# one_stationary_noiseless Turtlebot 1 Report

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*August 19, 2016*

This is a summary of the data from the one_stationary_noiseless experiment, Turtlebot #1.

The runtime of this experiment was 0 hours, 0 minutes, and 45.3 seconds.

The total number of external pose measurements recieved by the robot during this time was 0 which means poses were received at an average of 0 poses per second.

Shown below is the summary of each filter's error for both x and y coordinates, and also the error in total distance.

```
summary(continuous$x_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.713e-07 8.601e-07 8.711e-07 9.774e-07 8.838e-07 2.083e-06
```

```
summary(continuous$y_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.037e-09 1.039e-08 1.950e-08 1.959e-08 2.864e-08 3.748e-08
```

```
summary(continuous$yaw_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.350e-05 5.946e-05 7.101e-05 7.310e-05 8.627e-05 1.334e-04
```

```
summary(continuous$dist_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.713e-07 8.604e-07 8.717e-07 9.777e-07 8.840e-07 2.084e-06
```

```
summary(discrete$x_error)
```

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.404e-08  2.811e-08  8.690e-07  6.500e-07  1.022e-06  2.144e-06
```

```
summary(discrete$y_error)
```

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -4.898e-10 -4.405e-11  1.749e-10  6.810e-10  3.609e-10  7.200e-09
```

```
summary(discrete$yaw_error)
```

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -8.325e-05 -1.455e-05 -7.150e-07  9.516e-06  1.641e-05  1.441e-04
```

```r
summary(discrete$dist_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.182e-10 2.961e-08 8.690e-07 6.534e-07 1.022e-06 2.144e-06
```

```r
summary(noisy_odom$x_err)
```

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.070e-05 -2.850e-05 -2.721e-05 -2.755e-05 -2.646e-05 -2.389e-05
```

```r
summary(noisy_odom$y_err)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 6.689e-08 7.318e-08 7.940e-08 7.933e-08 8.542e-08 9.190e-08
```

```r
summary(noisy_odom$dist_err)
```

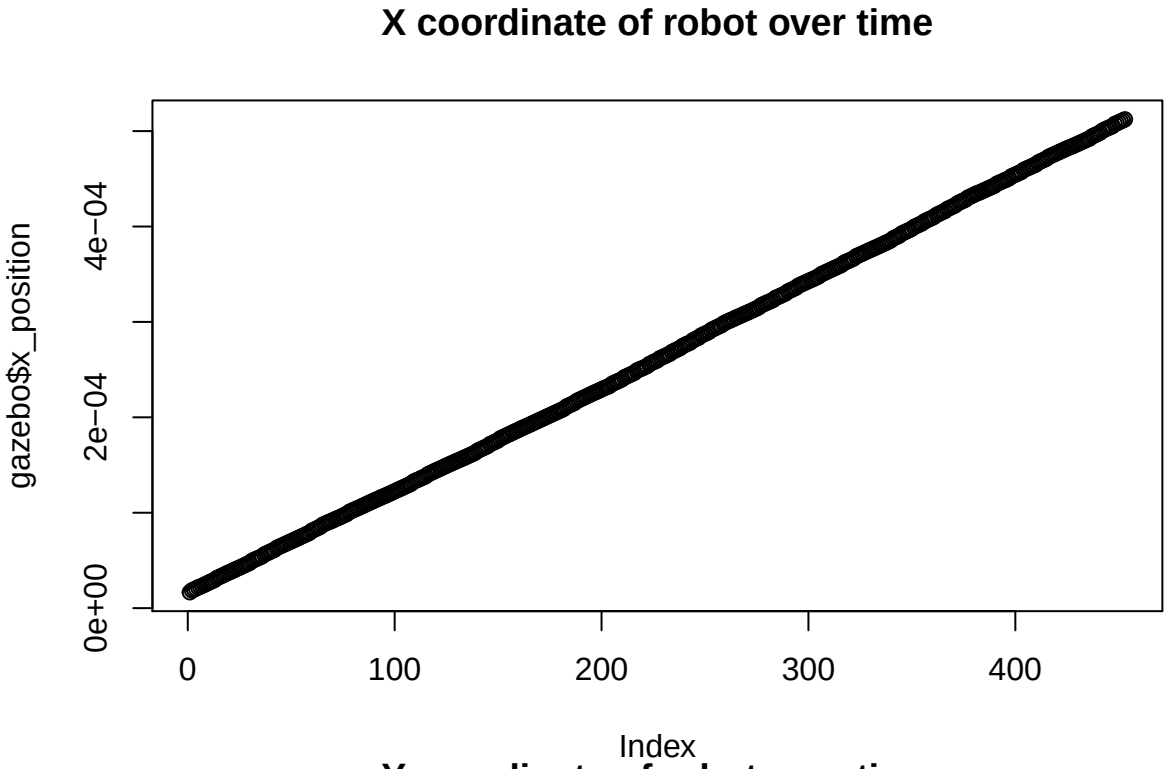
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 2.389e-05 2.646e-05 2.721e-05 2.755e-05 2.850e-05 3.070e-05
```

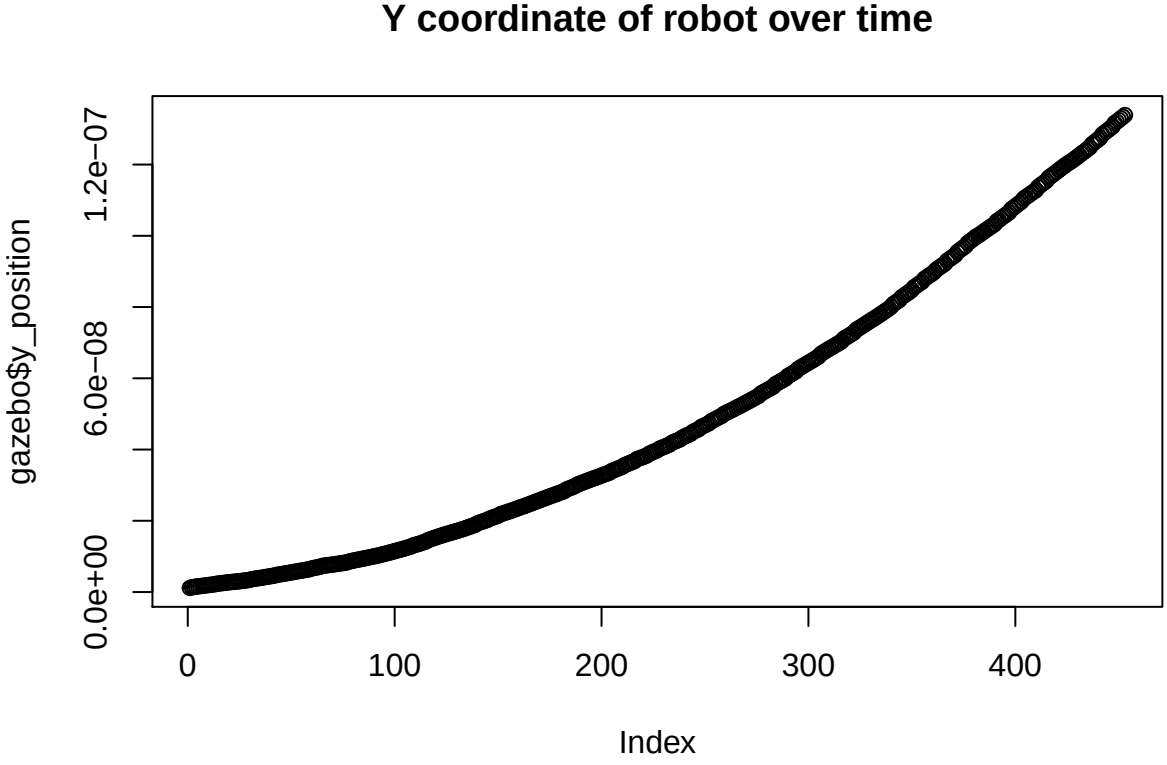
```r
if (NROW(gps) > 0) {
    summary(gps$x_err)
    summary(gps$y_err)
    summary(gps$dist_err)
}
```

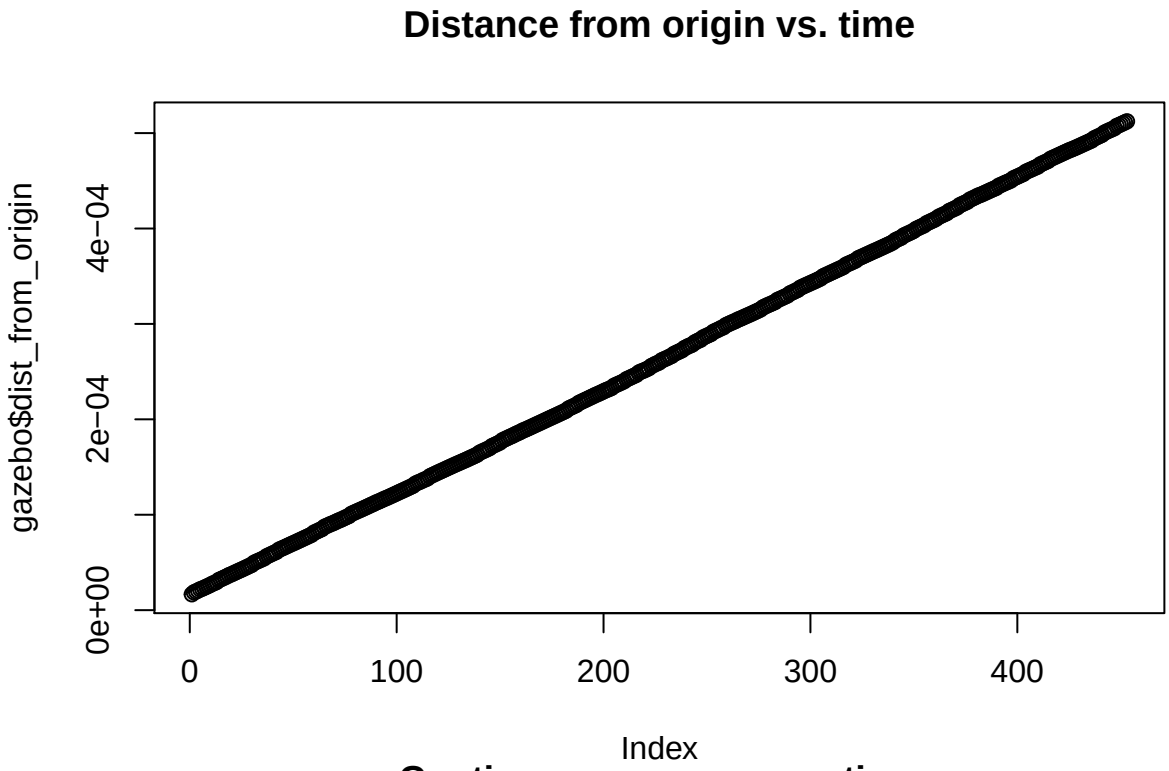
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 8.316e-05 1.904e-04 2.974e-04 2.972e-04 4.039e-04 5.113e-04
```

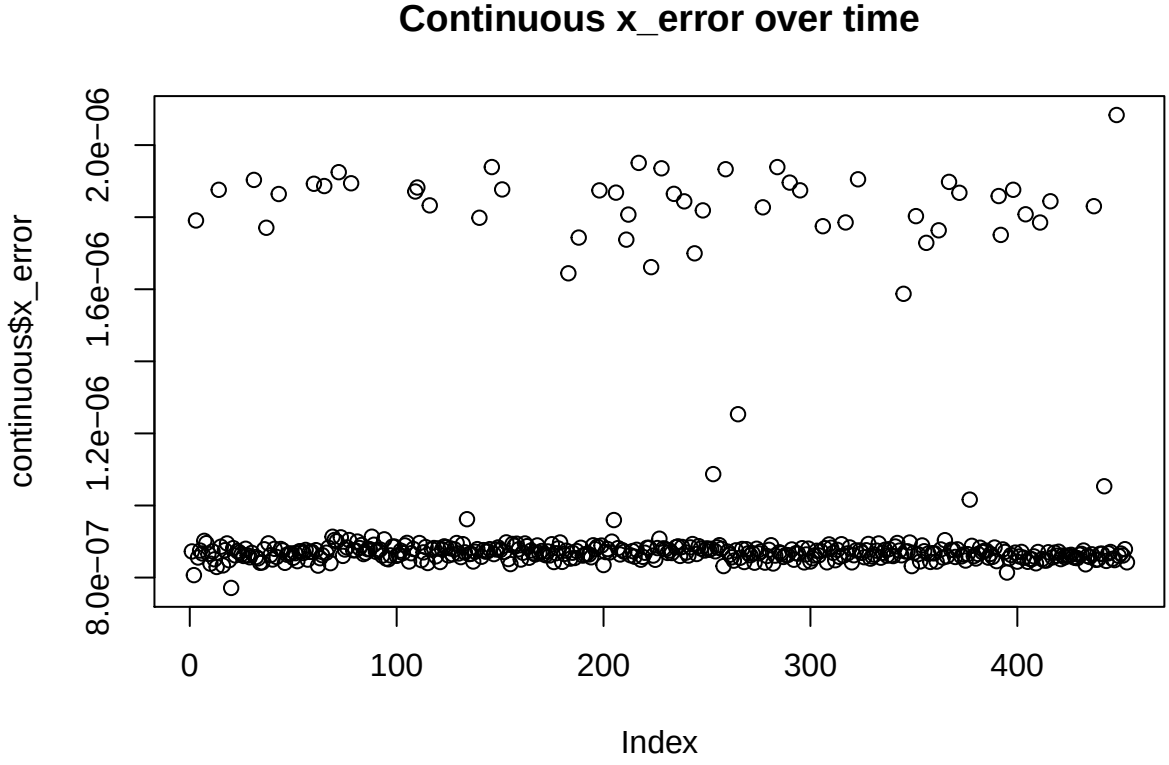
```r
if (NROW(noisy_odom) > 0) {
    summary(noisy_odom$x_variance)
    summary(noisy_odom$y_variance)
    summary(noisy_odom$yaw_variance)
}
```

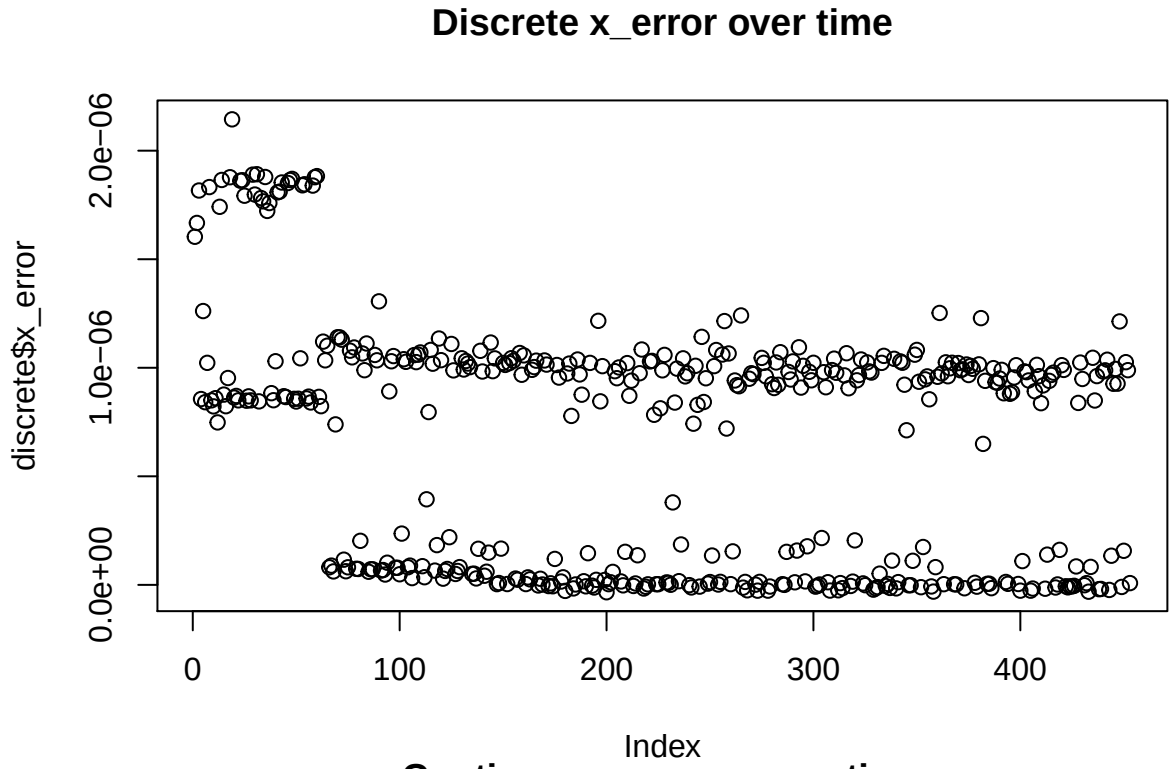
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 8.903e-16 8.966e-15 1.945e-14 2.565e-14 3.506e-14 1.719e-13
```

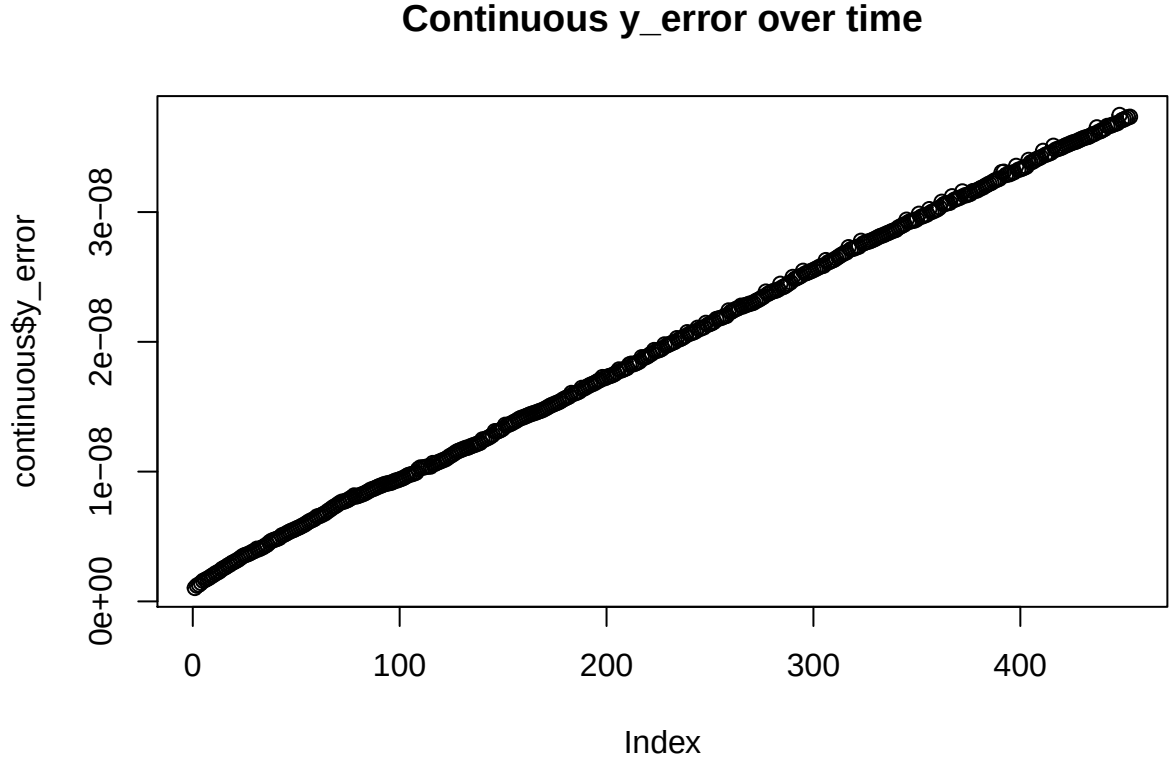

X coordinate of robot over time
gazebo$x_position
0e+00
2e−04
4e−04
0
100
200
300
400
Index

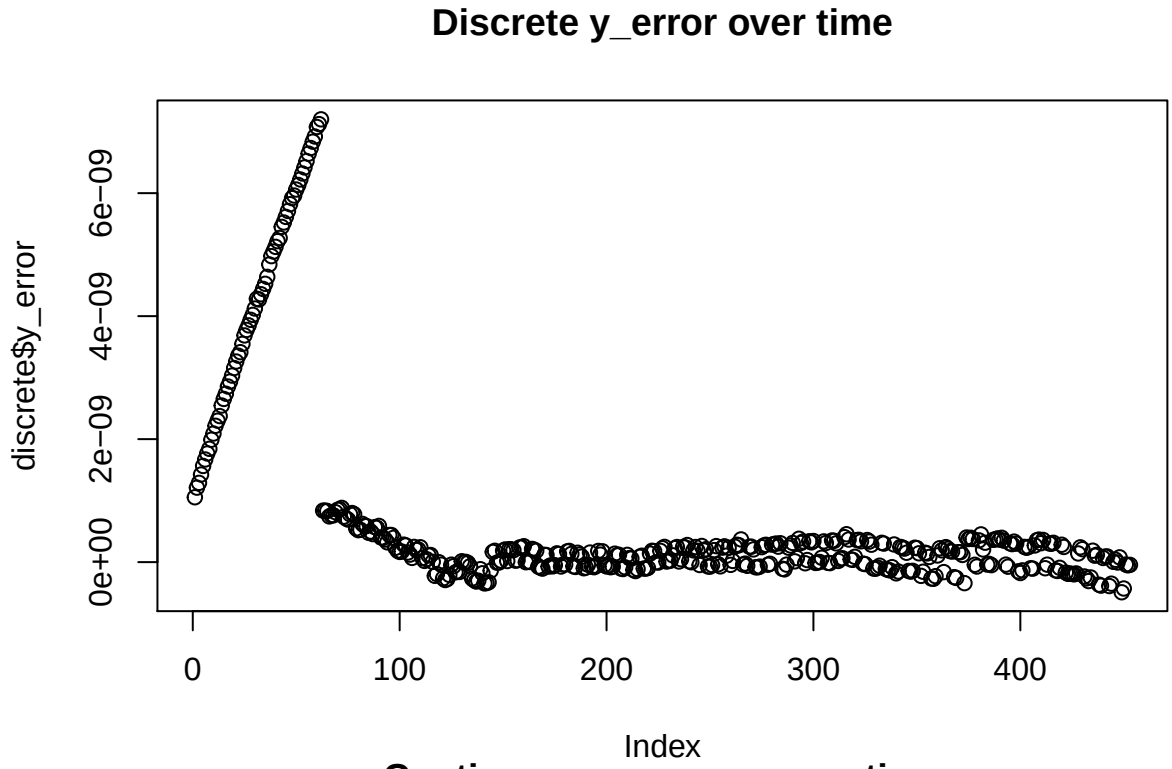

Y coordinate of robot over time
gazebo$y_position
0.0e+00
6.0e−08
1.2e−07
0
100
200
300
400
Index

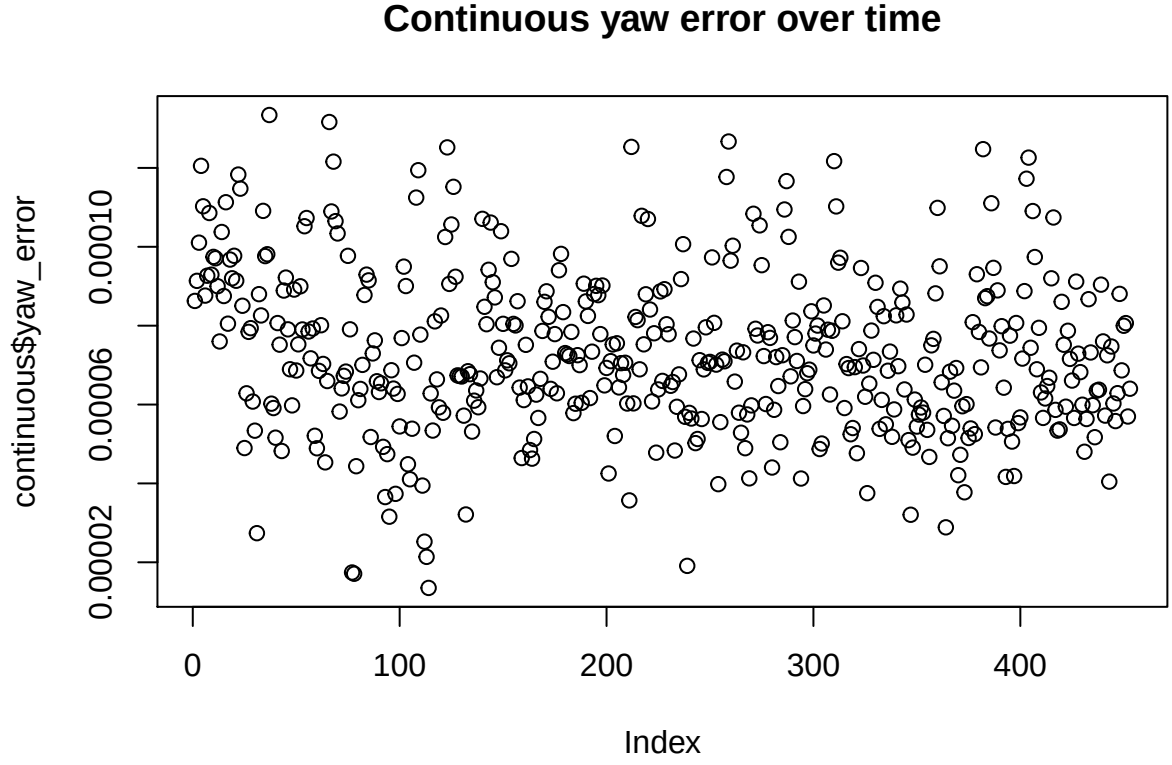

Distance from origin vs. time
gazebo$dist_from_origin
0e+00
2e−04
4e−04
0
100
200
300
400
Index

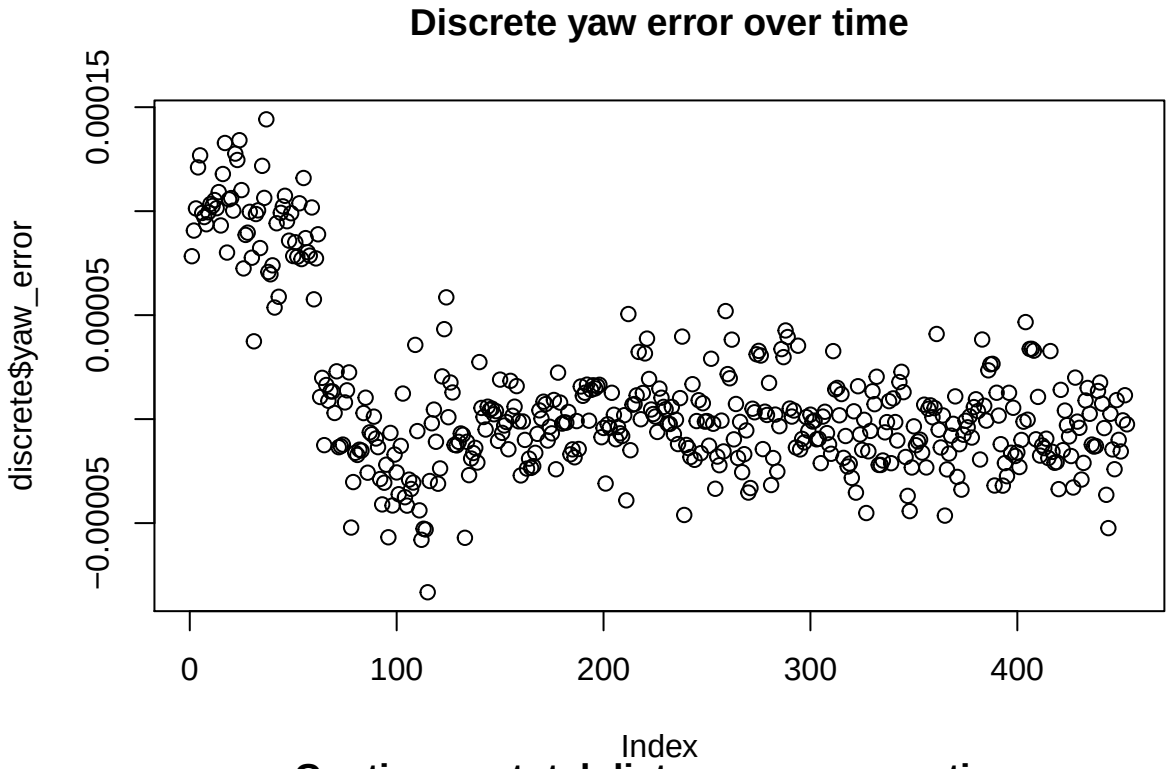

Continuous x_error over time
continuous$x_error
8.0e−07
1.2e−06
1.6e−06
2.0e−06
0
100
200
300
400
Index

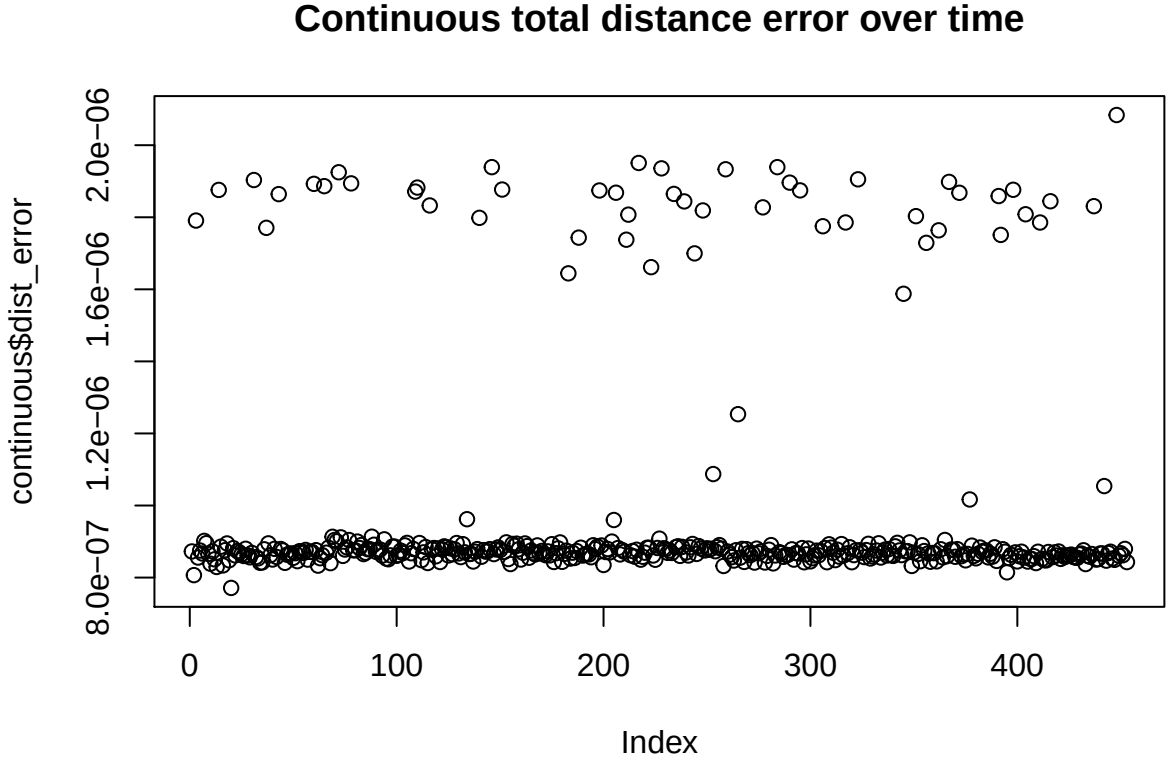

Discrete x_error over time
discrete$x_error
0.0e+00
1.0e−06
2.0e−06
0
100
200
300
400
Index

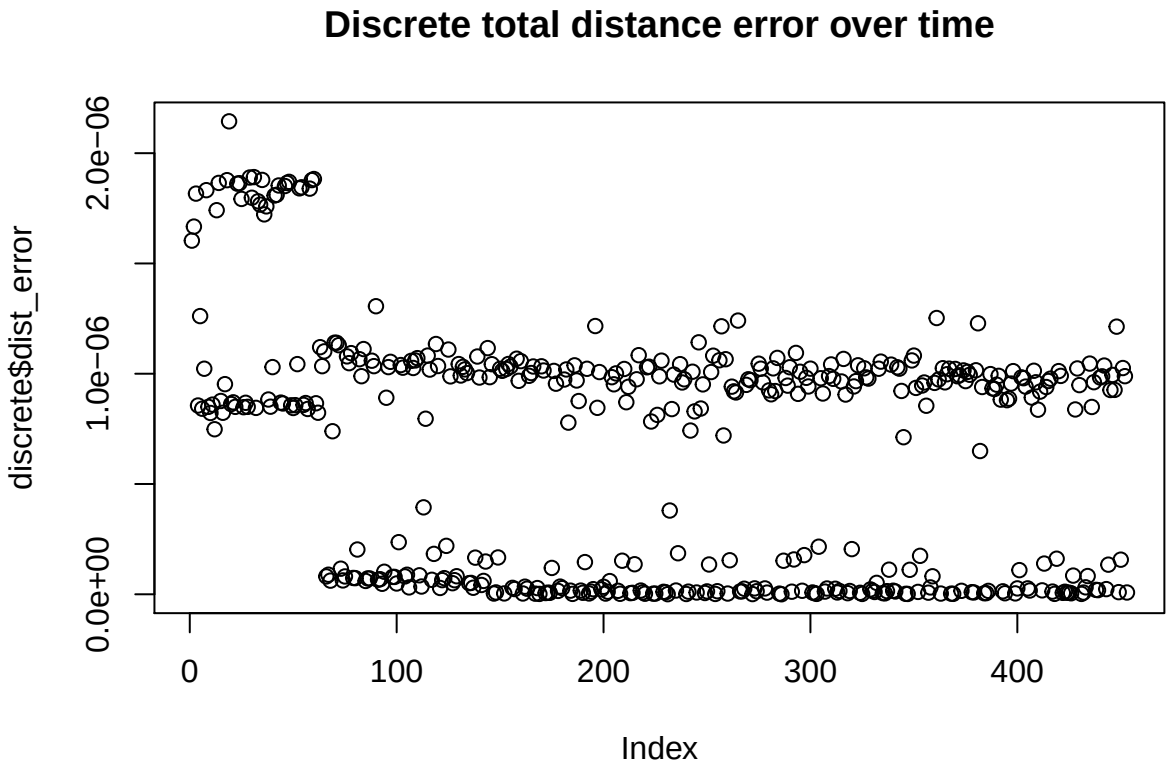

Continuous y_error over time
continuous$y_error
0e+00
1e−08
2e−08
3e−08
0
100
200
300
400
Index

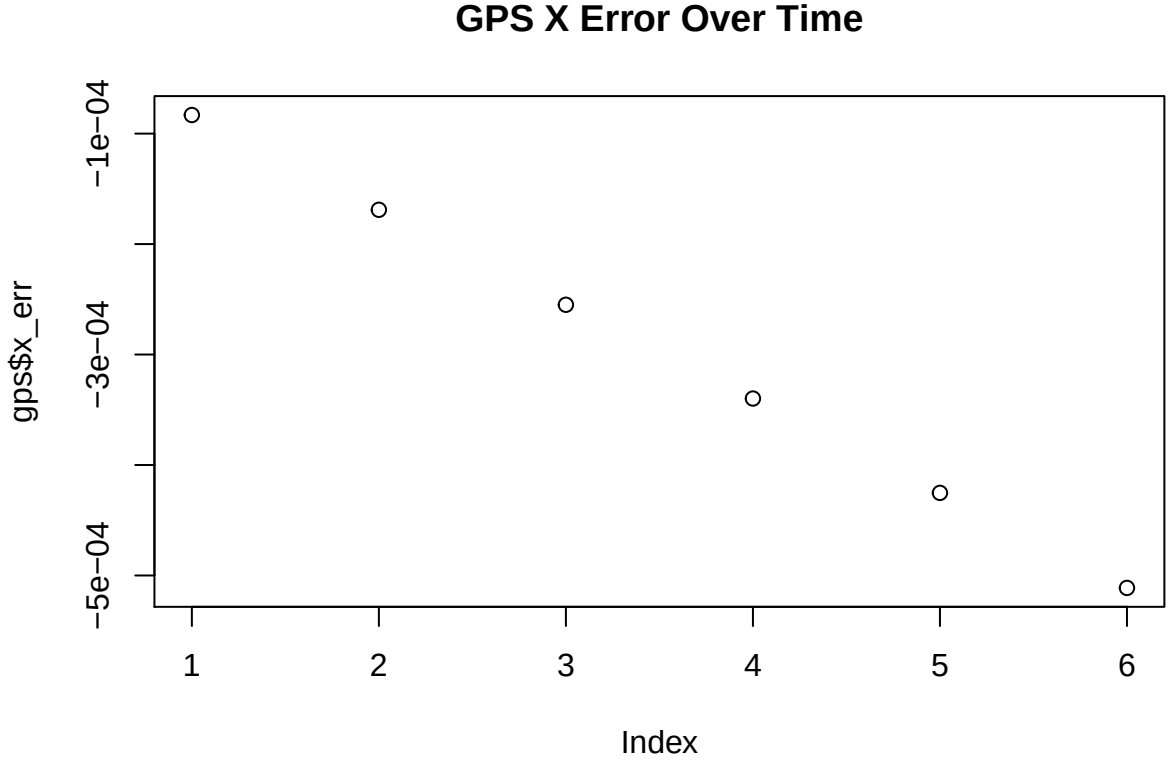

Discrete y_error over time
discrete$y_error
0e+00
2e−09
4e−09
6e−09
0
100
200
300
400
Index

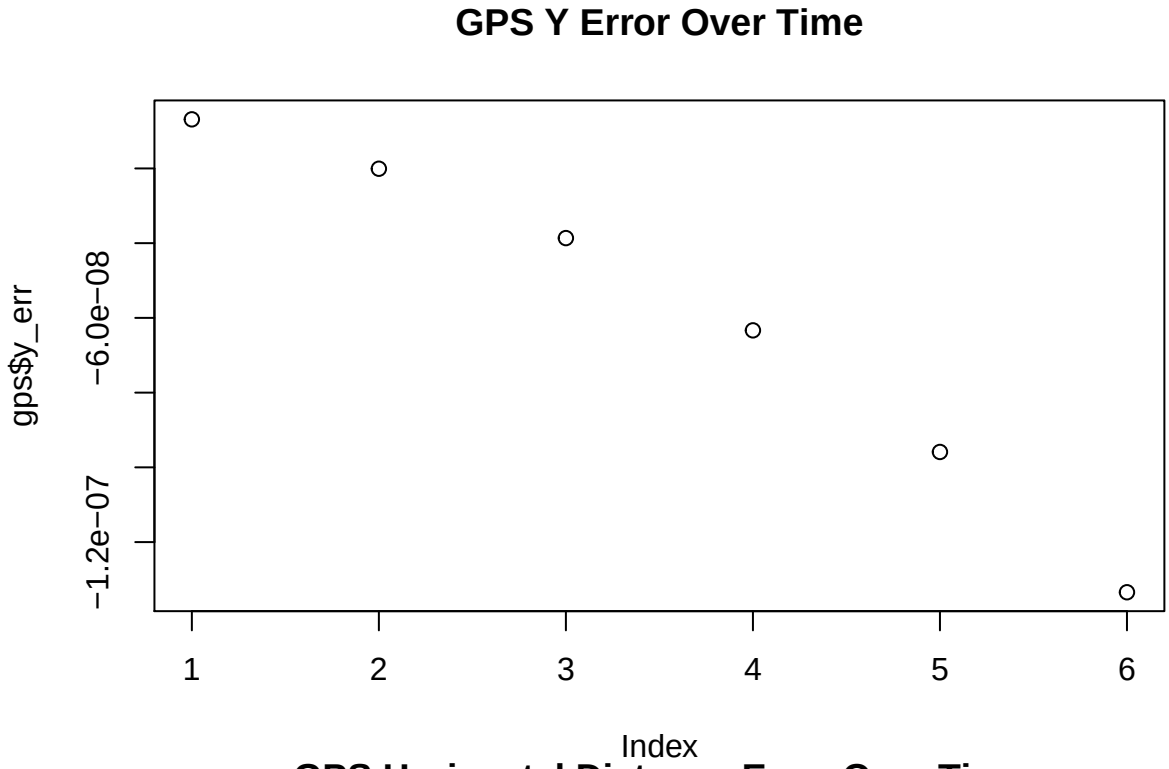

Continuous yaw error over time
continuous$yaw_error
0.00002
0.00006
0.00010
0
100
200
300
400
Index

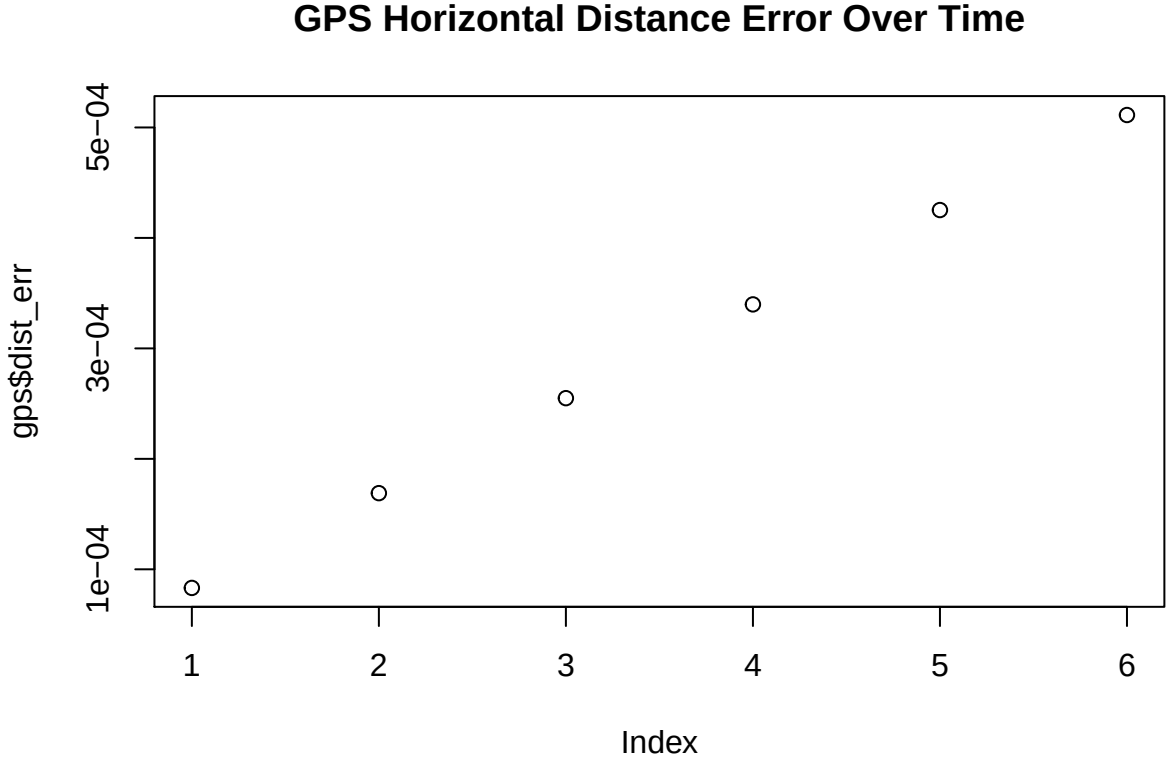

Discrete yaw error over time
discrete$yaw_error
0.00015
0.00005
−0.00005
0
100
200
300
400
Index

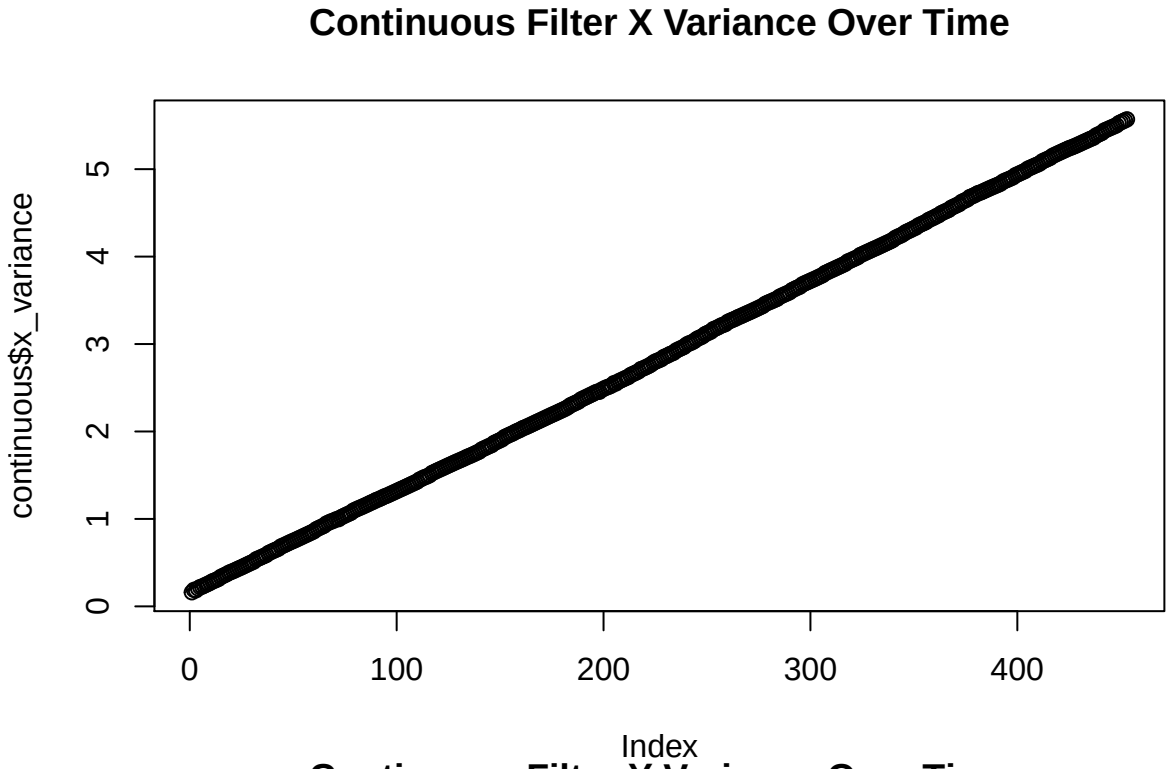

Continuous total distance error over time
continuous$dist_error
2.0e−06
1.6e−06
1.2e−06
8.0e−07
0
100
200
300
400
Index

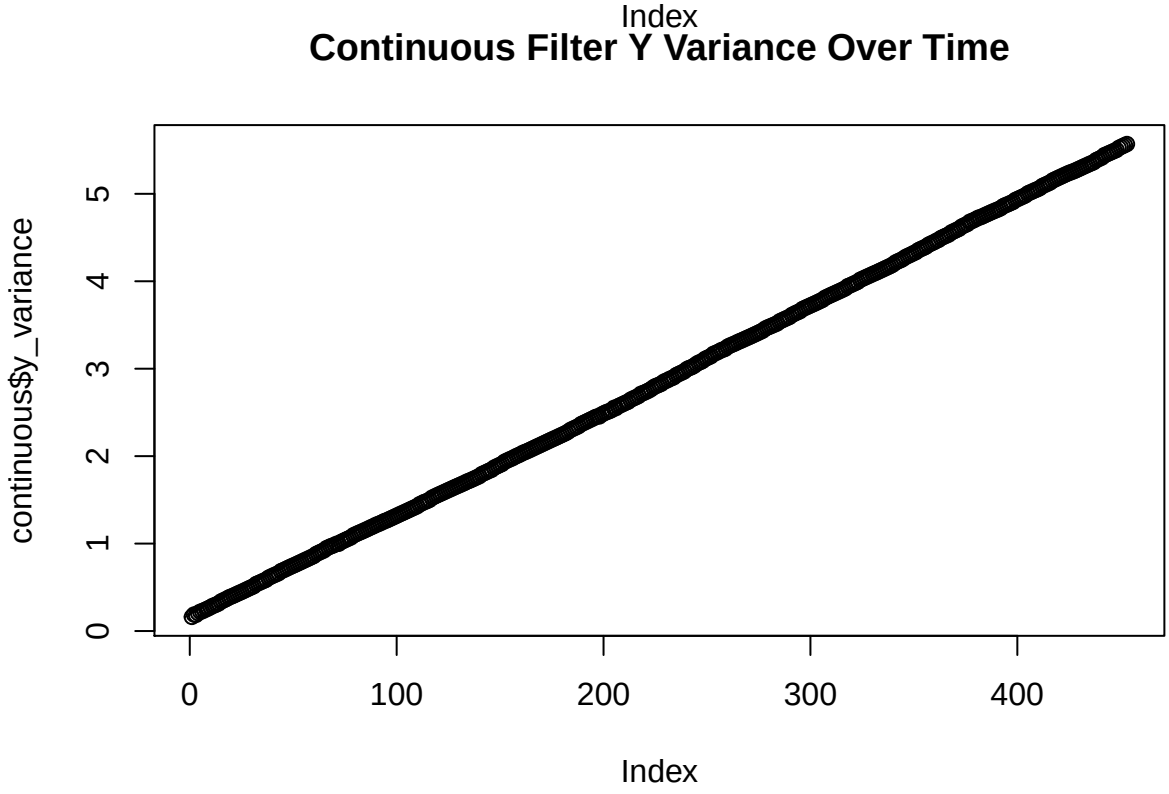

Discrete total distance error over time
discrete$dist_error
0.0e+00
1.0e−06
2.0e−06
0
100
200
300
400
Index

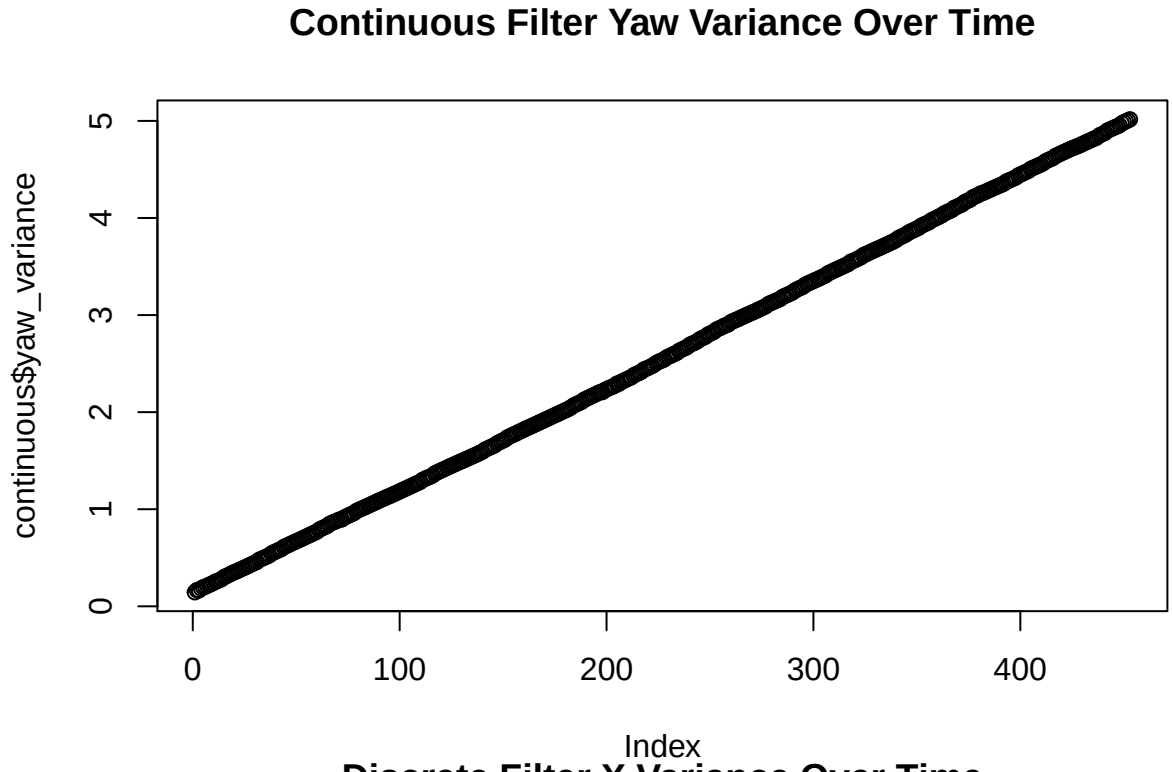

GPS X Error Over Time
gps$x_err
−5e−04
−3e−04
−1e−04
1
2
3
4
5
6
Index

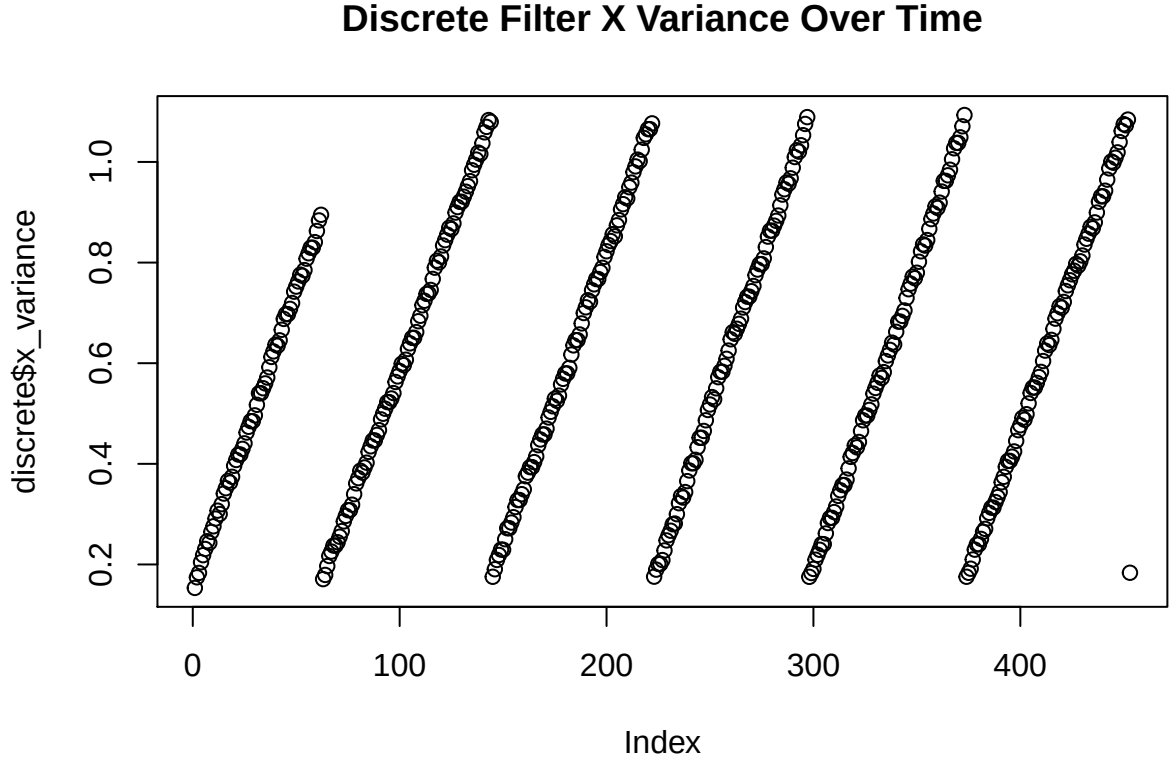

GPS Y Error Over Time
gps$y_err
−1.2e−07
−6.0e−08
1
2
3
4
5
6
Index

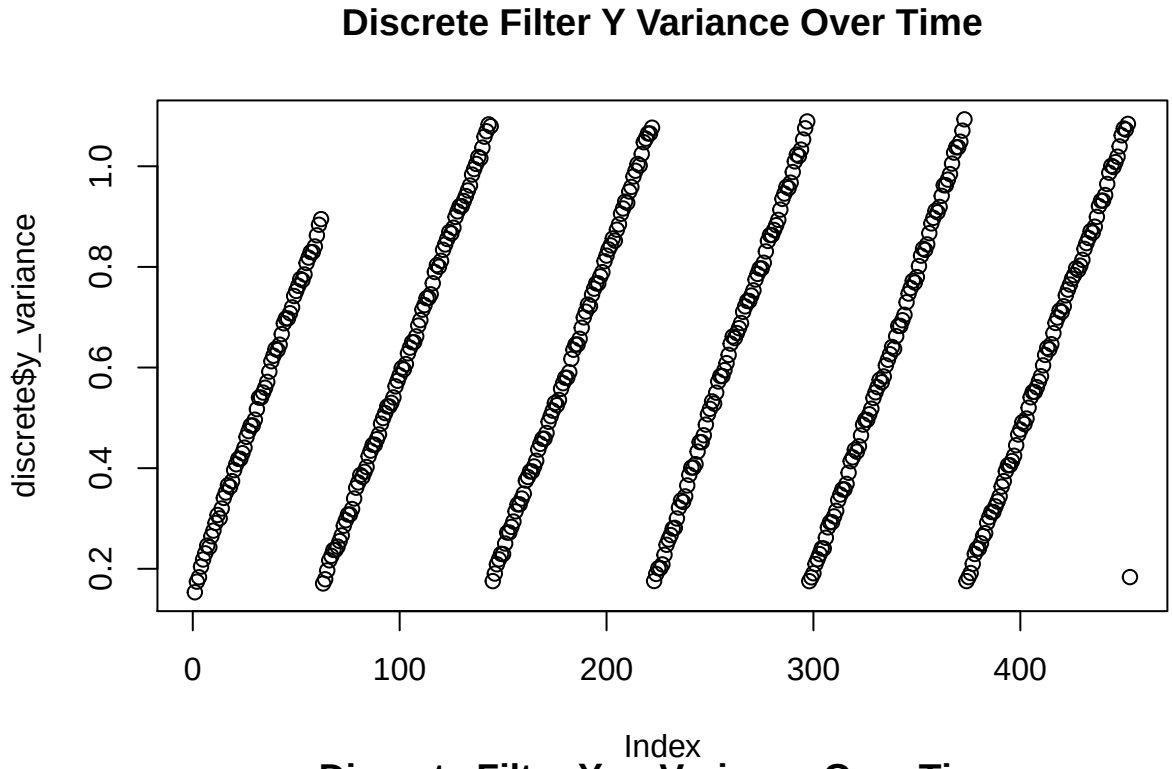

GPS Horizontal Distance Error Over Time
gps$dist_err
1e−04
3e−04
5e−04
1
2
3
4
5
6
Index

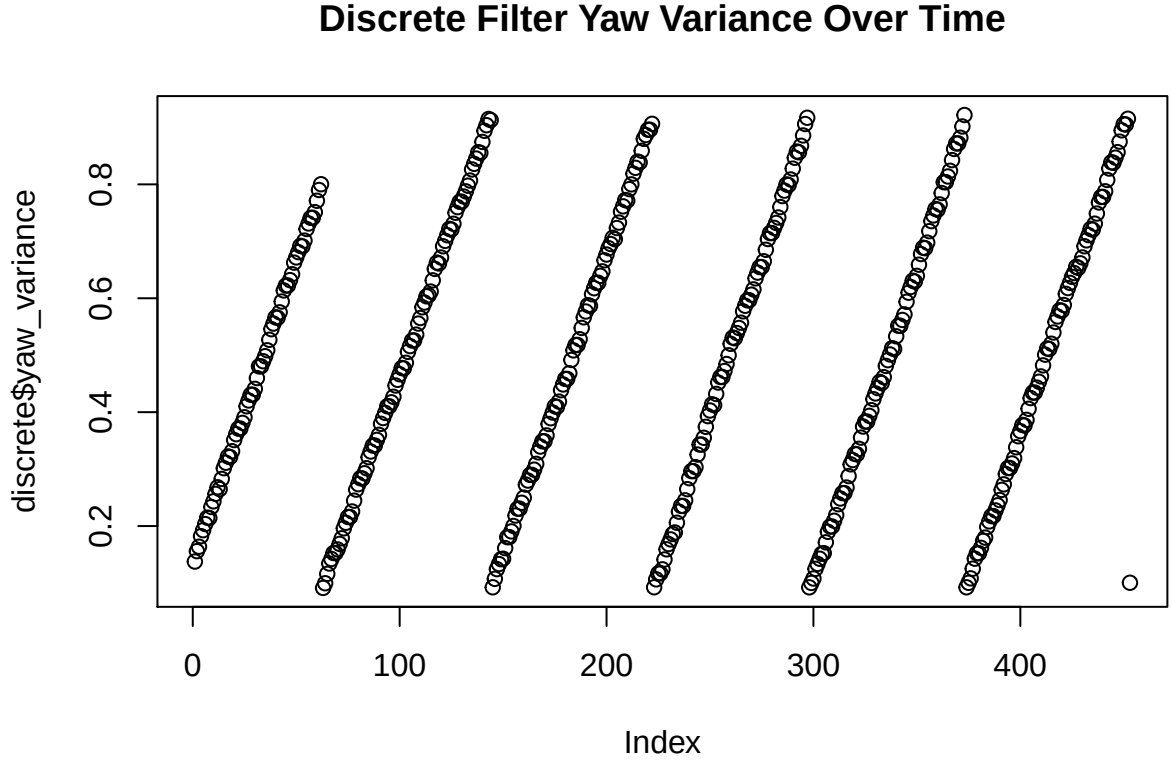

Continuous Filter X Variance Over Time
continuous$x_variance
0
1
2
3
4
5
0
100
200
300
400
Index

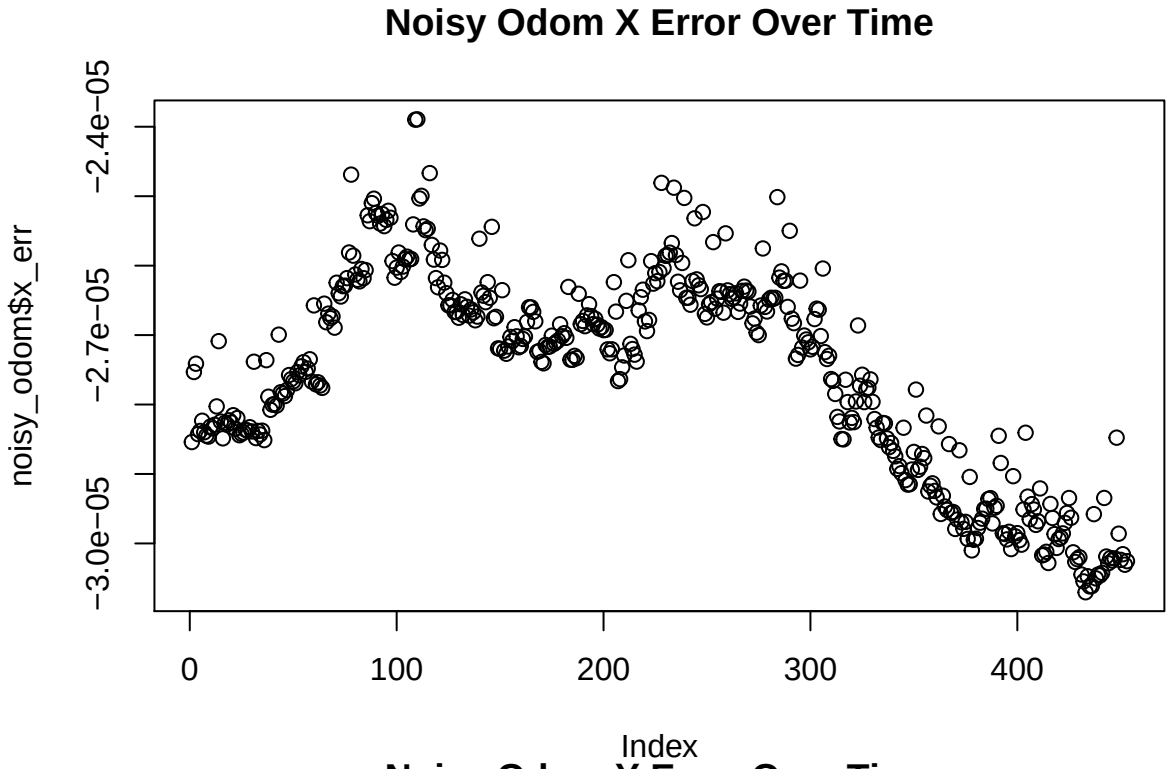

Continuous Filter Y Variance Over Time
continuous$y_variance
0
1
2
3
4
5
0
100
200
300
400
Index

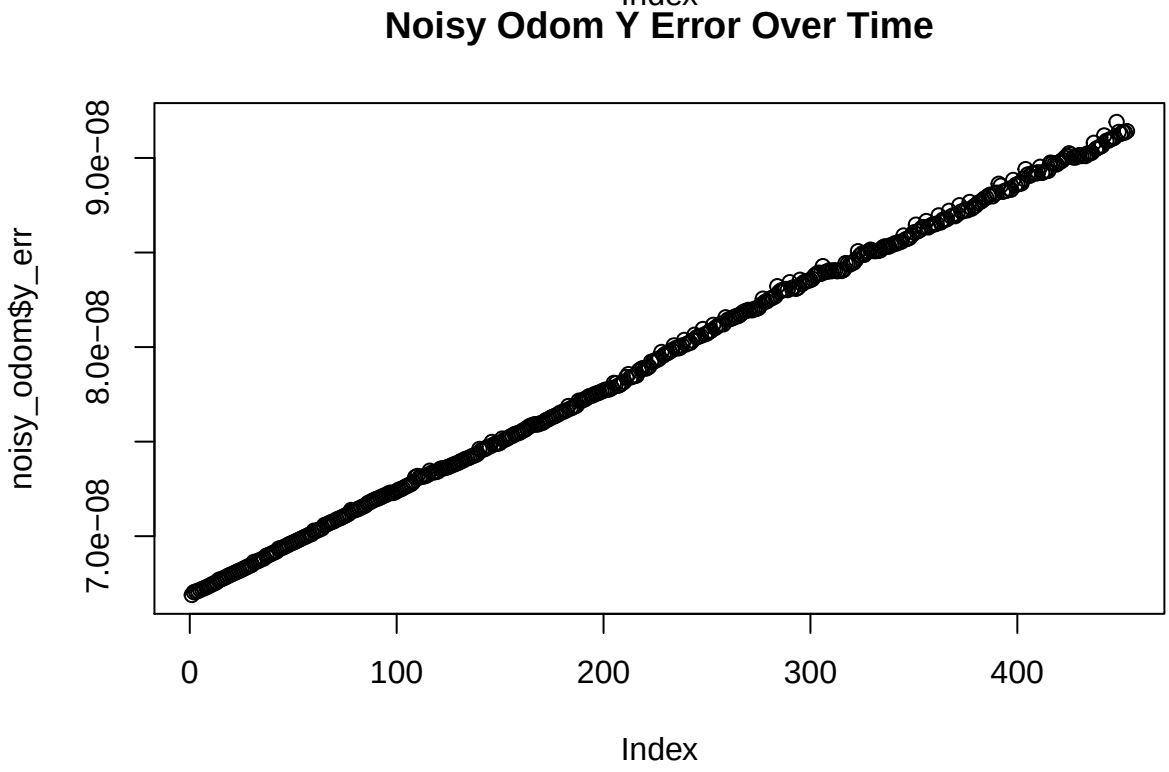

Continuous Filter Yaw Variance Over Time
continuous$yaw_variance
0
1
2
3
4
5
0
100
200
300
400
Index

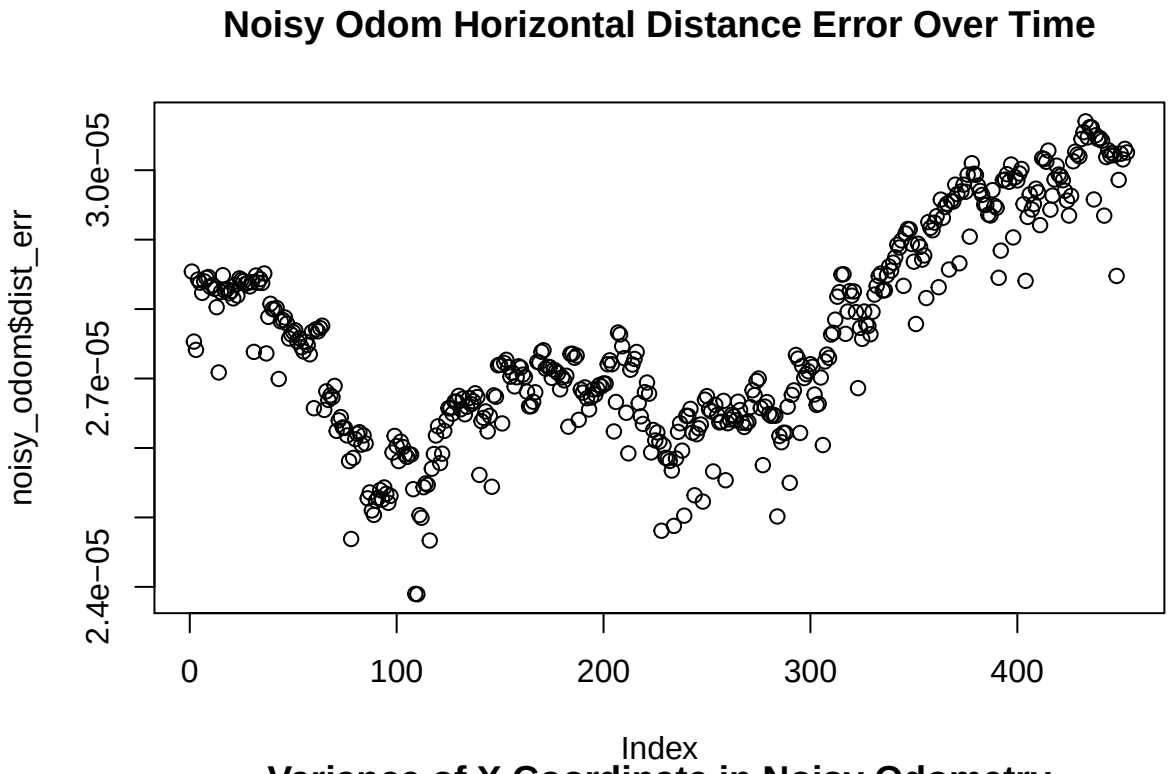

Discrete Filter X Variance Over Time
discrete$x_variance
0.2
0.4
0.6
0.8
1.0
0
100
200
300
400
Index

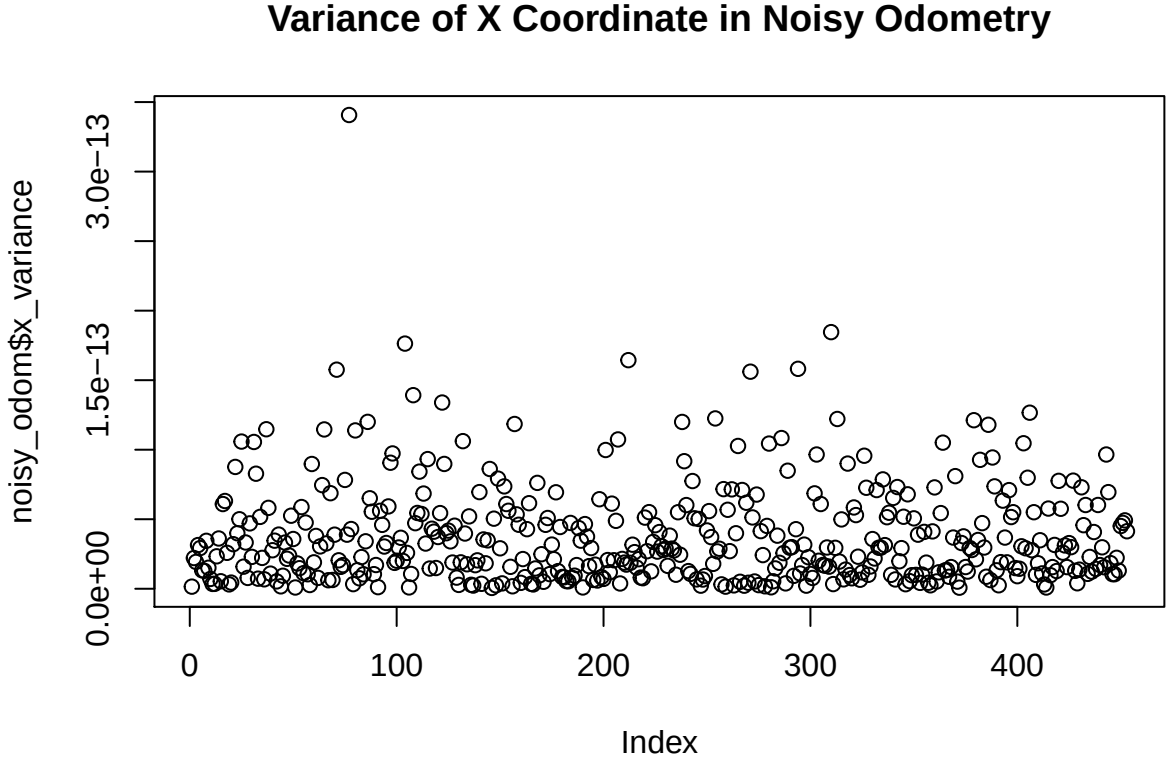

Discrete Filter Y Variance Over Time
discrete$y_variance
0.2
0.4
0.6
0.8
1.0
0
100
200
300
400
Index

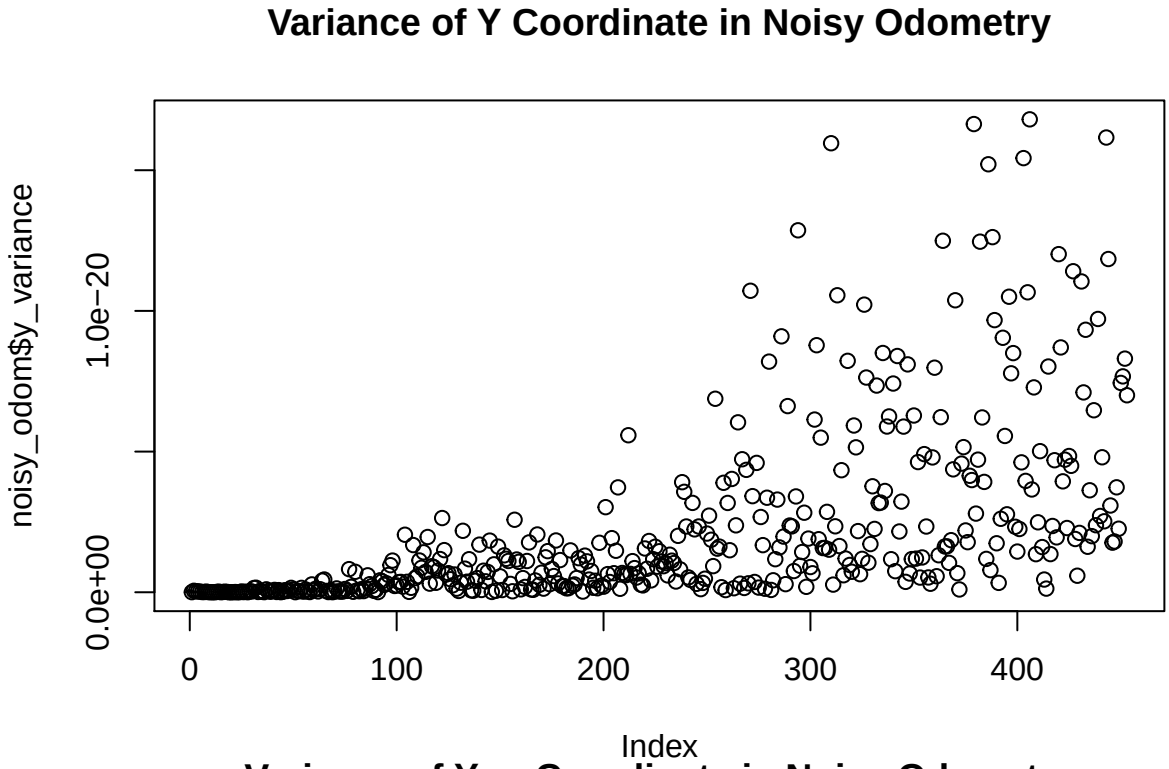

Discrete Filter Yaw Variance Over Time
discrete$yaw_variance
0.2
0.4
0.6
0.8
0
100
200
300
400
Index

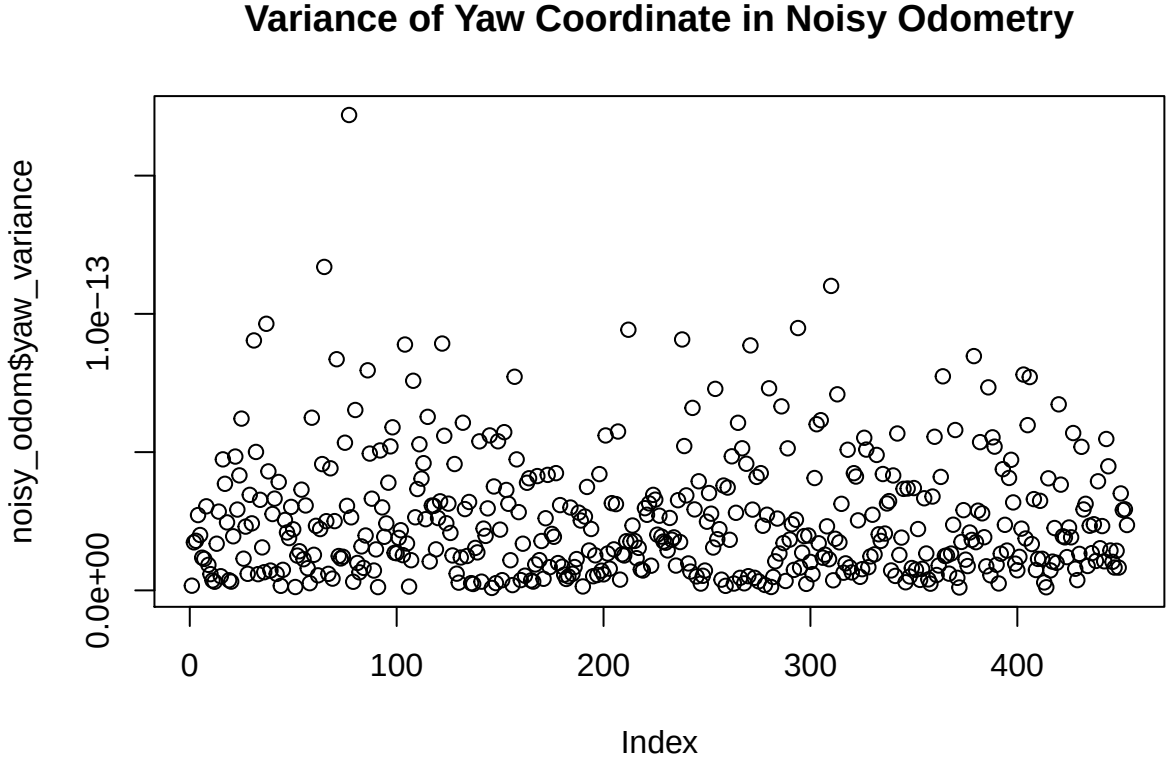

Noisy Odom X Error Over Time
noisy_odom$x_err
−2.4e−05
−2.7e−05
−3.0e−05
0
100
200
300
400
Index

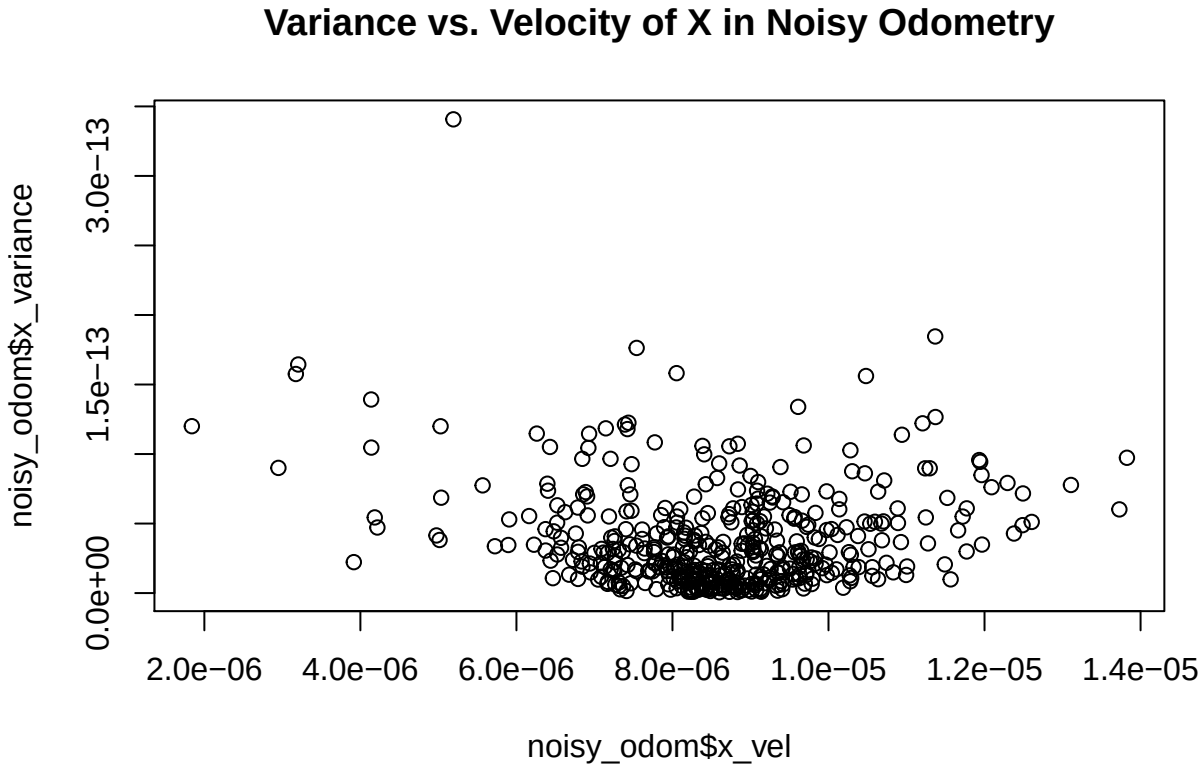

Noisy Odom Y Error Over Time
noisy_odom$y_err
9.0e−08
8.0e−08
7.0e−08
0
100
200
300
400
Index

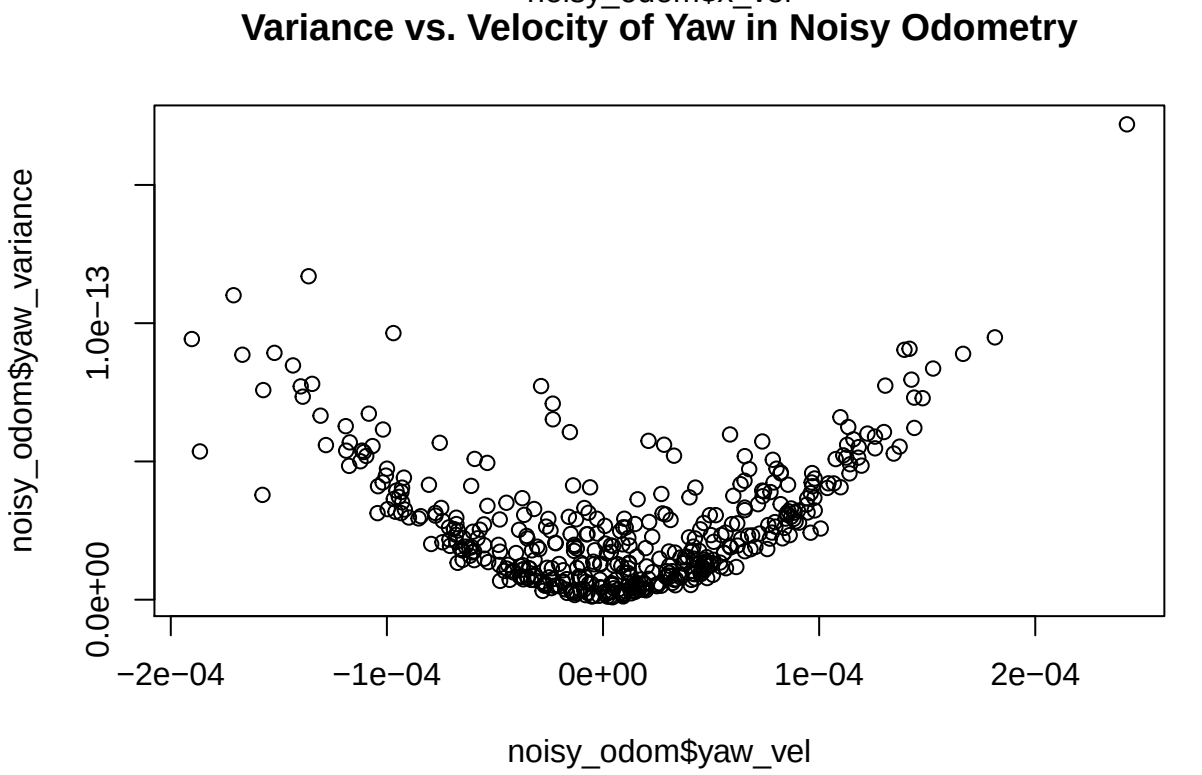

Noisy Odom Horizontal Distance Error Over Time
noisy_odom$dist_err
2.4e−05
2.7e−05
3.0e−05
0
100
200
300
400
Index


Variance of X Coordinate in Noisy Odometry
noisy_odom$x_variance
0.0e+00
1.5e−13
3.0e−13
0
100
200
300
400
Index


Variance of Y Coordinate in Noisy Odometry
noisy_odom$y_variance
0.0e+00
1.0e−20
0
100
200
300
400
Index


Variance of Yaw Coordinate in Noisy Odometry
noisy_odom$yaw_variance
0.0e+00
1.0e−13
0
100
200
300
400
Index


Variance vs. Velocity of X in Noisy Odometry
noisy_odom$x_variance
0.0e+00
1.5e−13
3.0e−13
2.0e−06
4.0e−06
6.0e−06
8.0e−06
1.0e−05
1.2e−05
1.4e−05
noisy_odom$x_vel


Variance vs. Velocity of Yaw in Noisy Odometry
noisy_odom$yaw_variance
0.0e+00
1.0e−13
−2e−04
−1e−04
0e+00
1e−04
2e−04
noisy_odom$yaw_vel