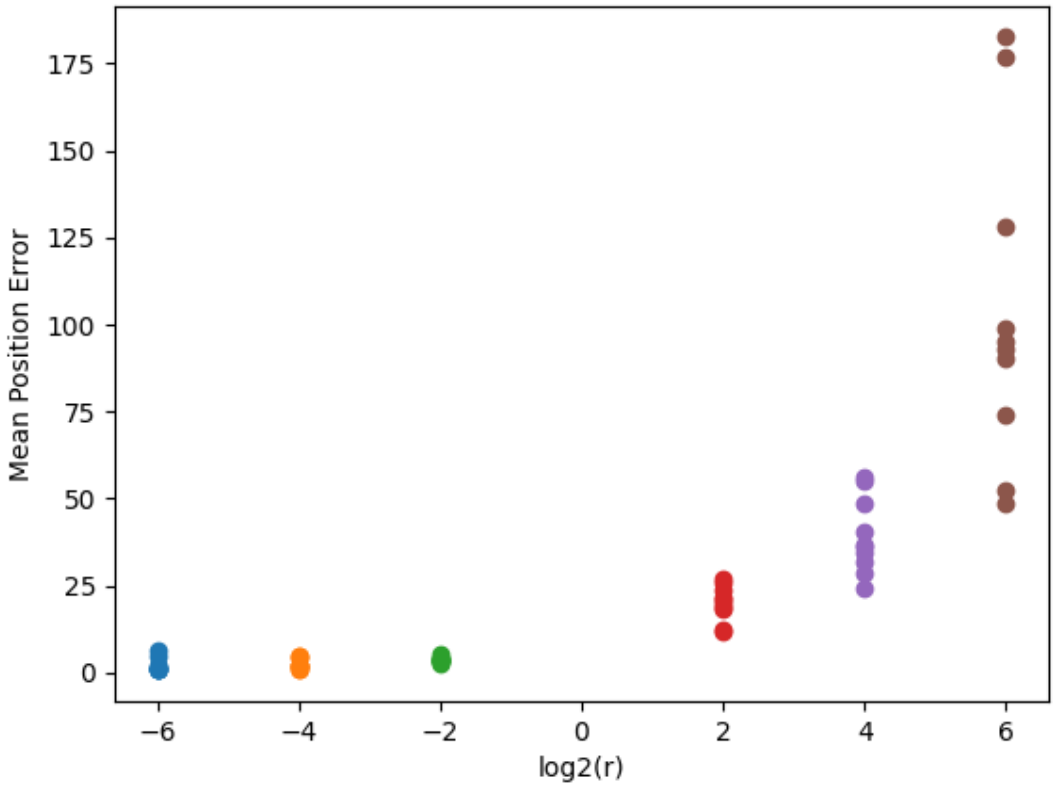
Particle Filter(PF)

(A)Plot the real robot path and the filter path under the default parameters.



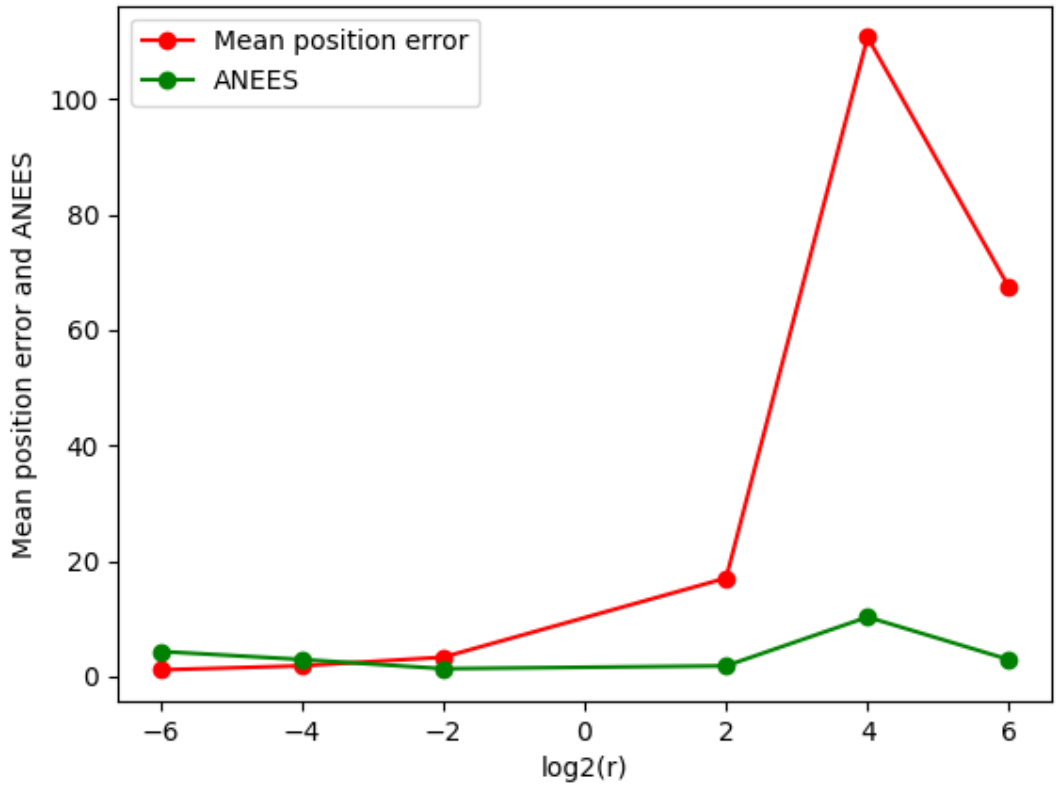
Mean position error: 8.567264372950905
Mean Mahalanobis error: 14.742252771106532
ANEES: 4.914084257035511

(B) Plot the mean position error as the α, β factors range over r and discuss.



Observations:
Similar to EKF, it can be observed that Mean position error increases as we increase the data-factor from 1/64 to 64

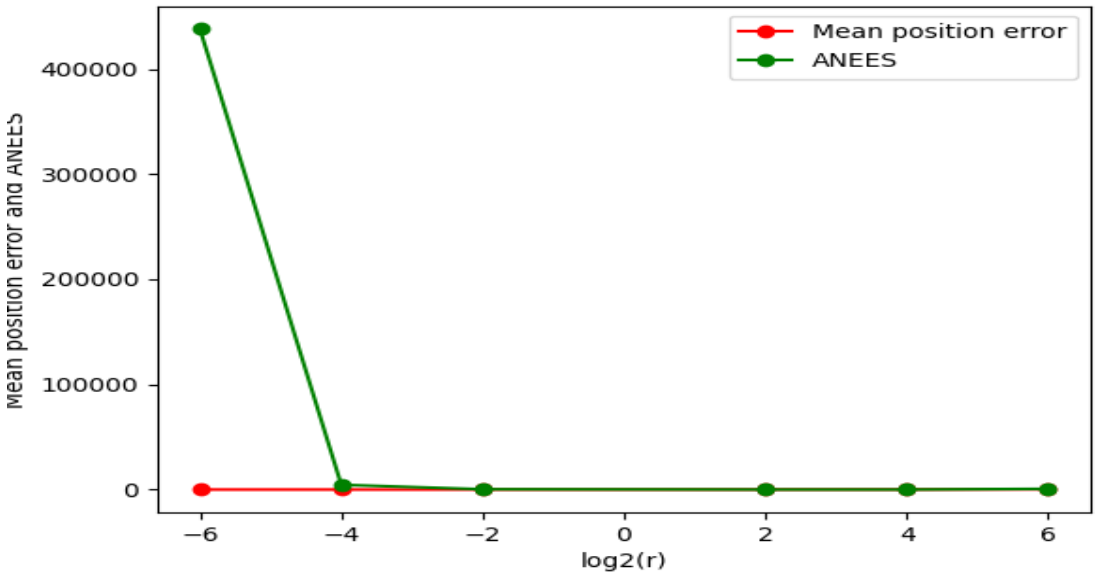
(C) Plot the mean position error and ANEES as the filter α, β factors vary over r while the data is generated with the default.



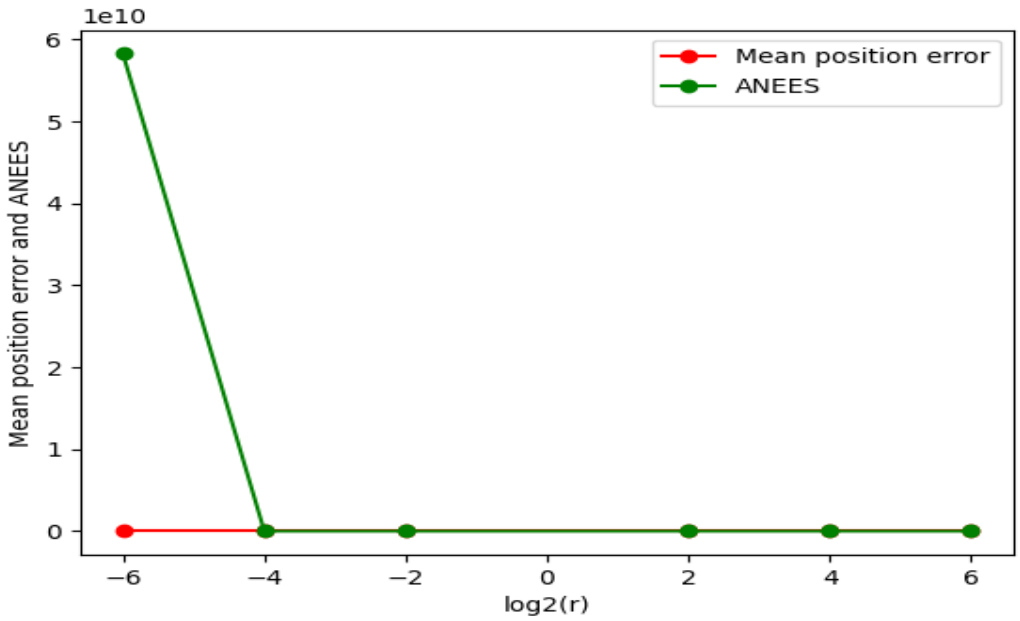
Observations:
The errors in general increase with increasing values of r, but a major dip is seen in from r=16 to r=64.

(D) Plot the mean position error and ANEES as the α, β factors range over r, and the number of particles varies over [20, 50, 500].

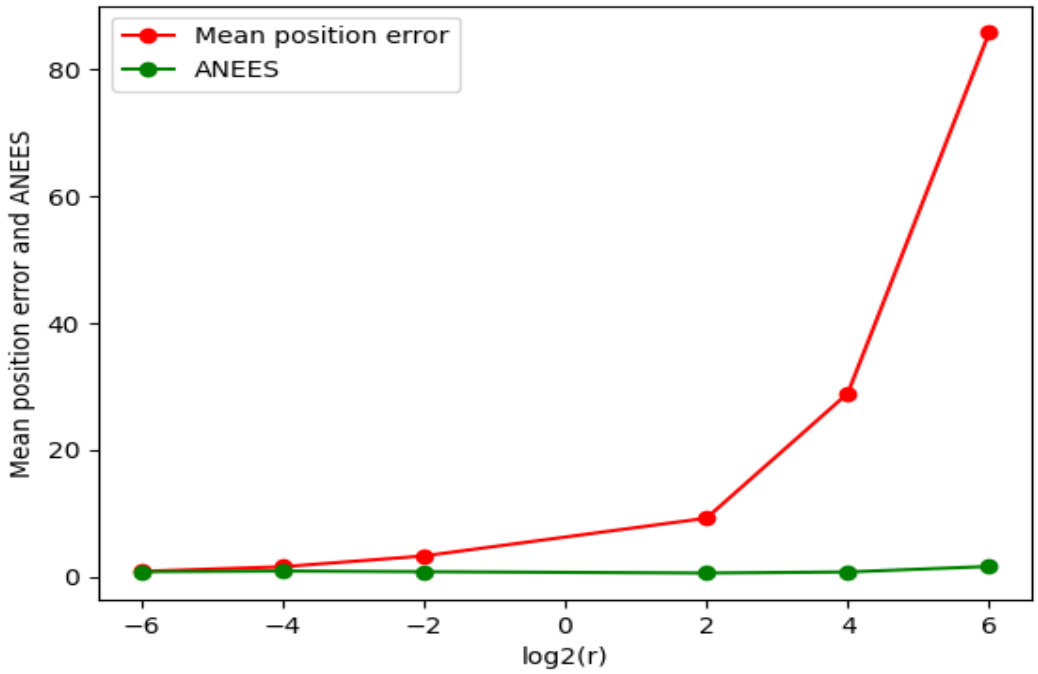
For 20 Particles:



For 50 Particles:



For 500 Particles:



Observations:
In Case of less number of particles, the distribution is not much continuous as we are calculating all the errors from the number of particles, so higher number of particles means less errors.