Monte Carlo Simulations

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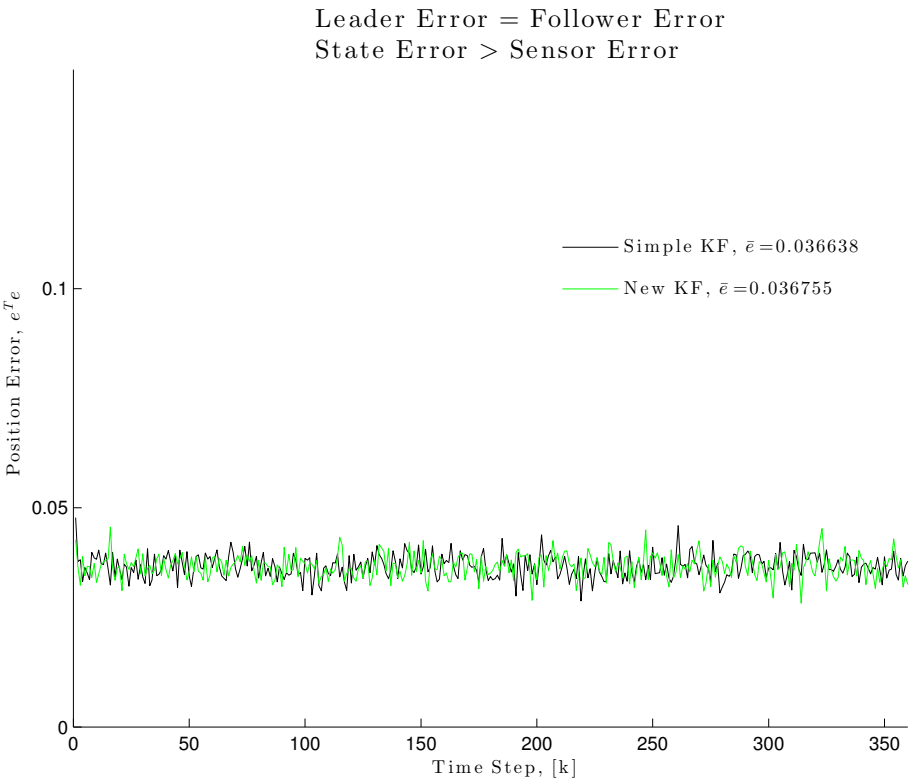
Section 1

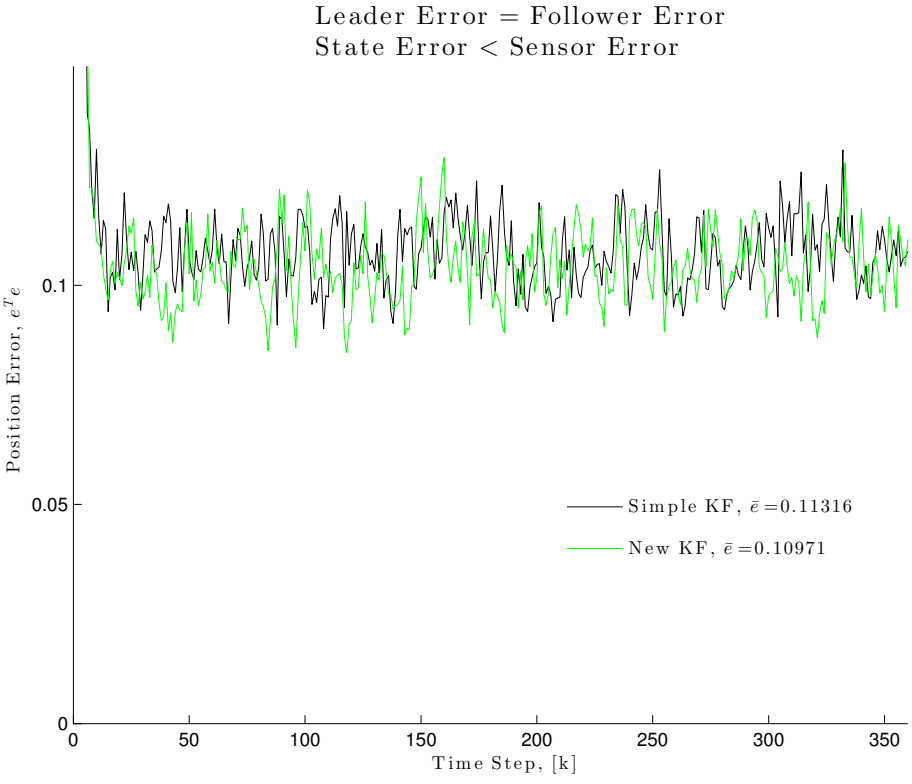
In the first three cases, the leader and follower have the *same* error covariance matrices, so:

$$Q_{(l)} = Q_{(f)} = Q$$
$$R_{(l)} = R_{(f)} = R$$
$$\text{where, } Q : \text{state covariance error}$$
$$R : \text{sensor covariance error}$$
$$\gamma > 1$$

The cases that were tested in this section are:

- $Q = R$
- $Q = R \times \gamma$
- $Q = R \times \frac{1}{\gamma}$


Leader Error = Follower Error
State Error > Sensor Error
Simple KF, $\bar{e}$ =0.036638
New KF, $\bar{e}$ =0.036755
Position Error, $e^T e$
Time Step, [k]
0
0.05
0.1
0
50
100
150
200
250
300
350


Leader Error = Follower Error
State Error < Sensor Error
Simple KF, $\bar{e}$ =0.11316
New KF, $\bar{e}$ =0.10971
Position Error, $e^T e$
Time Step, [k]
0
0.05
0.1
0
50
100
150
200
250
300
350

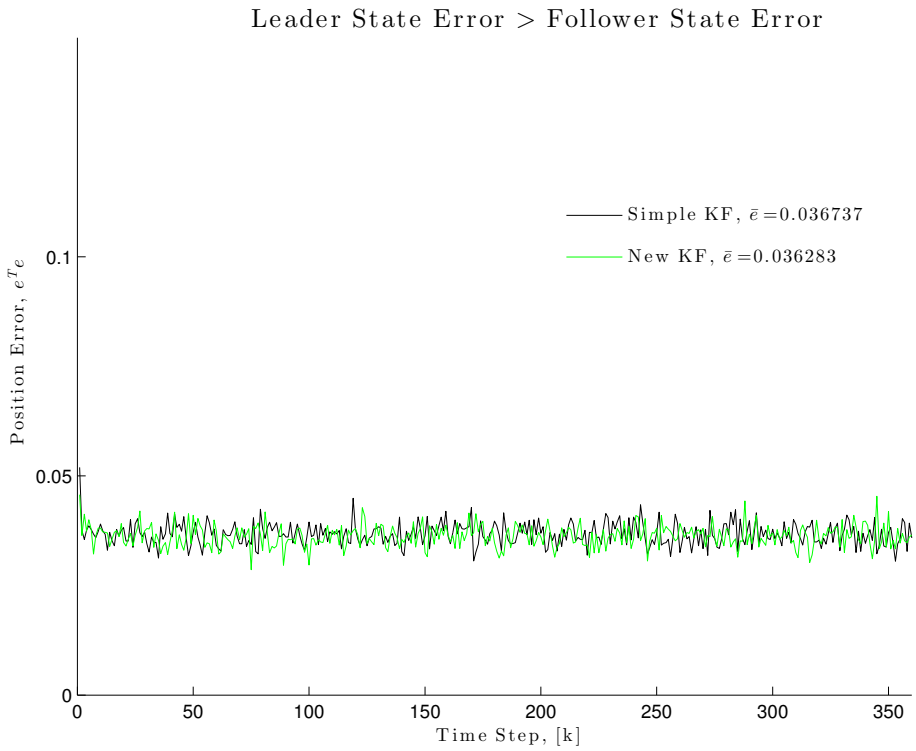
Section 2

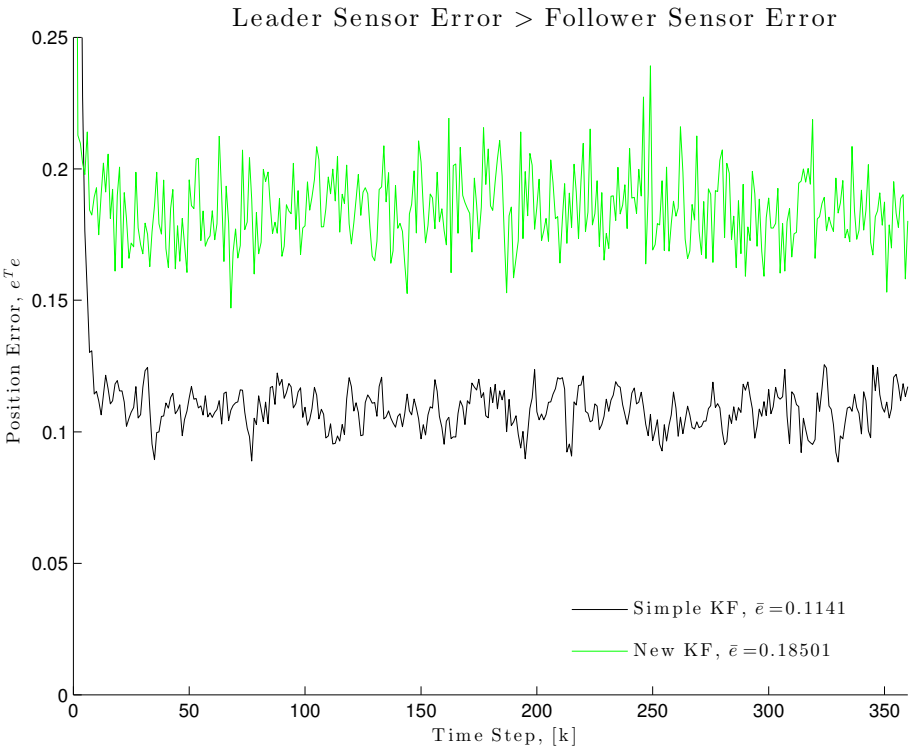
In the next three cases, the leader has larger error covariance matrices than the follower, so:

$$Q_{(l)} = Q_{(f)} \times \gamma$$
$$R_{(l)} = R_{(f)} \times \gamma$$
$$\text{where, } Q : \text{state covariance error}$$
$$R : \text{sensor covariance error}$$
$$\gamma > 1$$

The cases that were tested in this section are:

- $Q_{(l)} = Q_{(f)} \times \gamma$,
  $R_{(l)} = R_{(f)}$
- $Q_{(l)} = Q_{(f)}$,
  $R_{(l)} = R_{(f)} \times \gamma$
- $Q_{(l)} = Q_{(f)} \times \gamma$,
  $R_{(l)} = R_{(f)} \times \gamma$




Leader Sensor Error > Follower Sensor Error
Position Error, $e^T e$
Time Step, [k]
Simple KF, $\bar{e}$ =0.1141
New KF, $\bar{e}$ =0.18501


Leader State & Sensor Error > Follower State & Sensor Error
Position Error, $e^T e$
Time Step, [k]
Simple KF, $\bar{e}$ =0.24782
New KF, $\bar{e}$ =0.33808