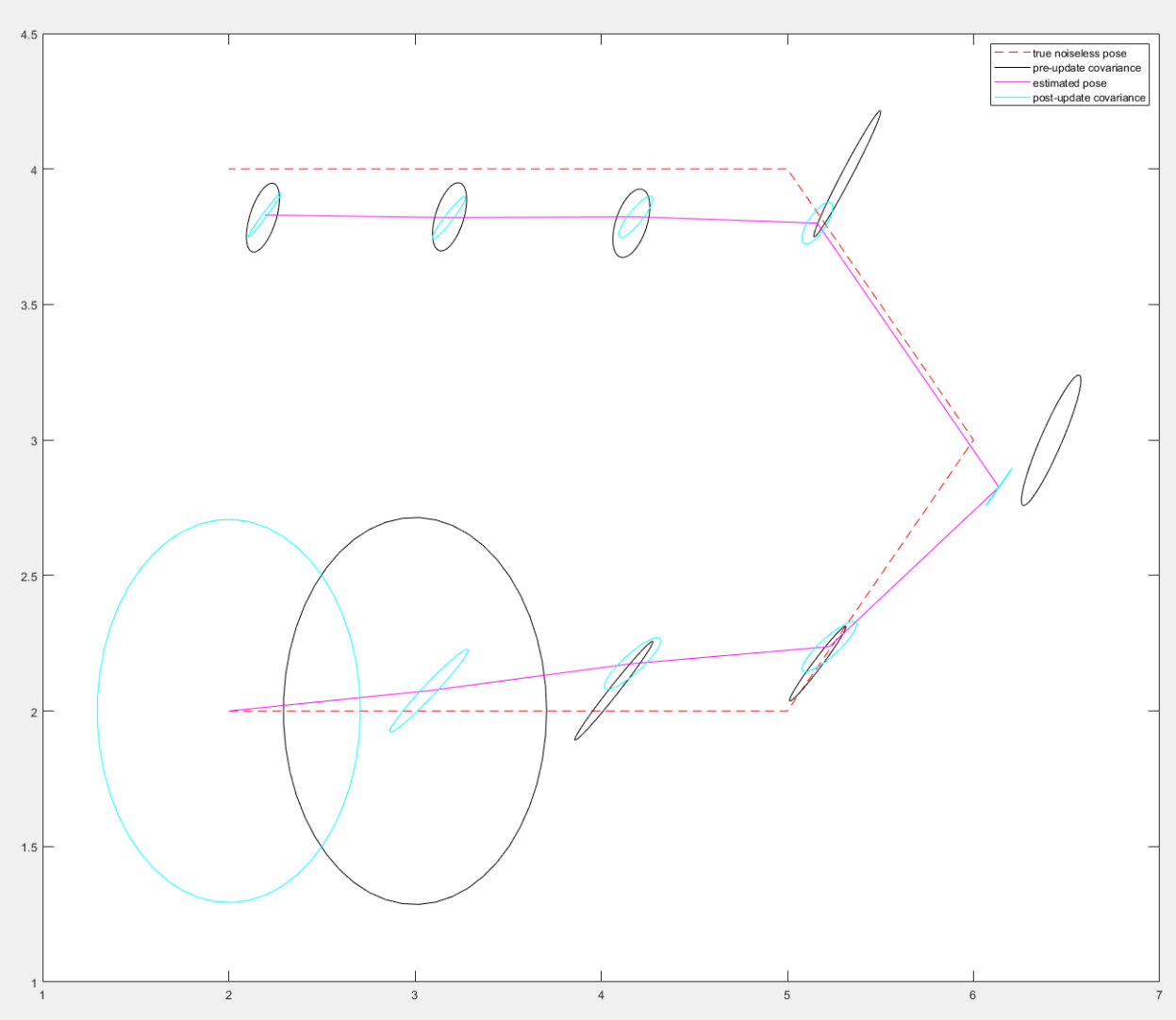
Tucker Guen - Project 1

Extended Kalman Filter

The initial covariance was picked to be a 3×3 identity matrix. The first two circles are of somewhat arbitrary size.

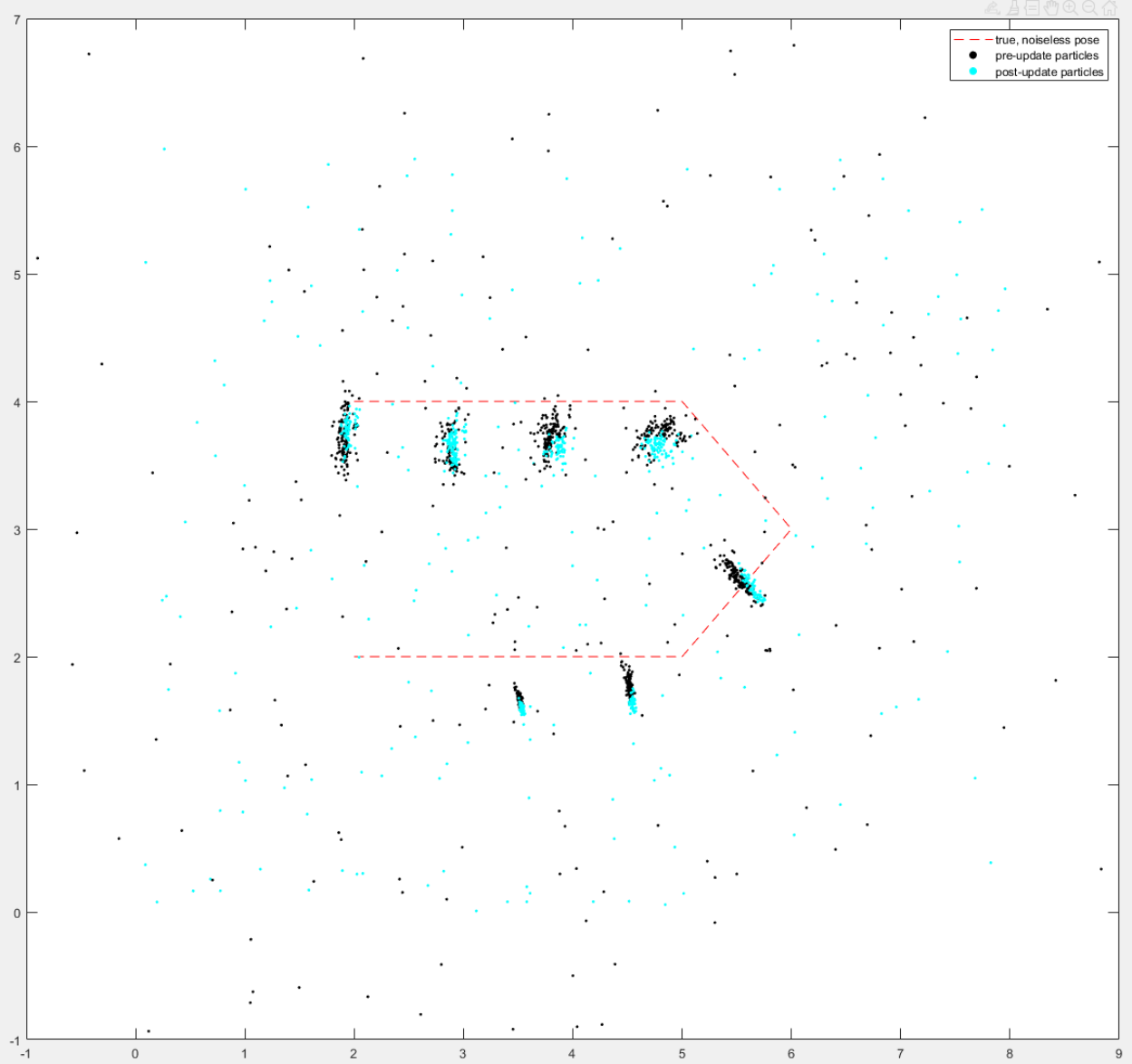
- Legend (also labeled on figure)
  - Orange dashed line: True robot motion using velocity motion model with same input commands and no motion uncertainty $(\alpha = [0, ..., 0])$
  - Magenta solid line: Noisy robot motion computed during each step of the EKF
  - Black Circles: The pose covariance ellipse before the measurement update
  - Cyan Circles: The pose covariance ellipse after the measurement update

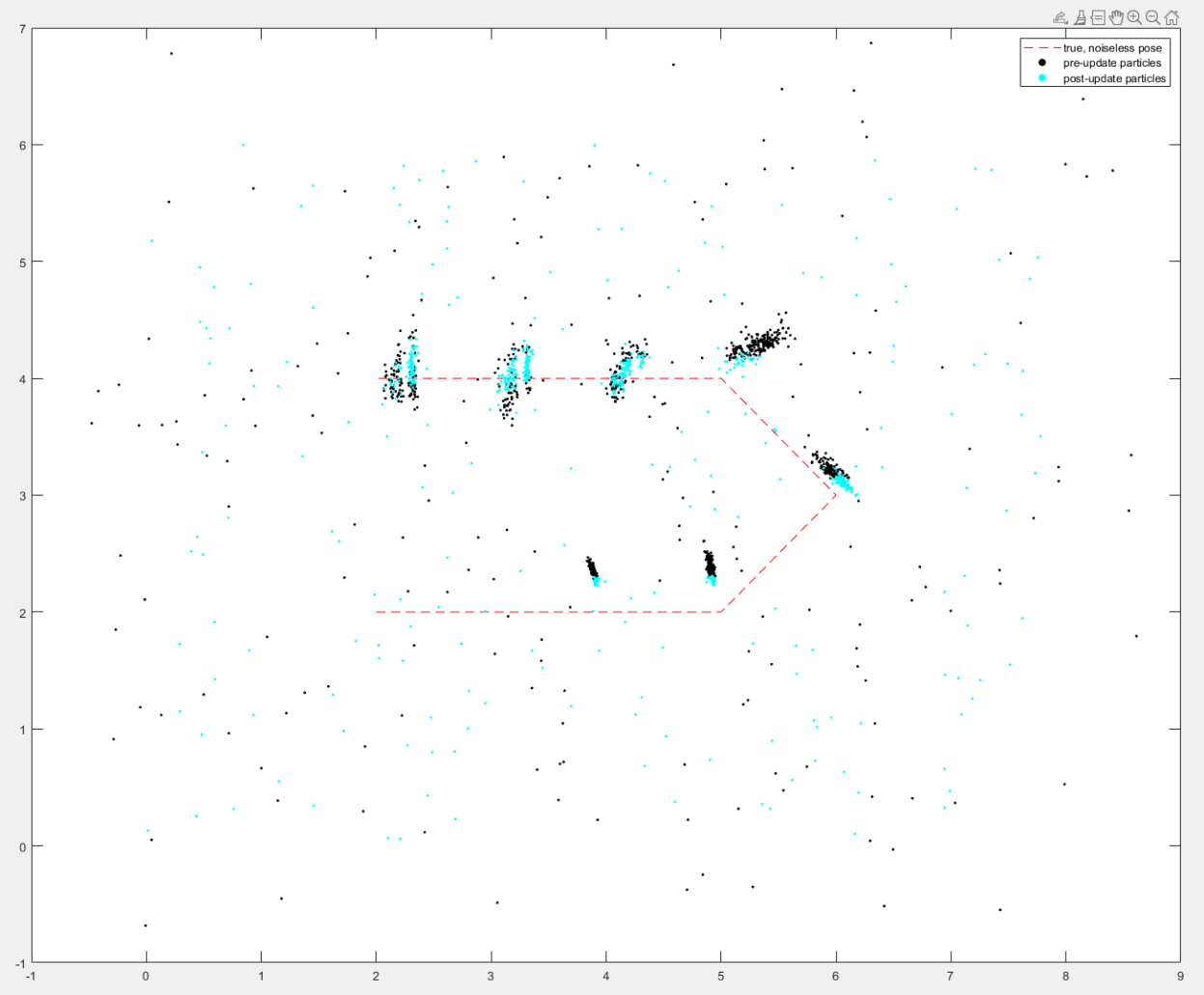

true noiseless pose
pre-update covariance
estimated pose
post-update covariance
4.5
4
3.5
3
2.5
2
1.5
1
1
2
3
4
5
6
7

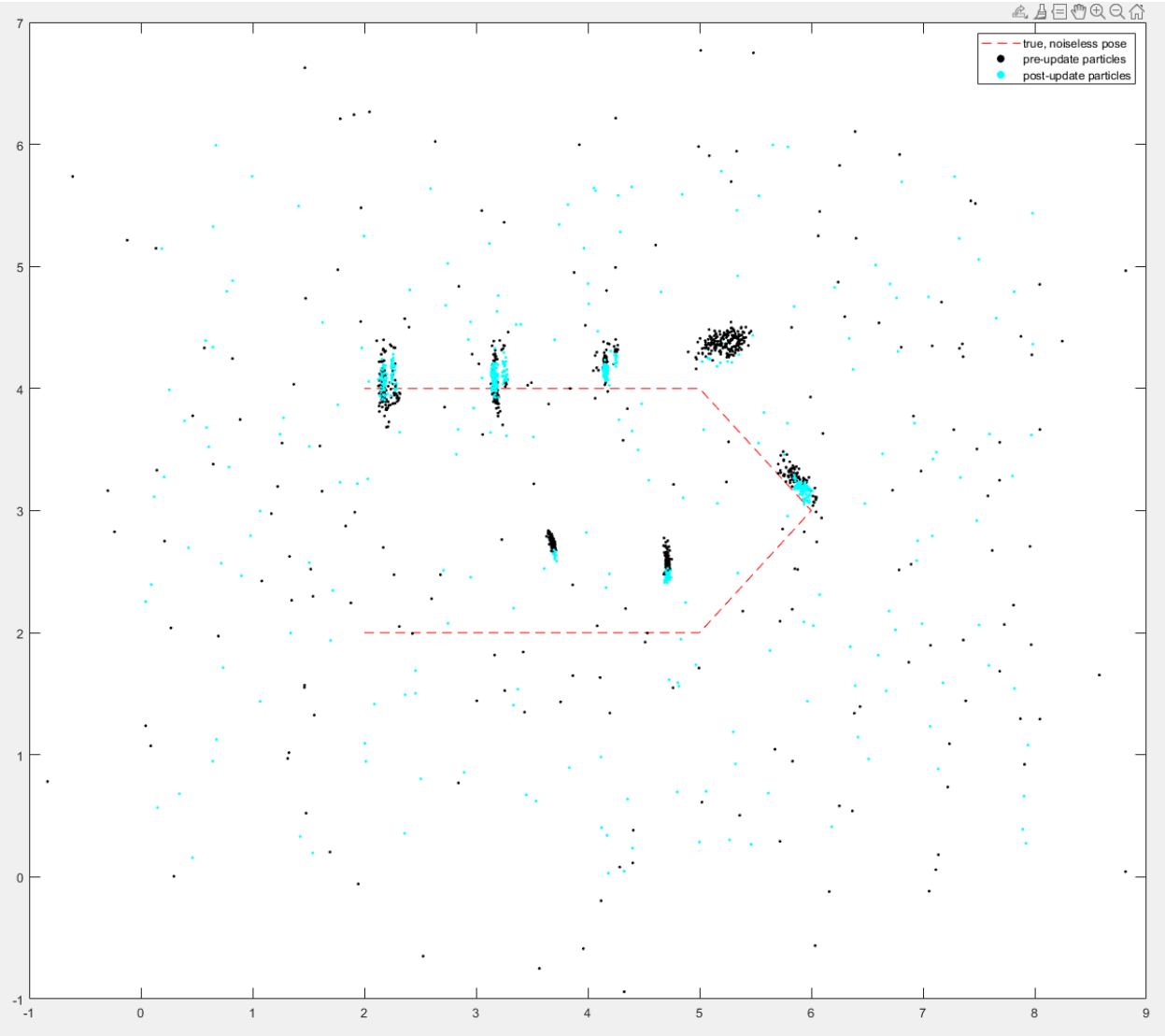
Particle Filter

- Legend:
  - Orange dashed line: True robot motion using velocity motion model with same input commands and no motion uncertainty ($\alpha = [0, ..., 0]$)
  - Black Dots: The set of particles before measurement update (resampling)
  - Cyan Dots: The set if particles after measurement update

Due to the randomness of resampling, the results of the particle filter can vary, but here are a few good runs that converge well and demonstrate resampling.


true, noiseless pose
pre-update particles
post-update particles
7
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7
8
9


true, noiseless pose
pre-update particles
post-update particles
7
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7
8
9


true, noiseless pose
pre-update particles
post-update particles
7
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7
8
9