

# two\_mobile\_noiseless\_no\_gps Turtlebot 2 Report

Matthew Swartwout

August 10, 2016

This is a summary of the data from the two\_mobile\_noiseless\_no\_gps experiment, Turtlebot #2.

The runtime of this experiment was 0 hours, 6 minutes, and 44.8 seconds.

The total number of external pose measurements received by the robot during this time was 643 which means poses were received at an average of 1.5884387 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.
## -4.234e-05 5.270e-05 1.269e-04 1.550e-04 2.646e-04 4.131e-04
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -4.422e-04 -2.928e-04 -1.718e-04 -1.820e-04 -8.009e-05 7.366e-05
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.125   -1.392   -1.372   -1.267   -1.350    3.096
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 1.564e-05 1.616e-04 2.748e-04 2.676e-04 3.662e-04 5.233e-04
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -27.280  -20.980  -16.050  -16.420  -11.520    0.187
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -9.687   1.274  37.130  32.640  58.780  96.780
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.123   -1.376   -1.338  -1.239   -1.306    3.098
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 0.02941 26.03000 40.69000 42.10000 60.08000 96.91000
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -2.6270  -1.5160  -1.0080  -1.0710  -0.7259  0.1573
```

```

summary(noisy_odom$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -1.75600 -0.22780  0.02713  0.07933  0.79310  1.65500

summary(noisy_odom$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.000004 0.735200 1.384000 1.292000 1.946000 2.900000

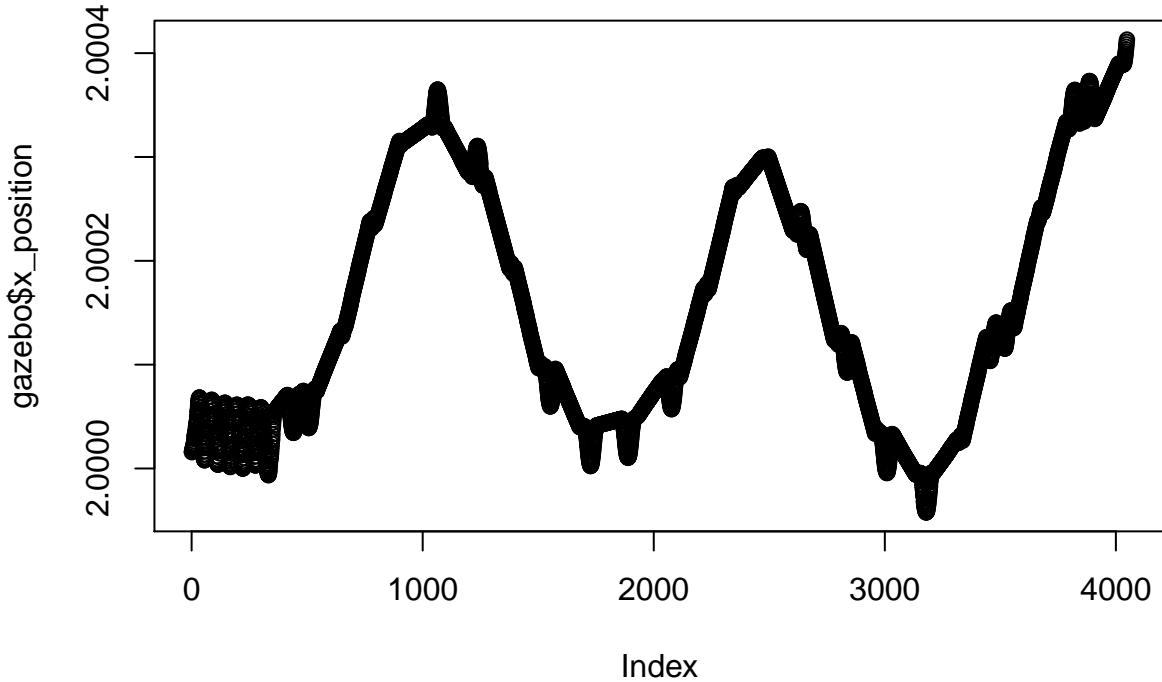
if (NROW(gps) > 0) {
  summary(gps$x_err)
  summary(gps$y_err)
  summary(gps$dist_err)
}

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

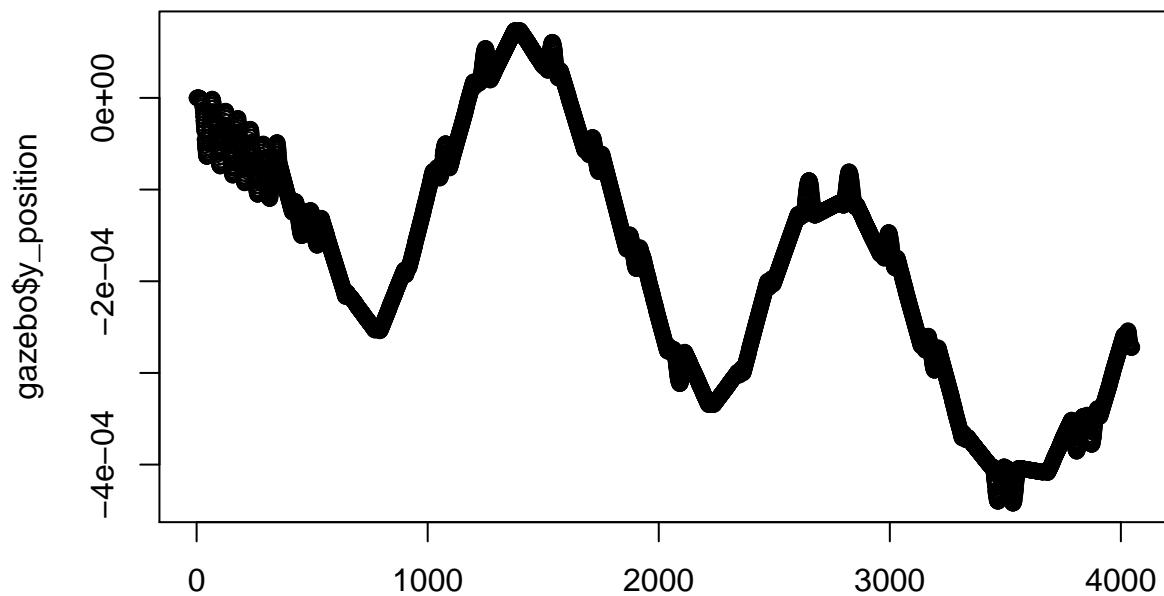
##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.000000 0.000000 0.000000 0.001980 0.007013 0.008723

```

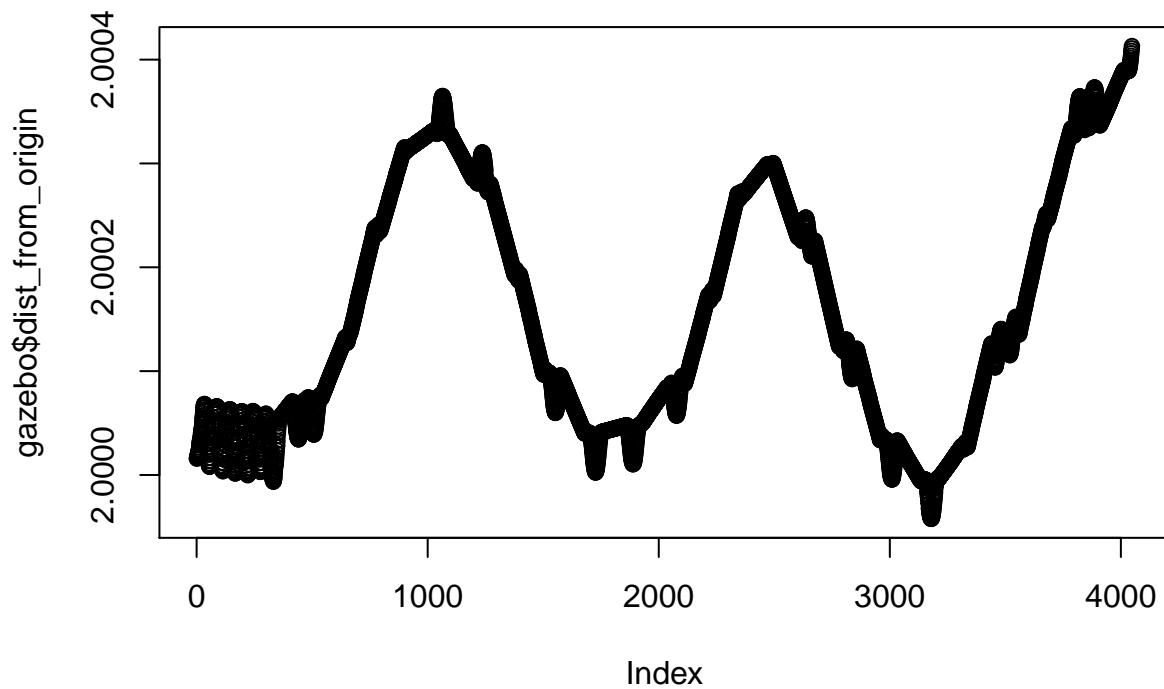
### X coordinate of robot over time



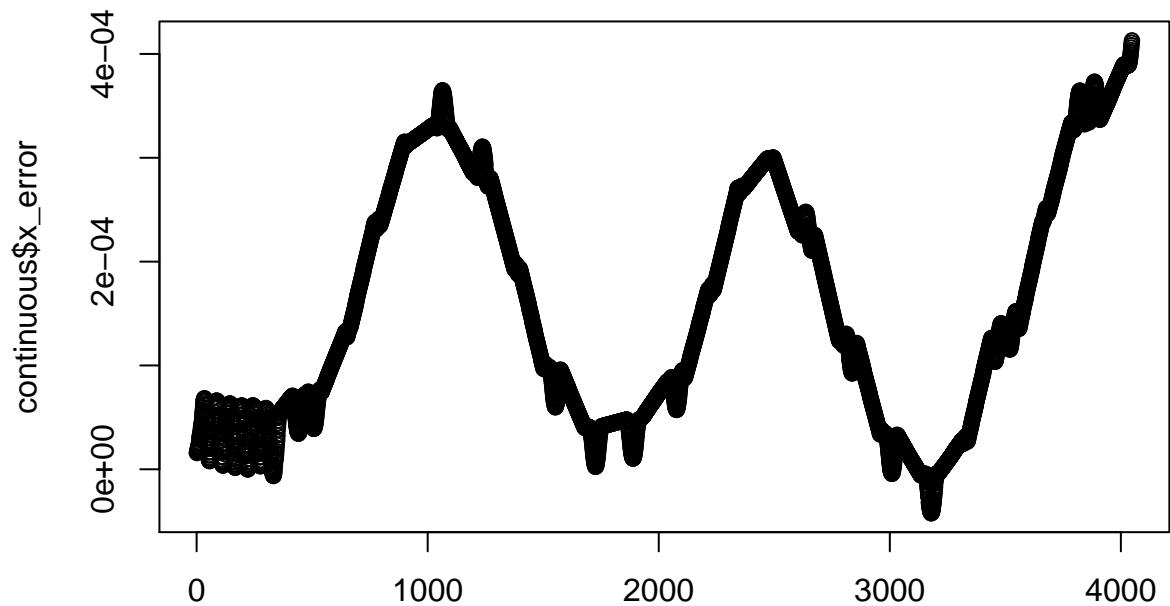
**Y coordinate of robot over time**



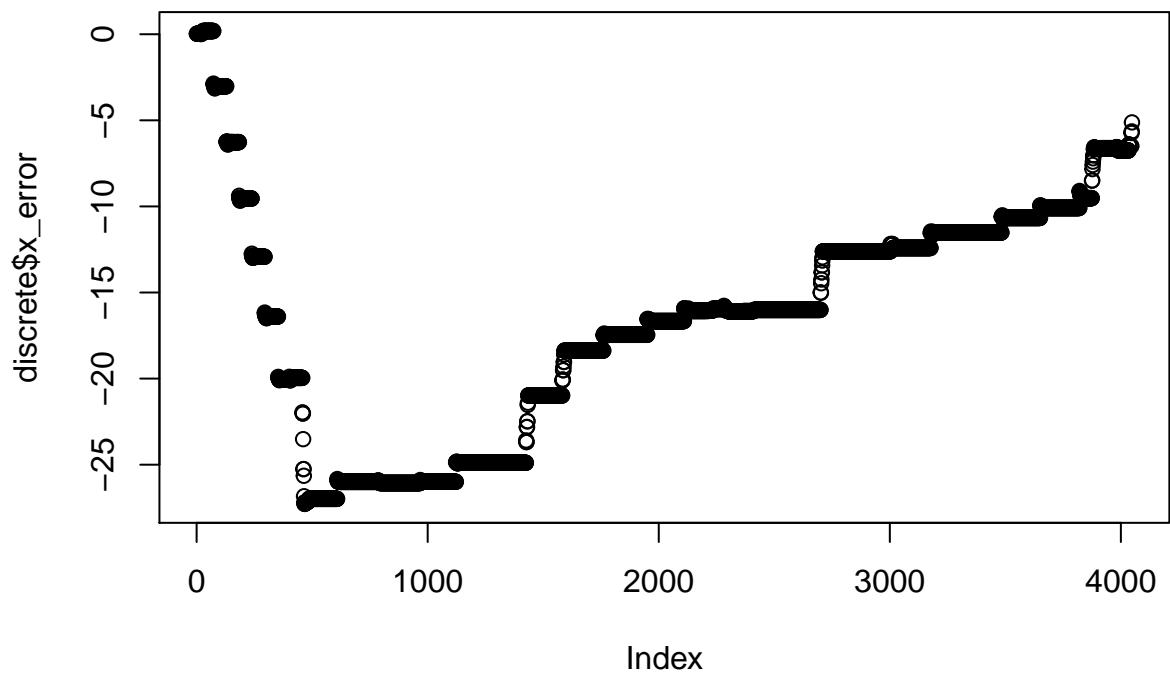
**Distance from origin vs. time<sup>Index</sup>**



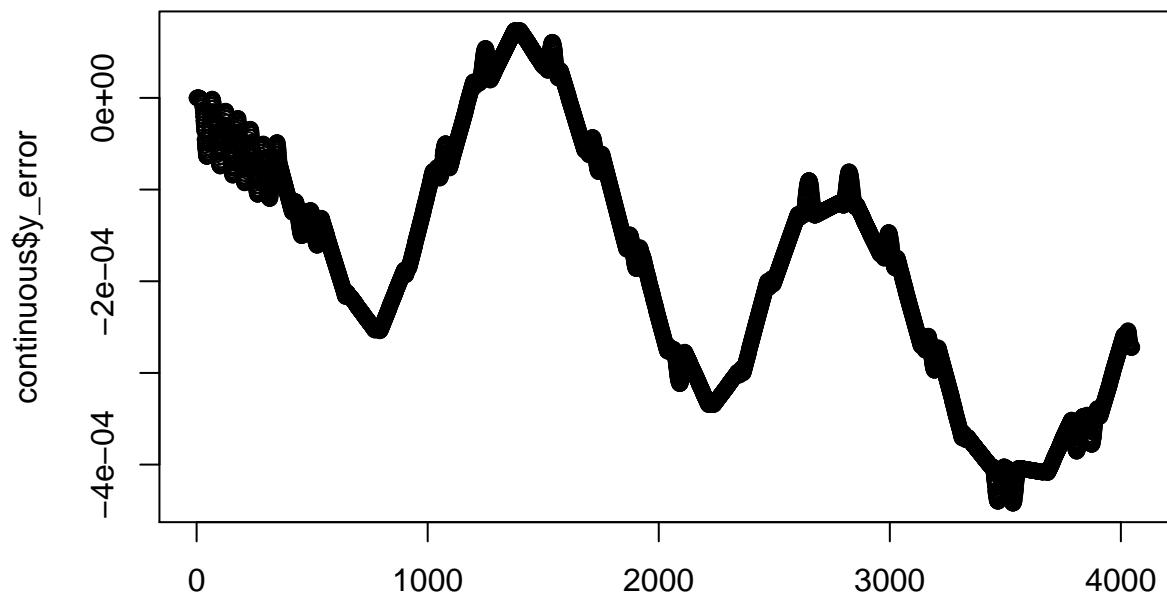
**Continuous x\_error over time**



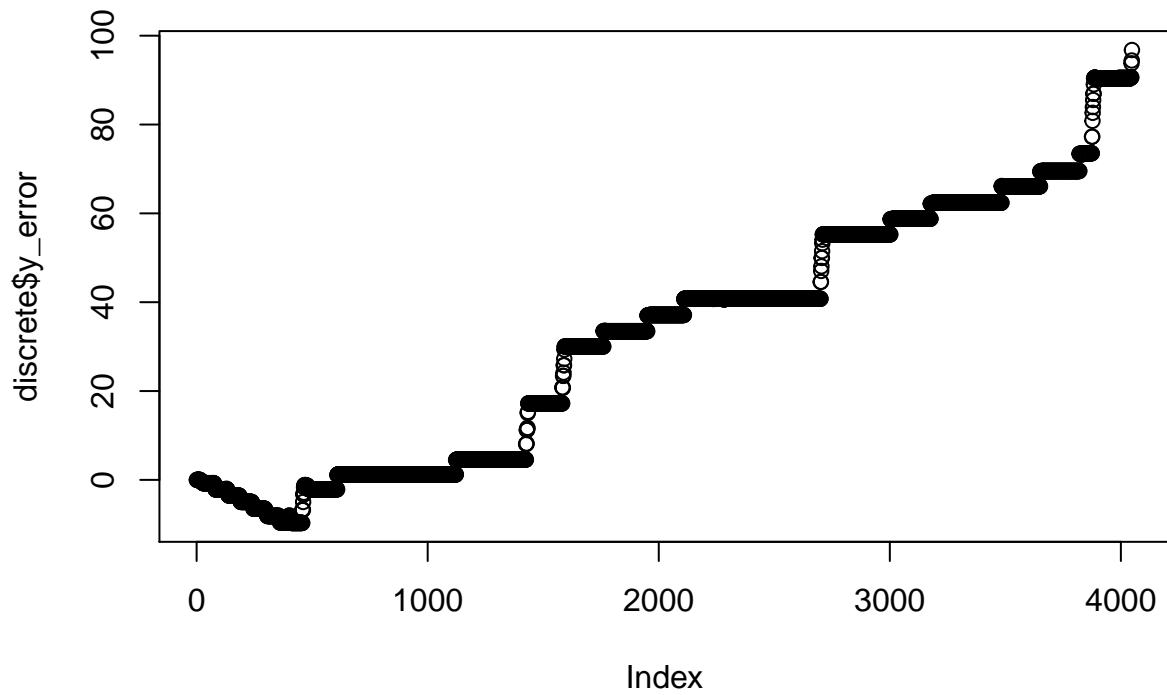
**Discrete x\_error over time**



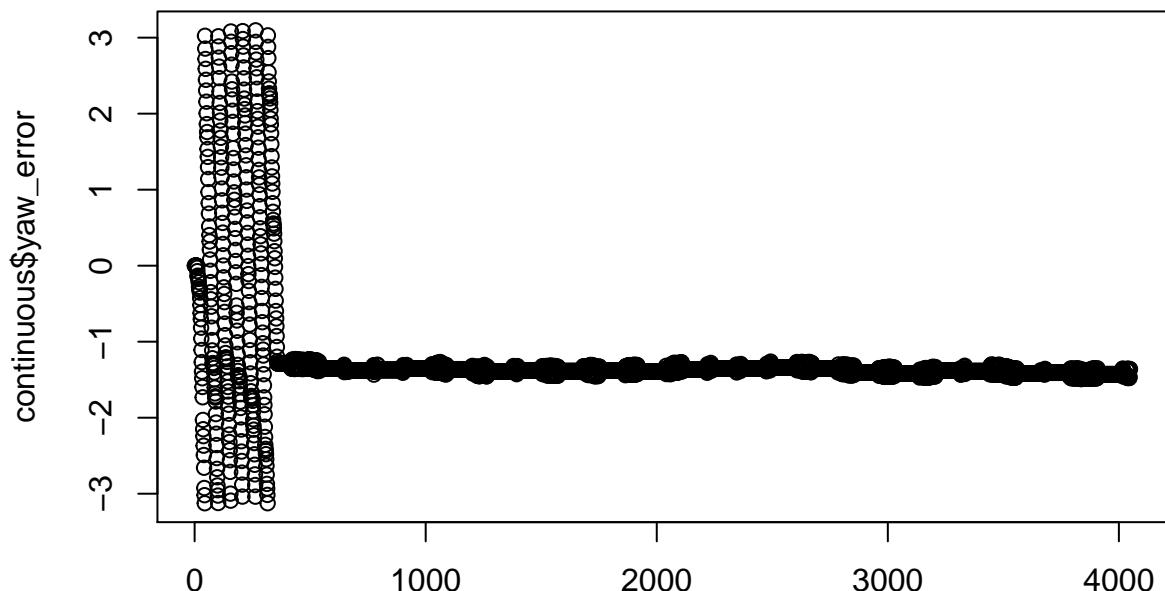
**Continuous y\_error over time**



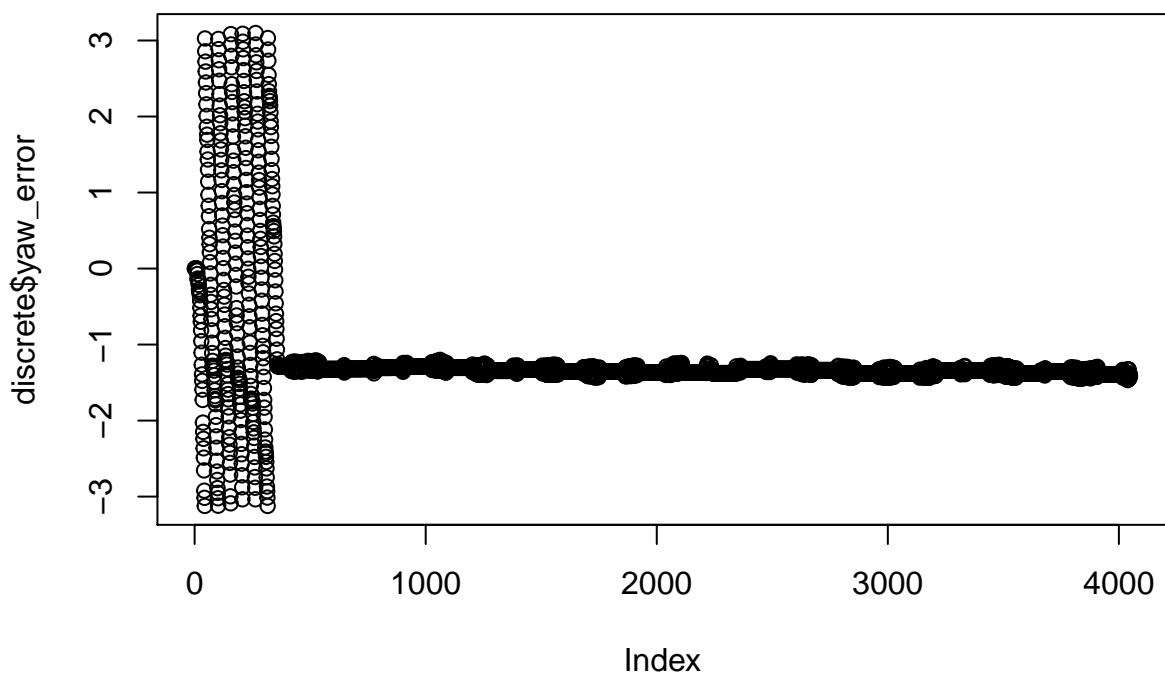
**Discrete y\_error over time**



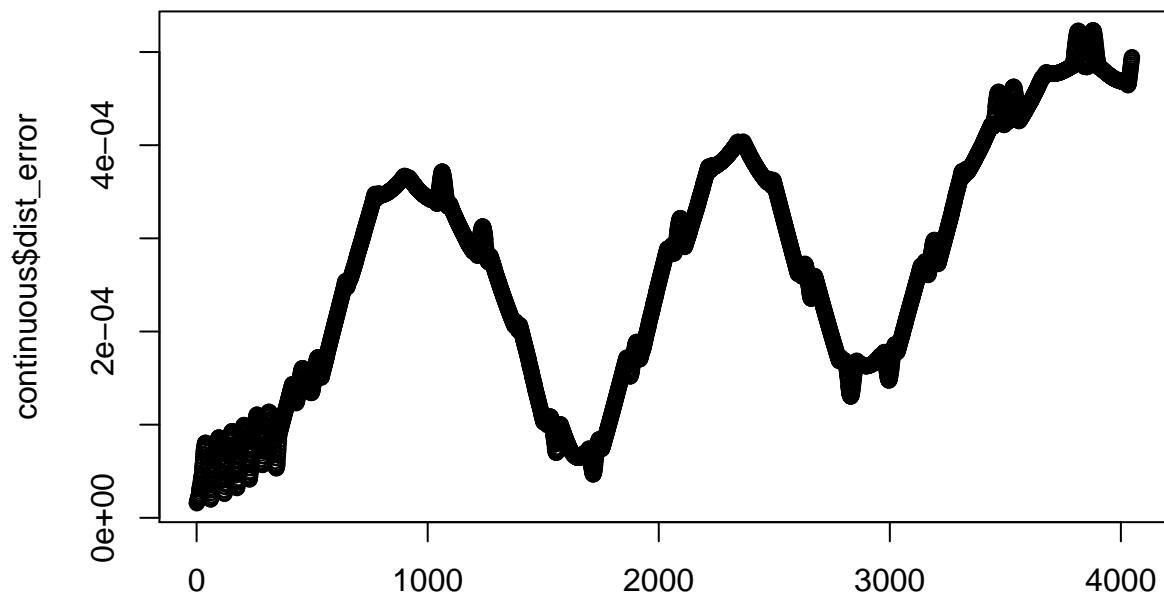
**Continuous yaw error over time**



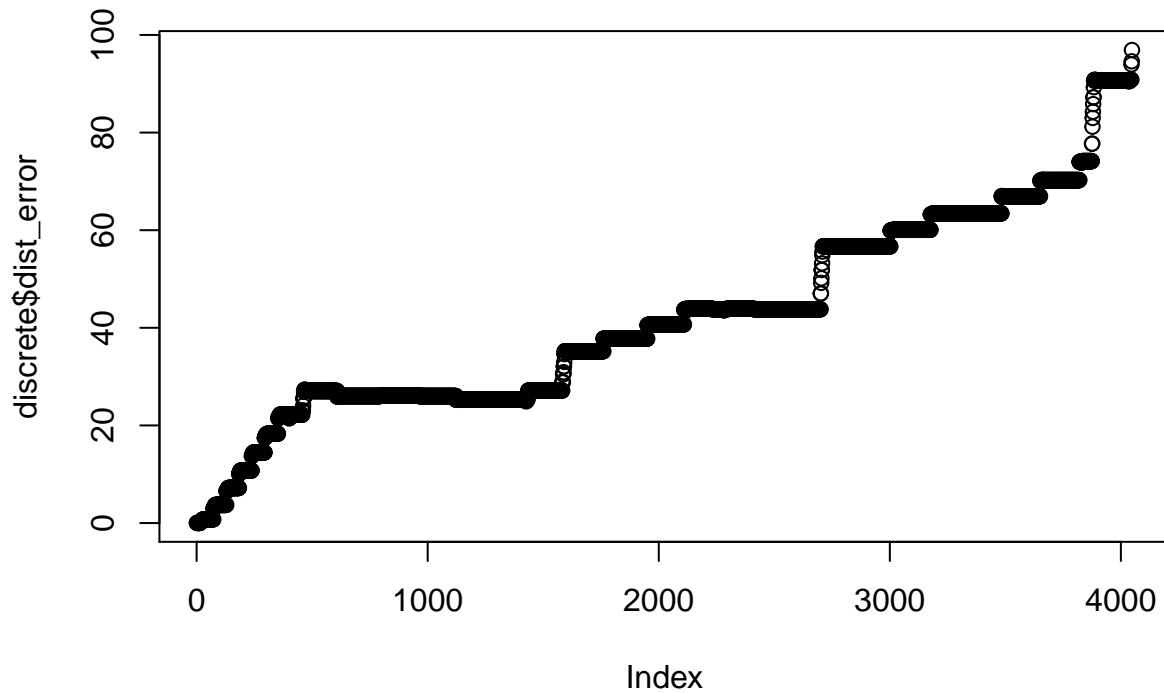
**Discrete yaw error over time**



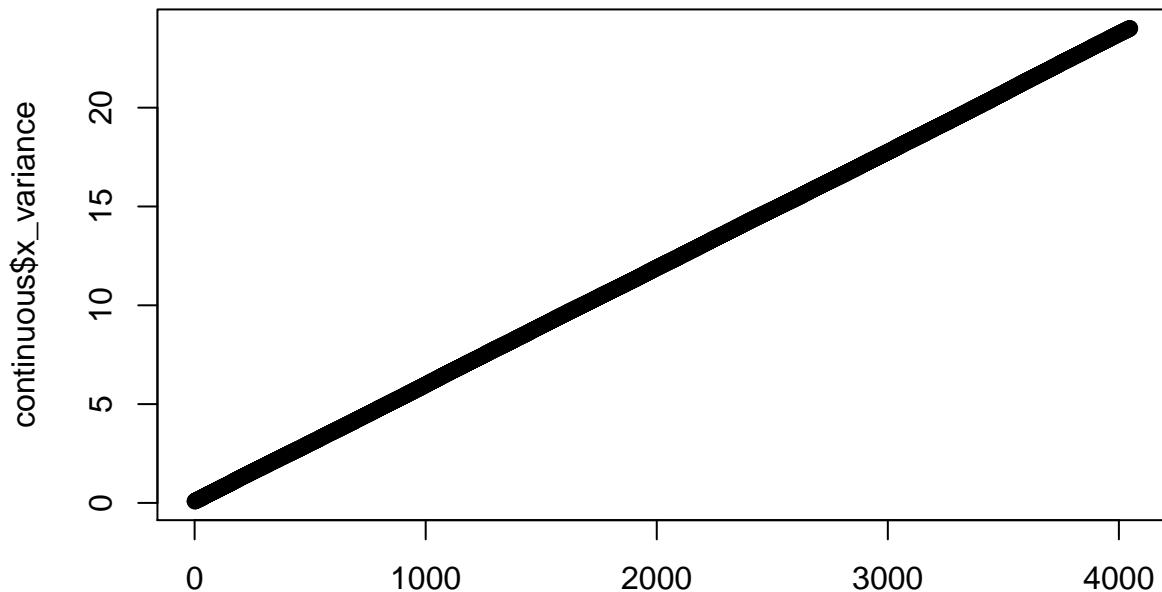
**Continuous total distance error over time**



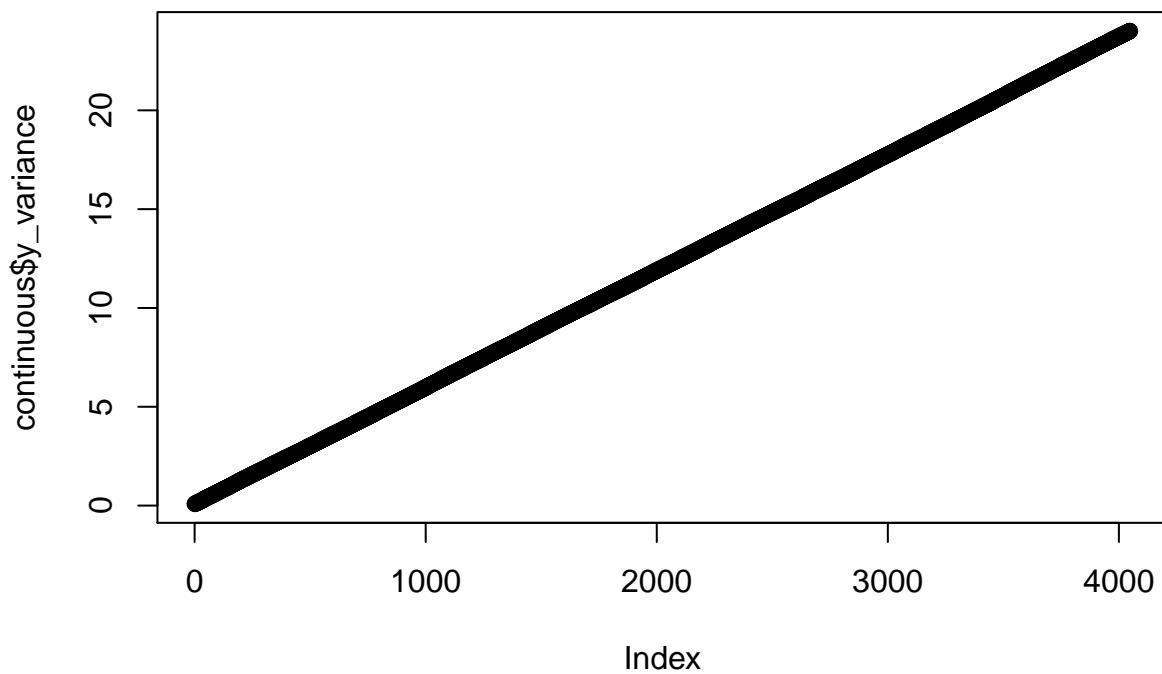
**Discrete total distance error over time**



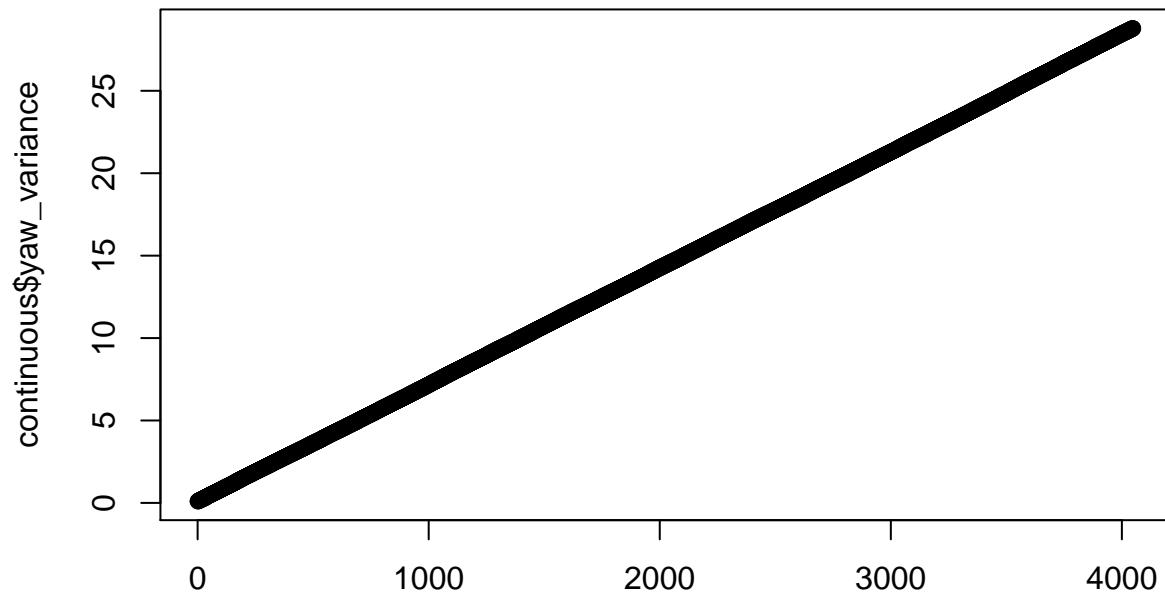
**Continuous Filter X Variance Over Time**



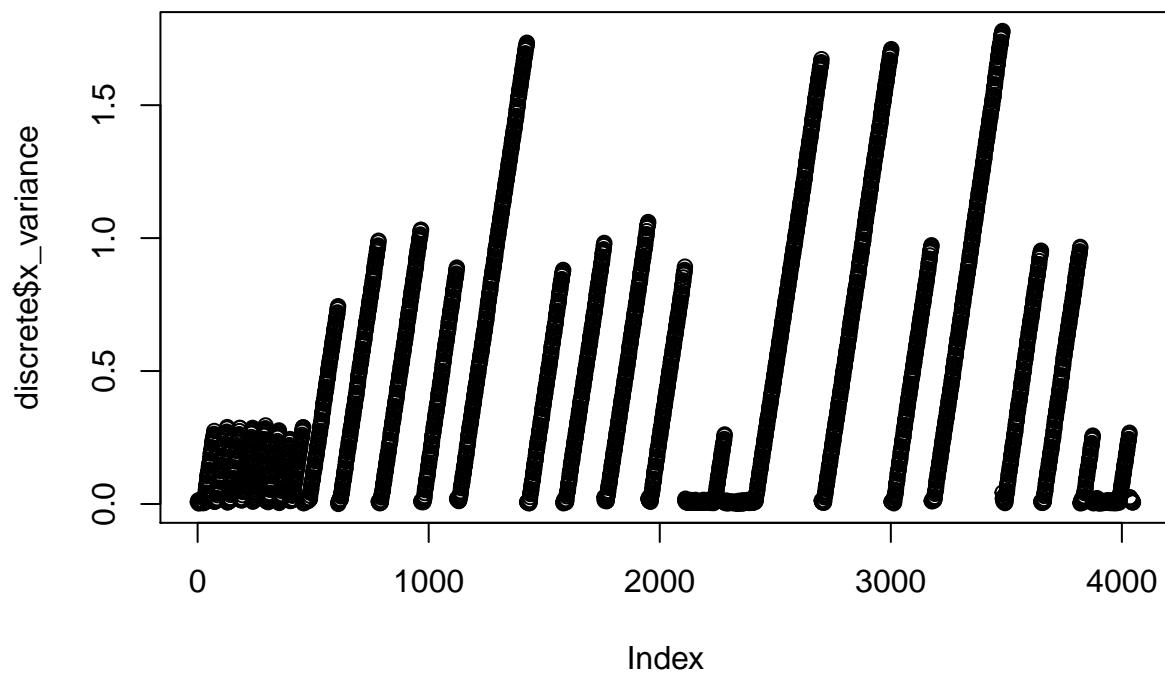
**Continuous Filter Y Variance Over Time**



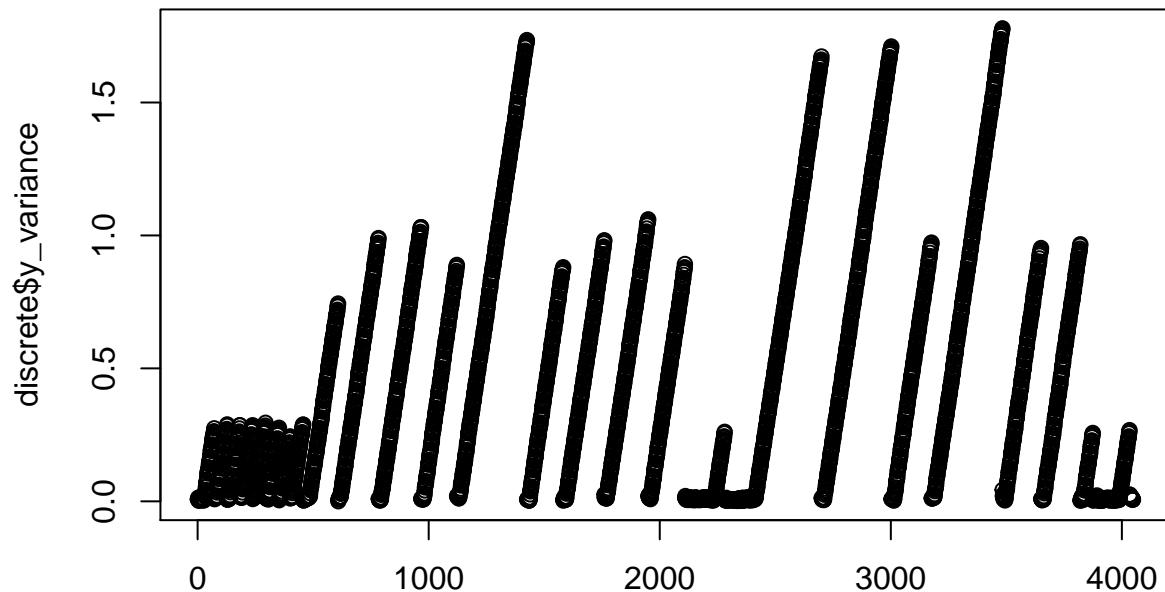
**Continuous Filter Yaw Variance Over Time**



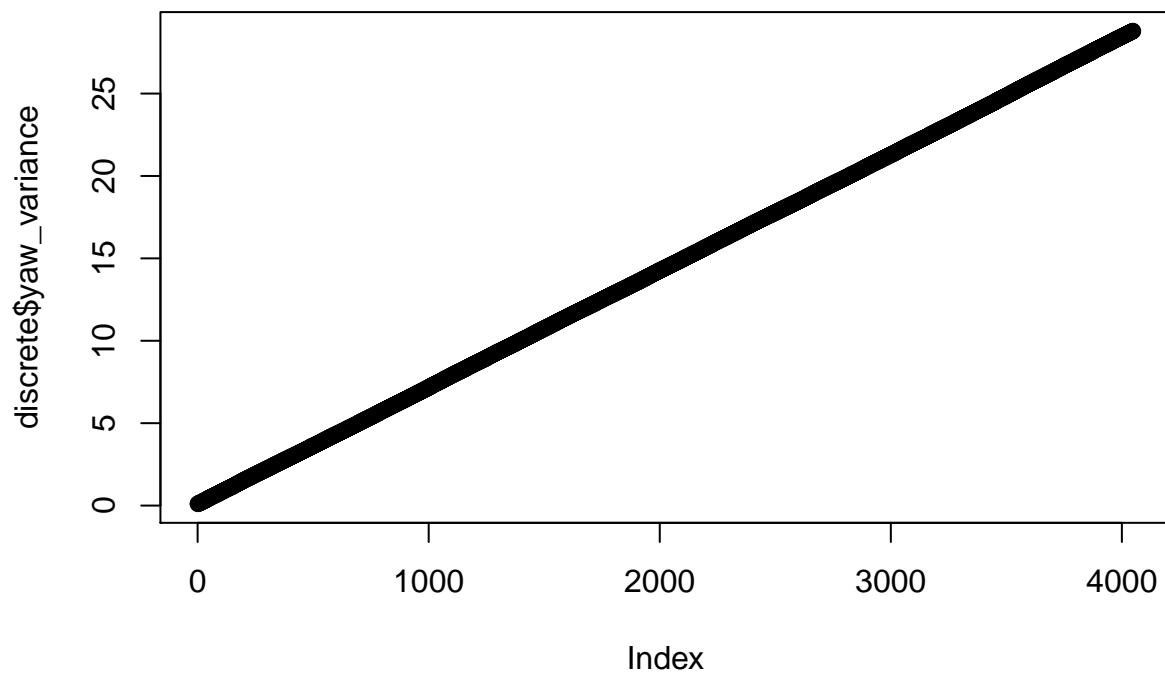
**Discrete Filter X Variance Over Time**



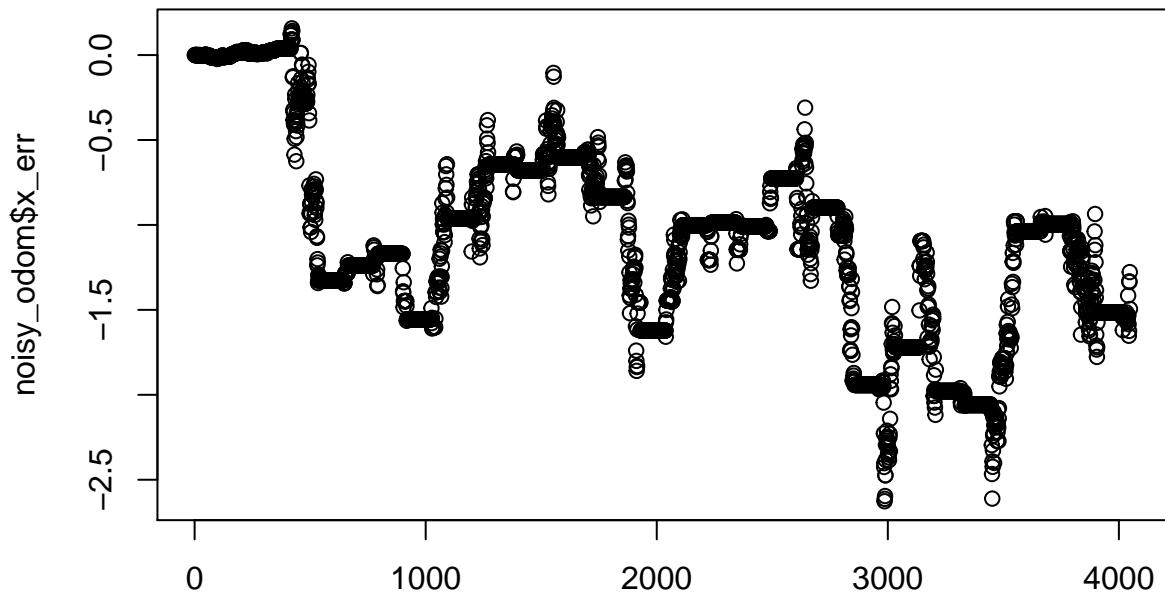
**Discrete Filter Y Variance Over Time**



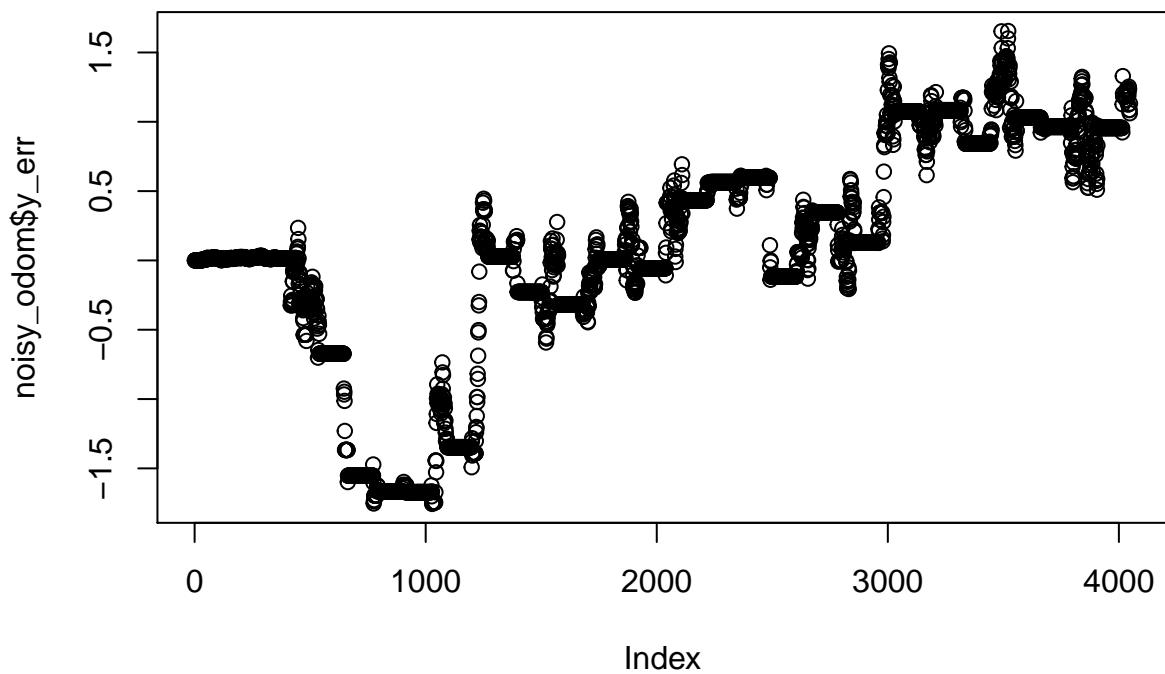
**Discrete Filter Yaw Variance Over Time**



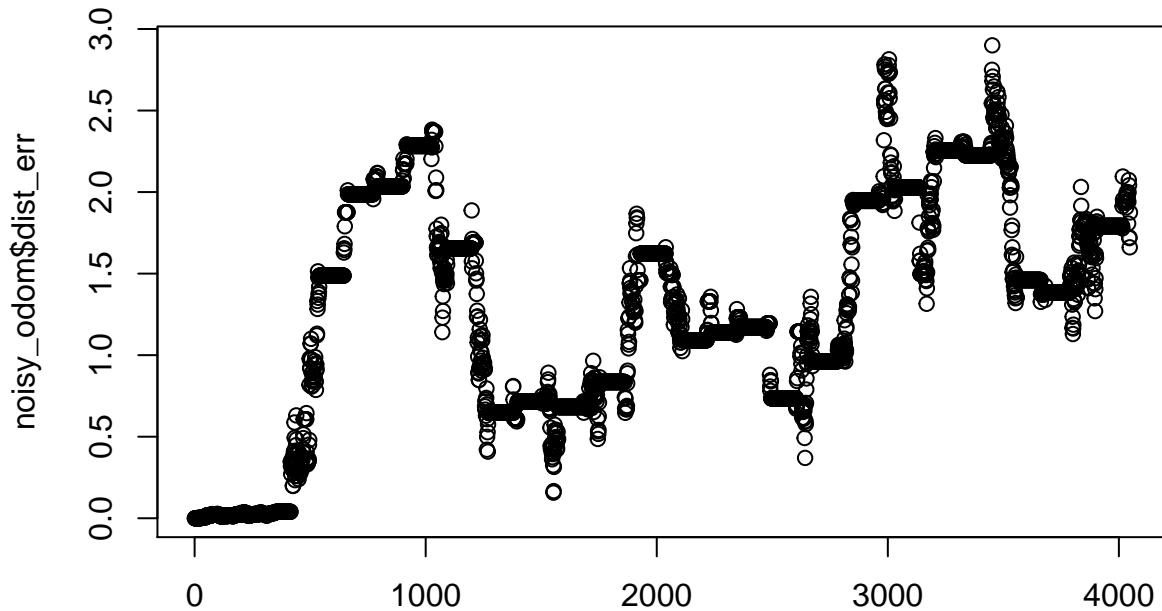
**Noisy Odom X Error Over Time**



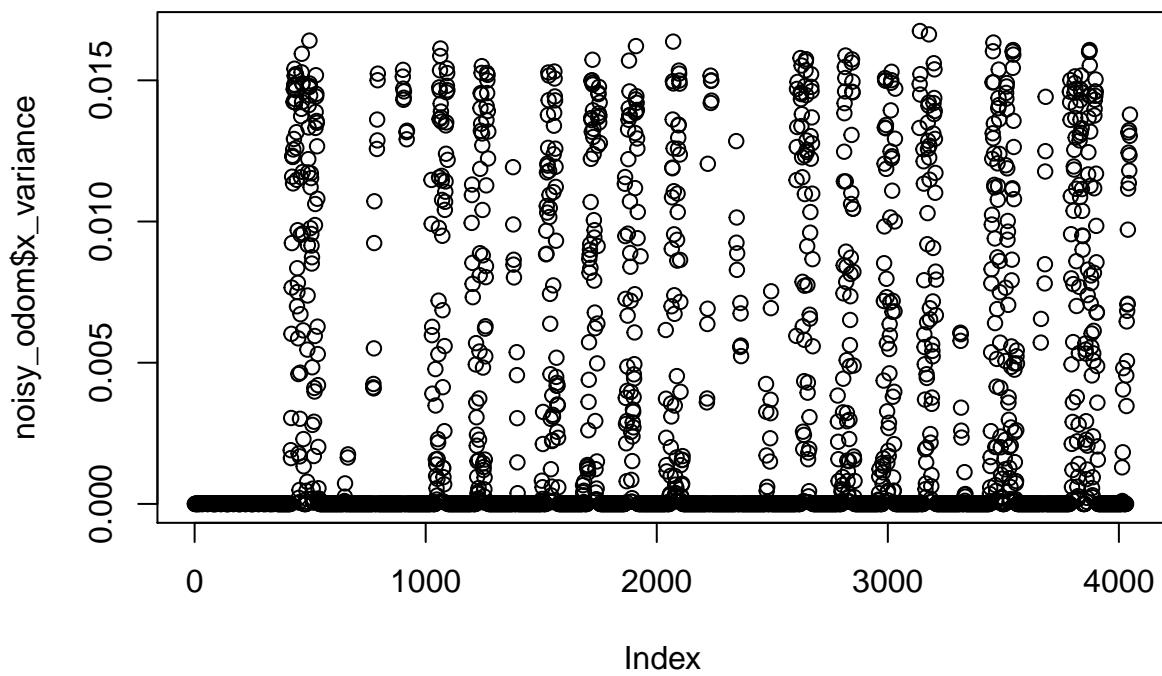
**Noisy Odom Y Error Over Time**



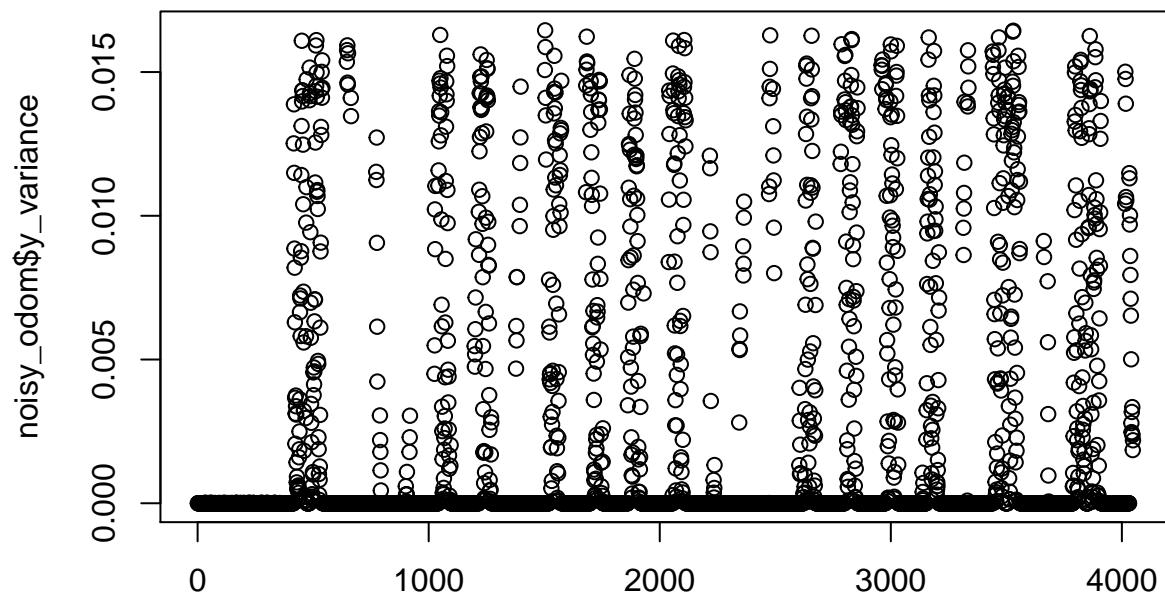
### Noisy Odom Horizontal Distance Error Over Time



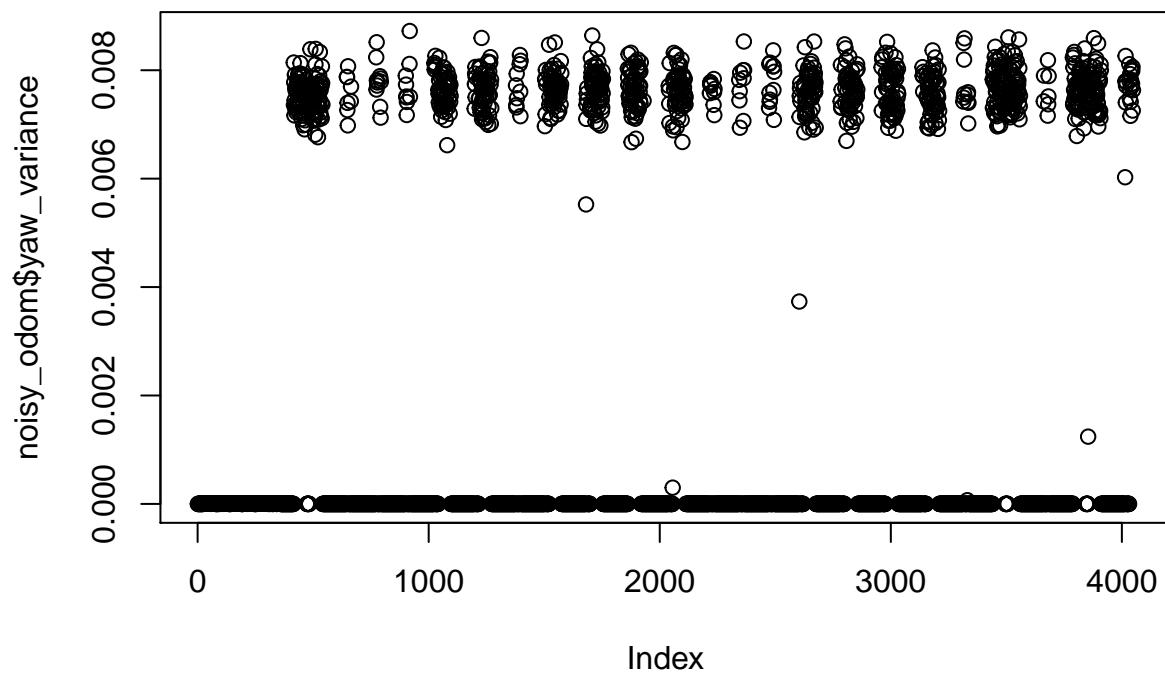
### Variance of X Coordinate in Noisy Odometry



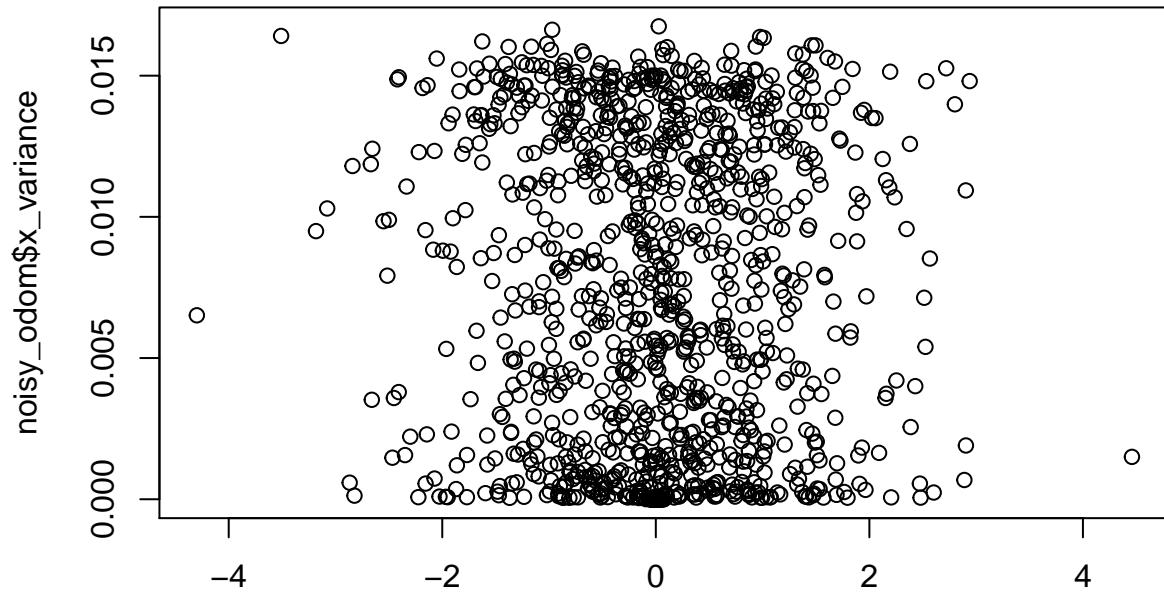
**Variance of Y Coordinate in Noisy Odometry**



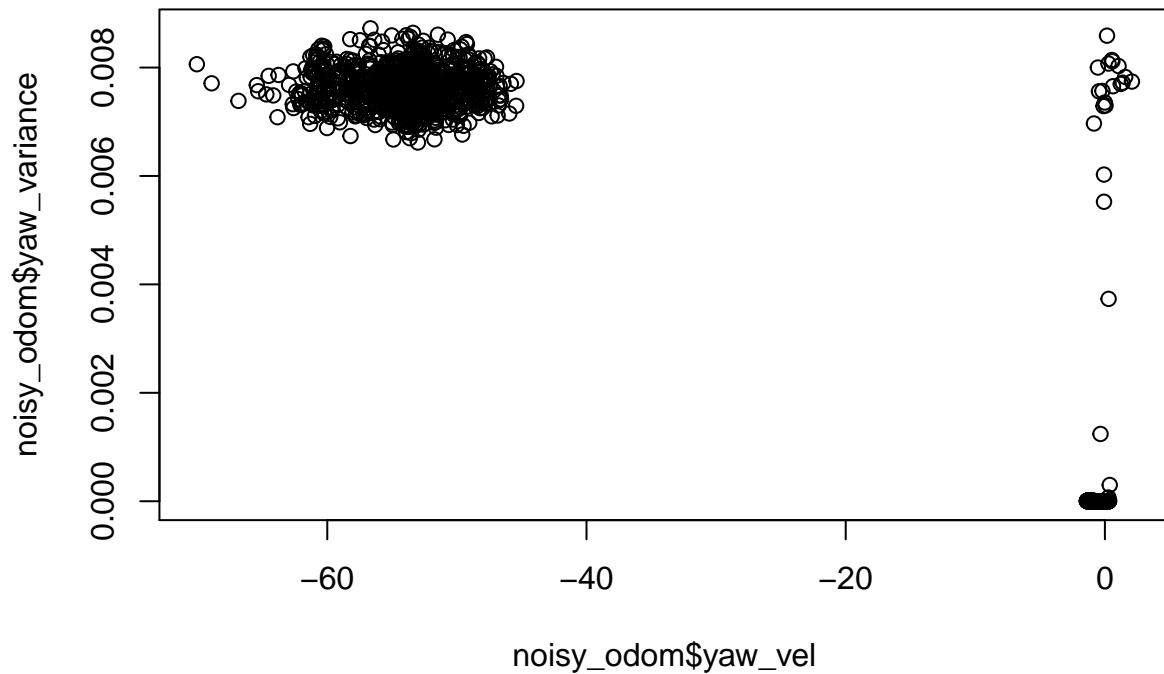
**Variance of Yaw Coordinate in Noisy Odometry**



**Variance vs. Velocity of X in Noisy Odometry**



**Variance vs. Velocity of Yaw in Noisy Odometry**



noisy\_odom\$yaw\_vel