

# two\_stationary\_noiseless Turtlebot 2 Report

*Matthew Swartwout*

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

The runtime of this experiment was 0 hours, 0 minutes, and 48.7 seconds.

The total number of external pose measurements recieved by the robot during this time was 492 which means poses were received at an average of 10.1026694 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.
## 0.0000148 0.0001393 0.0002630 0.0002631 0.0003877 0.0005122
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 6.127e-10 1.270e-08 2.982e-08 3.585e-08 5.519e-08 9.691e-08
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 6.661e-05 1.173e-04 1.555e-04 1.934e-04 2.719e-04 3.855e-04
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 0.0000148 0.0001393 0.0002630 0.0002631 0.0003877 0.0005122
```

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

```
##      Min. 1st Qu.  Median     Mean 3rd Qu.     Max.
## 0.02784 0.03018 0.03020 0.03019 0.03022 0.03024
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.002696 -0.002588 -0.002513 -0.002534 -0.002501 -0.002358
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -3.418e-05 5.638e-06 2.653e-05 3.288e-05 5.669e-05 1.194e-04
```

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

```
##      Min. 1st Qu.  Median     Mean 3rd Qu.     Max.
## 0.02794 0.03028 0.03031 0.03030 0.03033 0.03035
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -2.413e-05 -2.155e-05 -1.945e-05 -1.964e-05 -1.782e-05 -1.603e-05
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.956e-08 2.226e-08 2.517e-08 2.515e-08 2.794e-08 3.110e-08
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.603e-05 1.782e-05 1.945e-05 1.964e-05 2.155e-05 2.413e-05
```

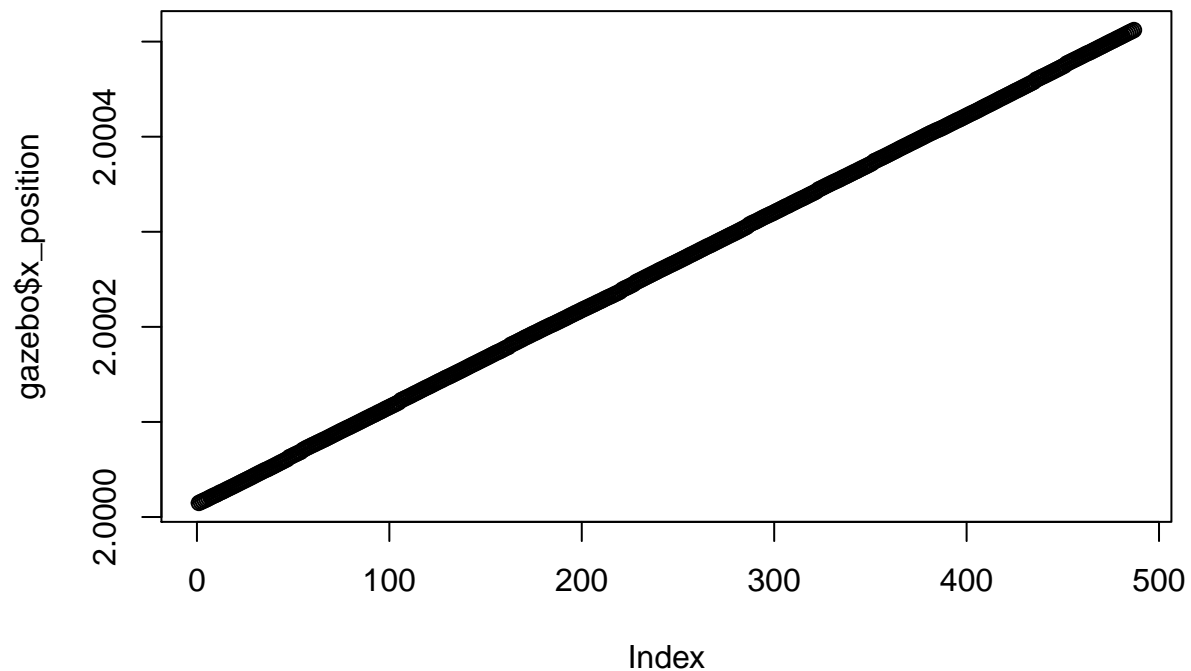
```
if (NROW(gps) > 0) {
  summary(gps$x_err)
  summary(gps$y_err)
  summary(gps$dist_err)
}
```

```
##      Min. 1st Qu.  Median     Mean 3rd Qu.     Max.
##   2.000   2.000   2.000   2.000   2.000   2.001
```

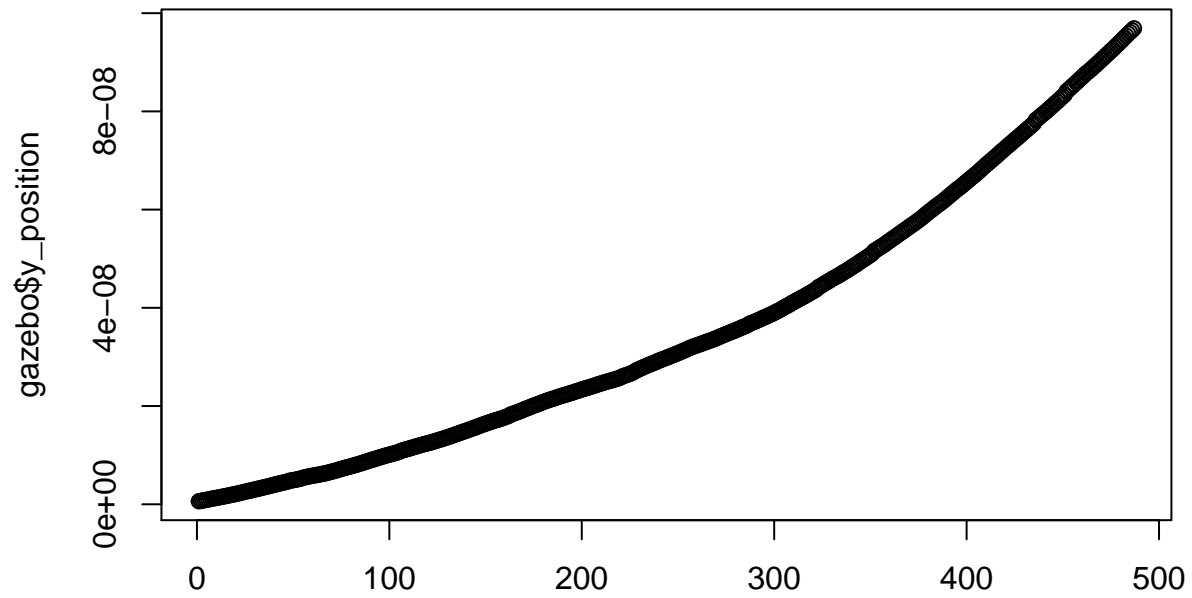
```
if (NROW(noisy_odom) > 0) {
  summary(noisy_odom$x_variance)
  summary(noisy_odom$y_variance)
  summary(noisy_odom$yaw_variance)
}
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 9.848e-16 8.977e-15 1.838e-14 2.371e-14 3.087e-14 1.449e-13
```

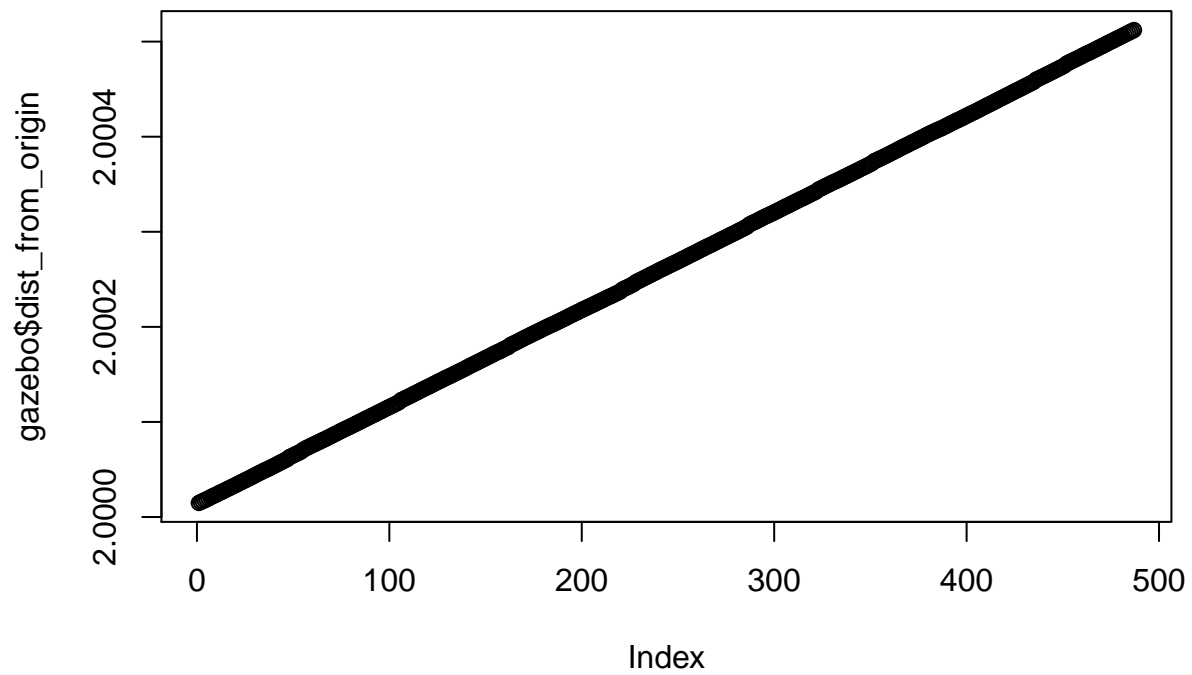
## X coordinate of robot over time



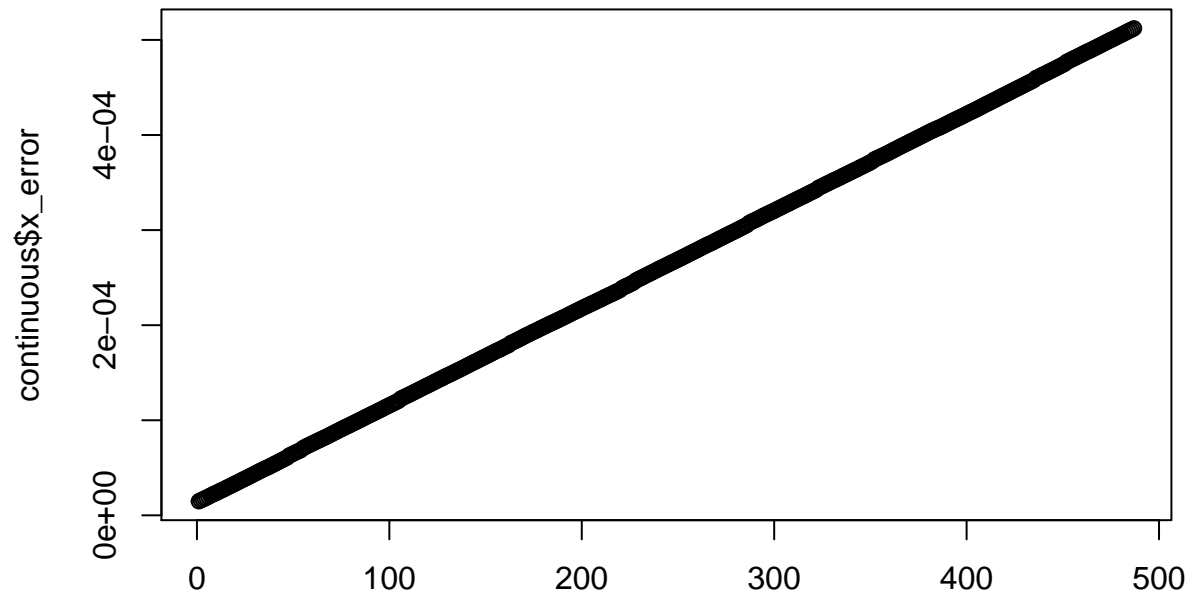
**Y coordinate of robot over time**



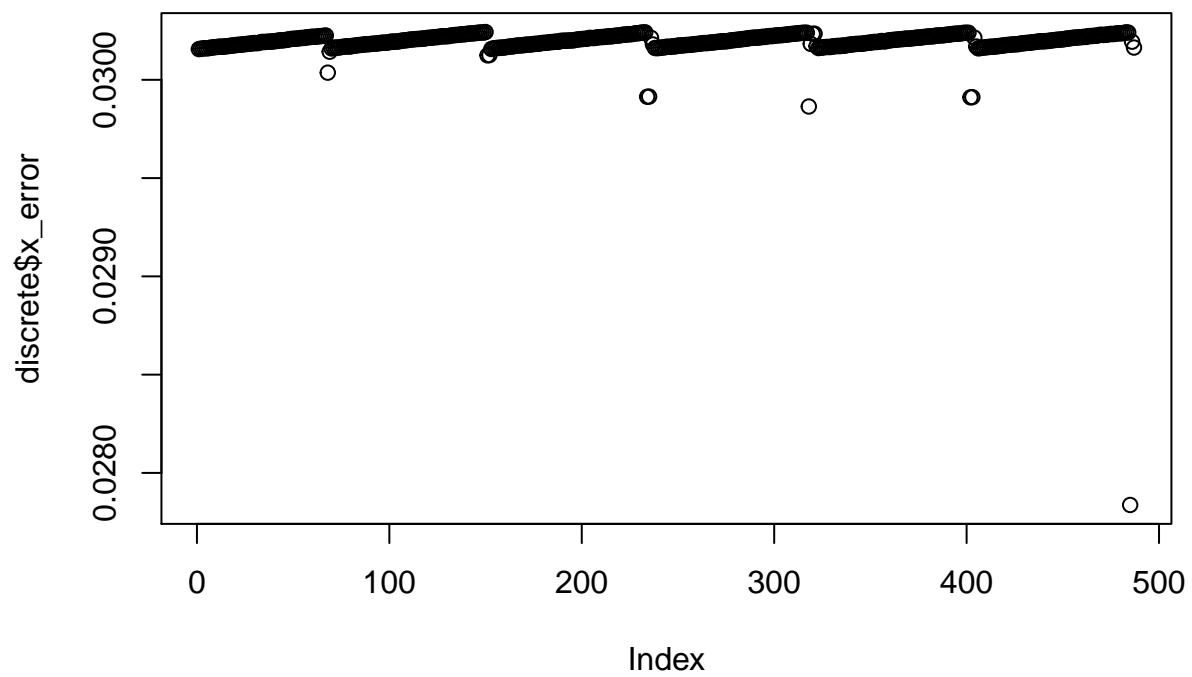
**Distance from origin vs. time**



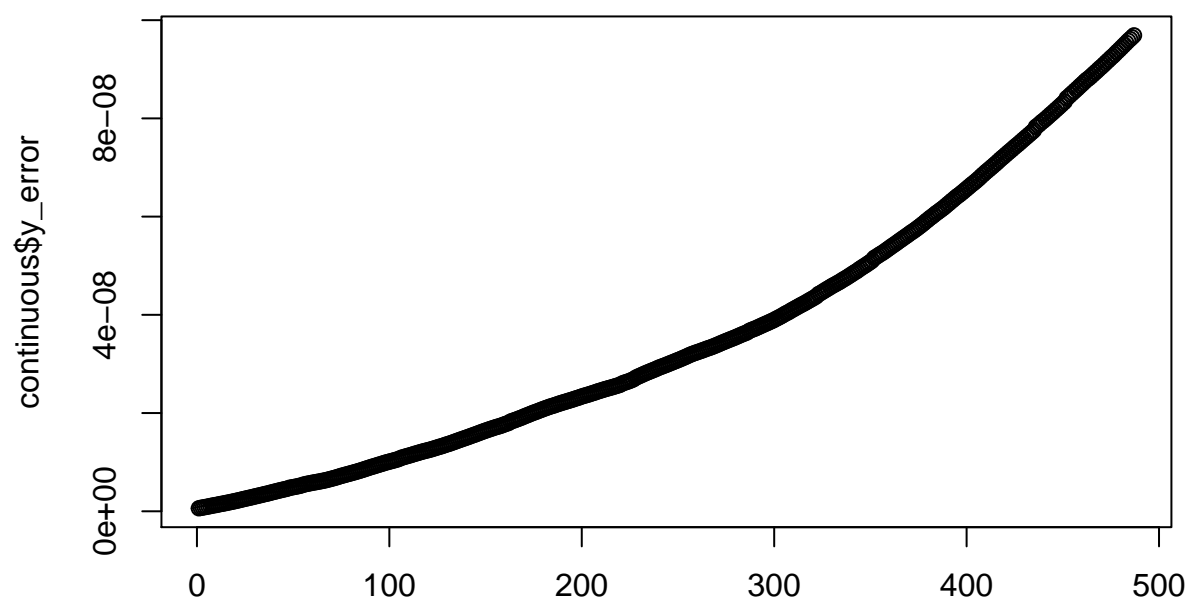
Continuous x\_error over time



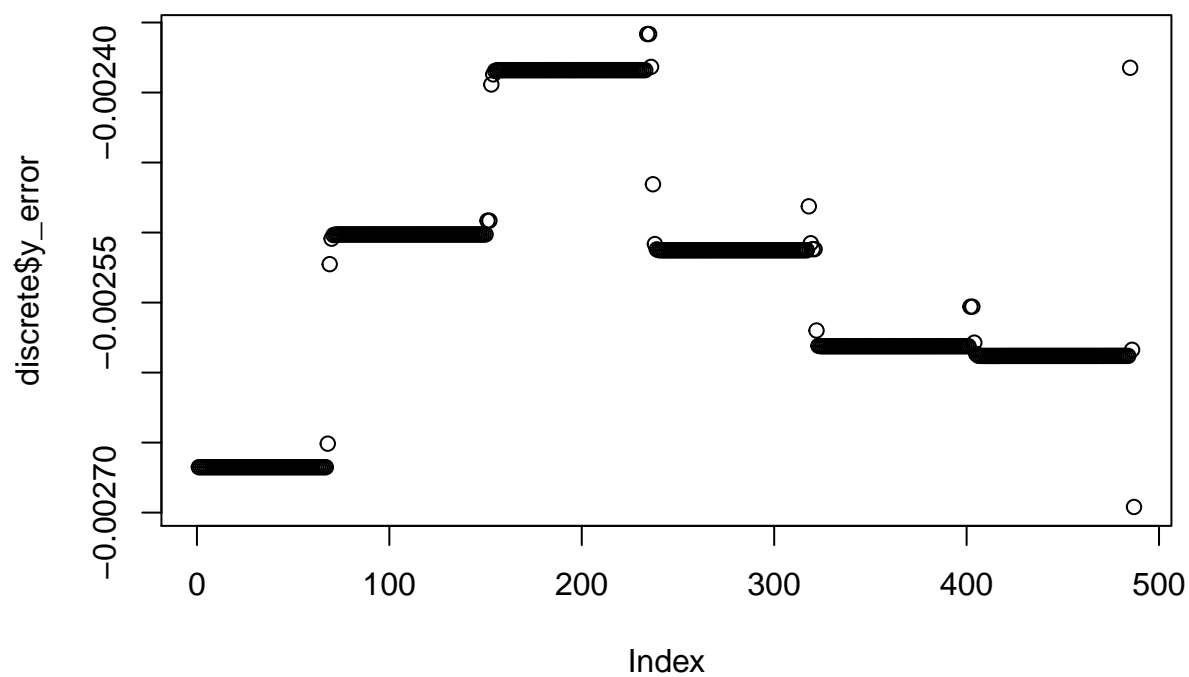
Discrete x\_error over time



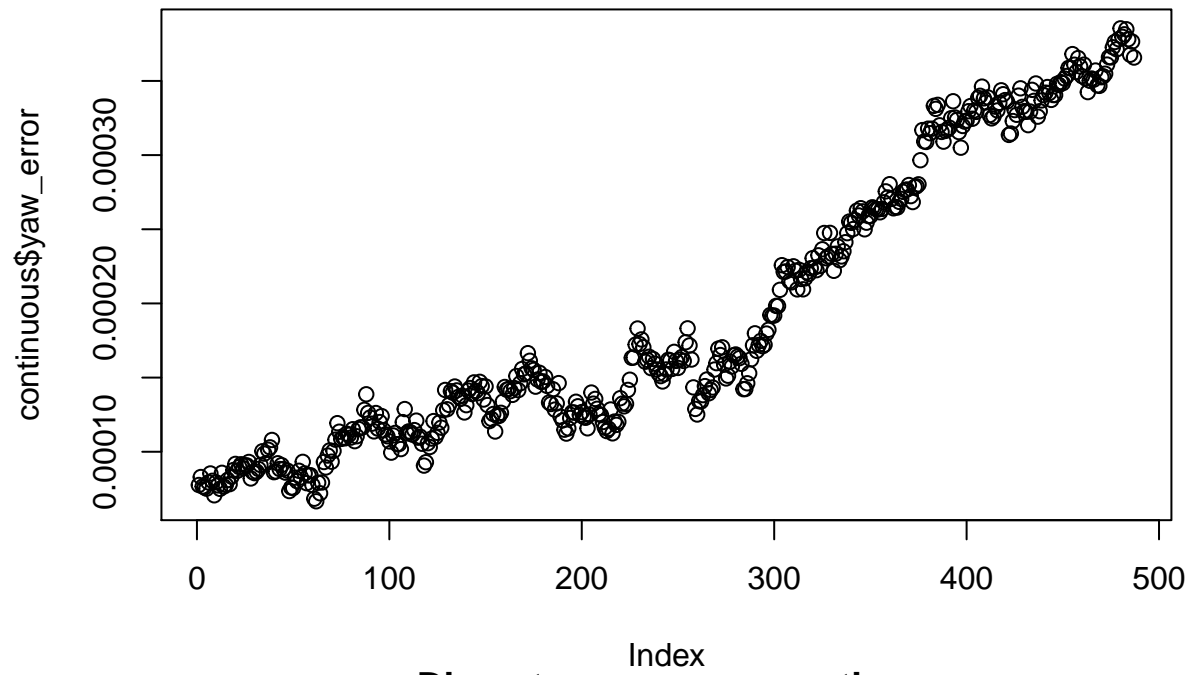
Continuous y\_error over time



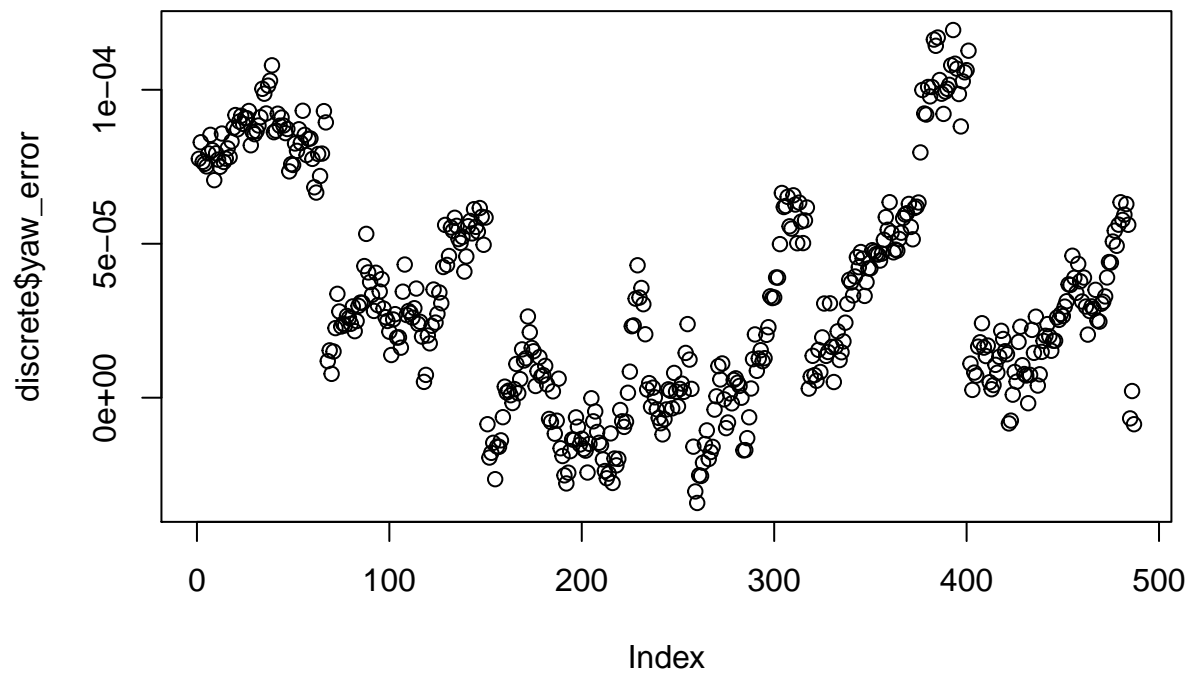
Discrete y\_error over time



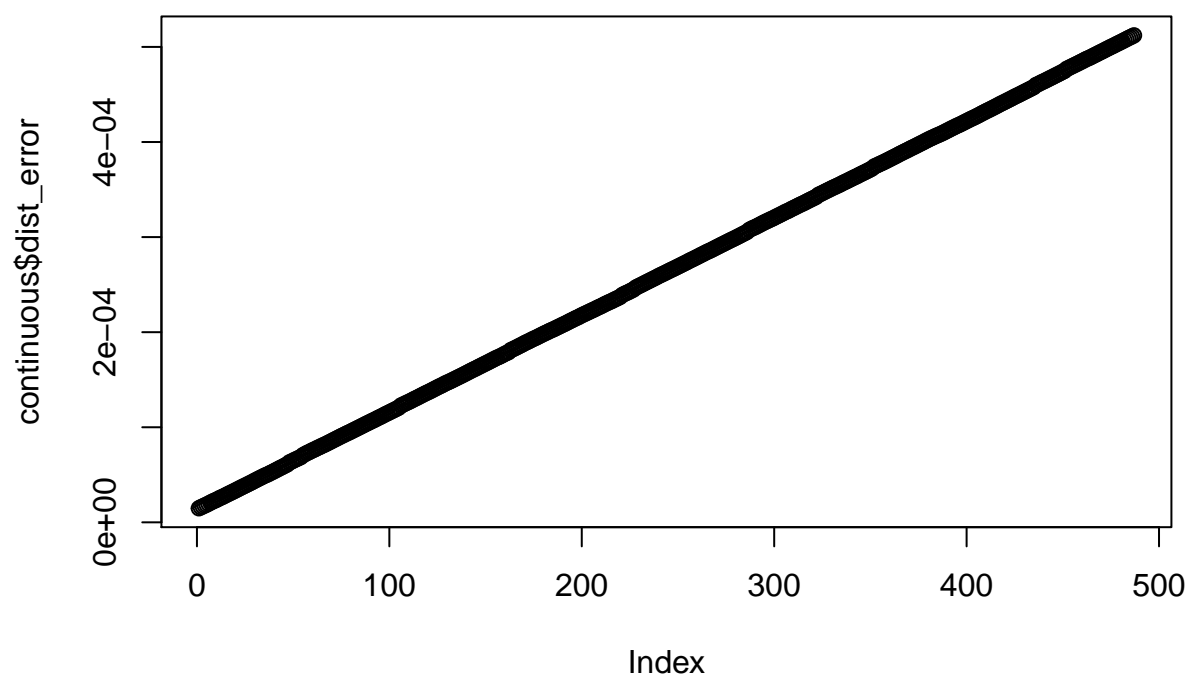
**Continuous yaw error over time**



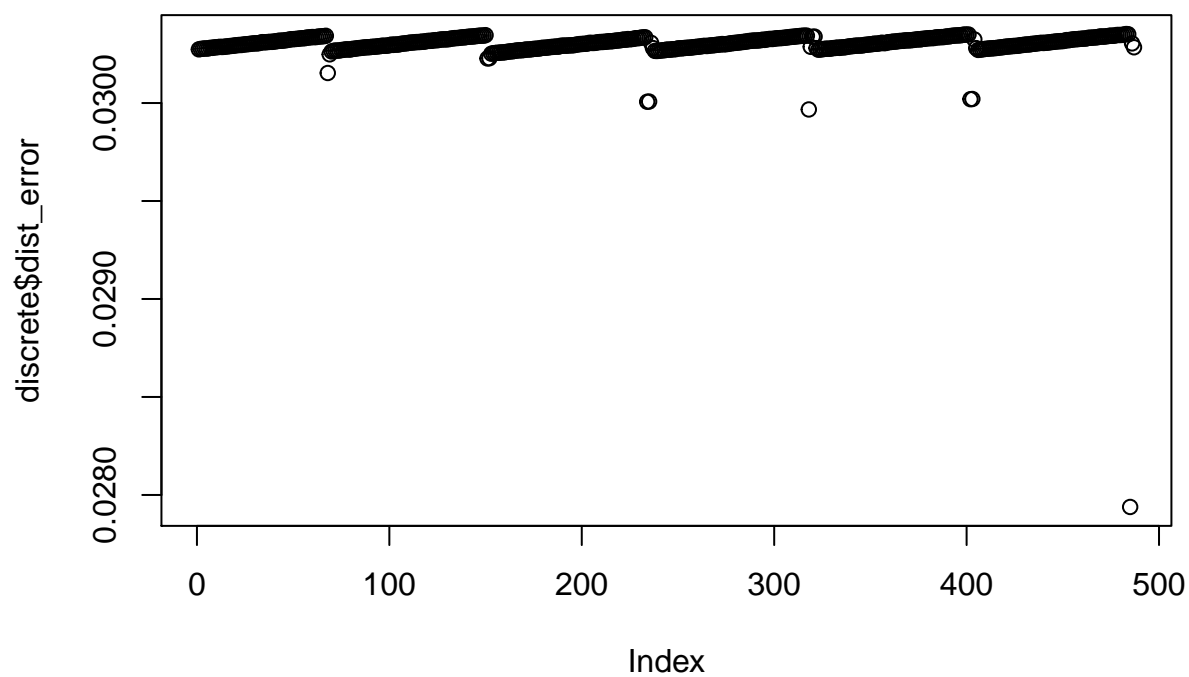
**Discrete yaw error over time**



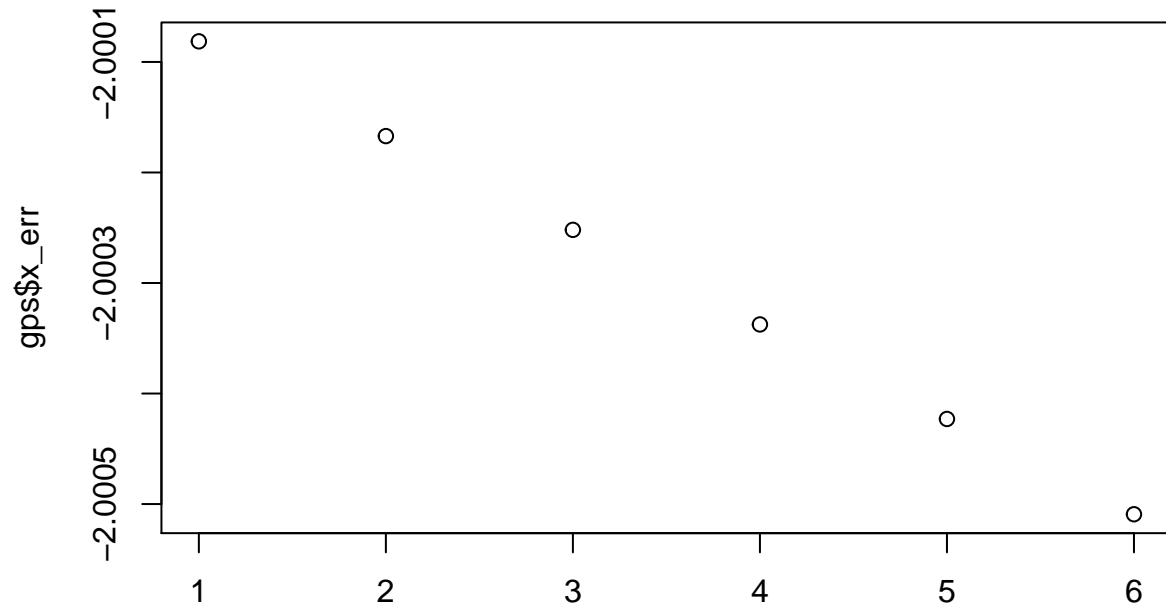
**Continuous total distance error over time**



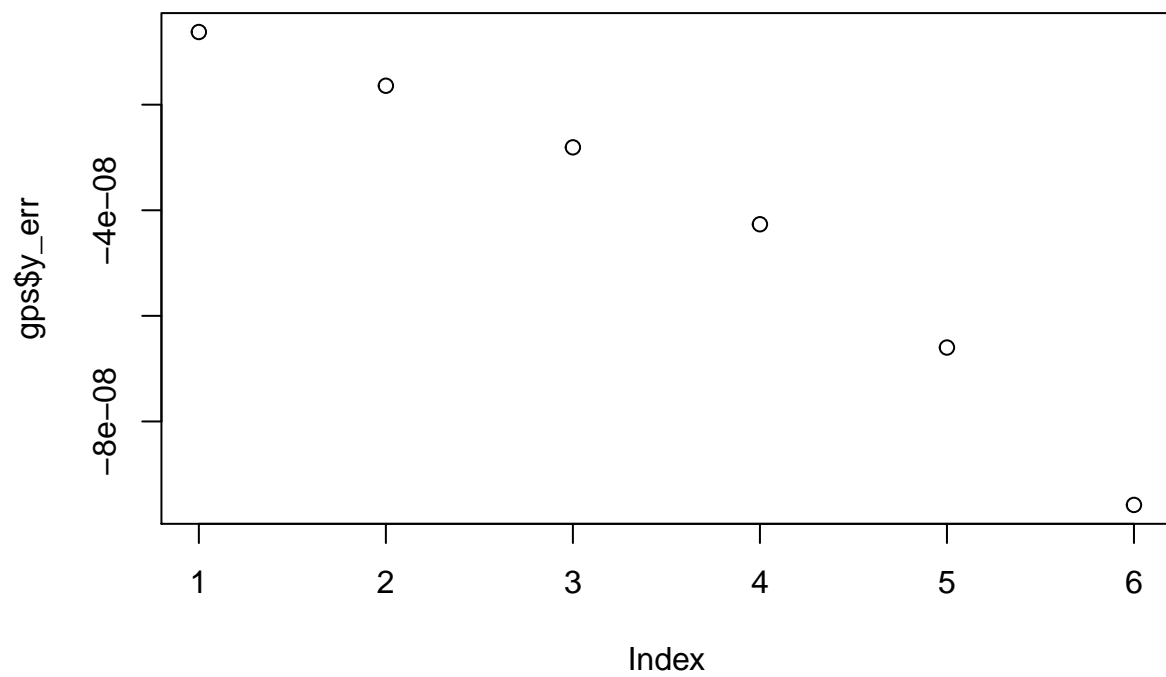
**Discrete total distance error over time**



**GPS X Error Over Time**

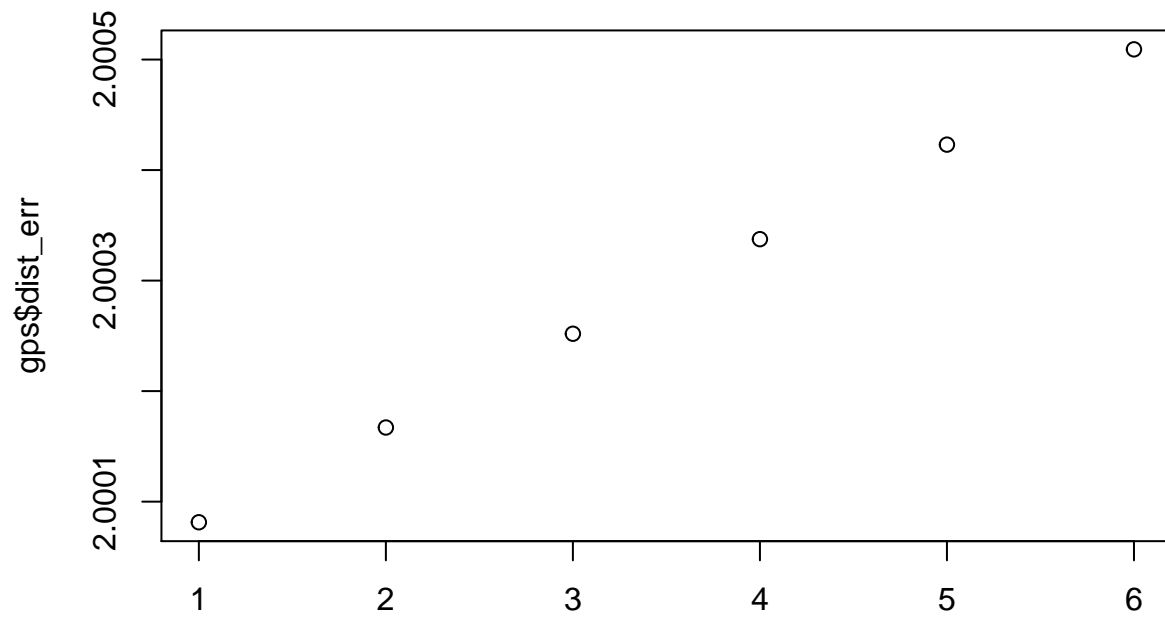


**GPS Y Error Over Time**

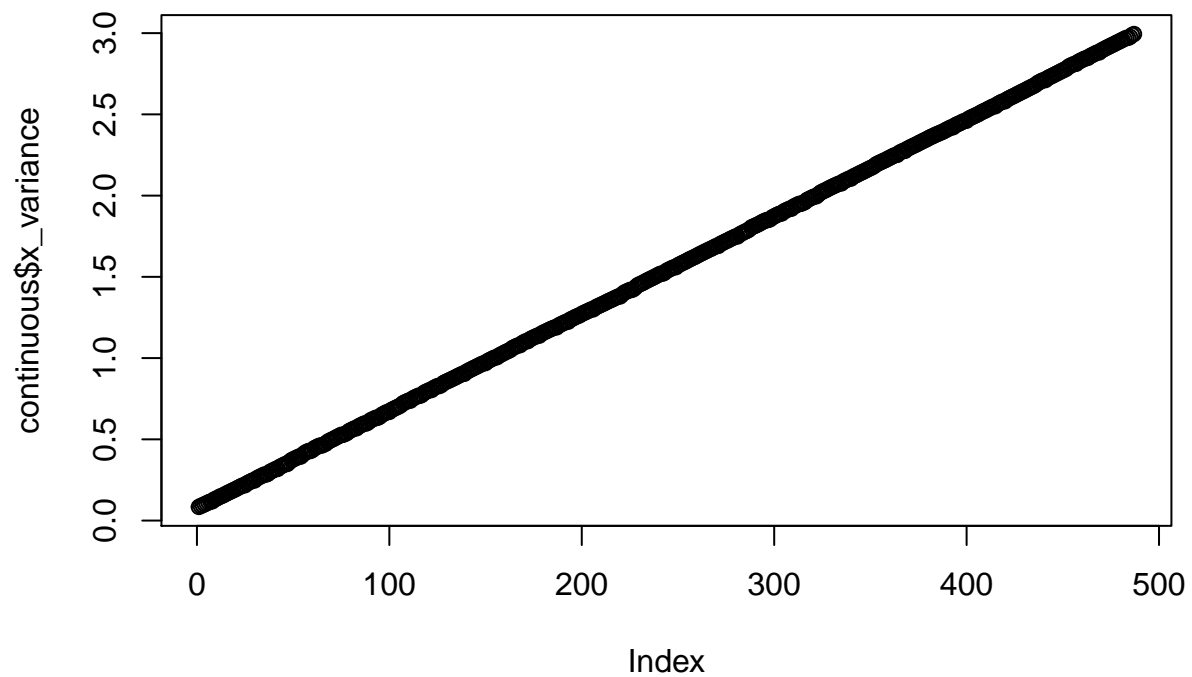




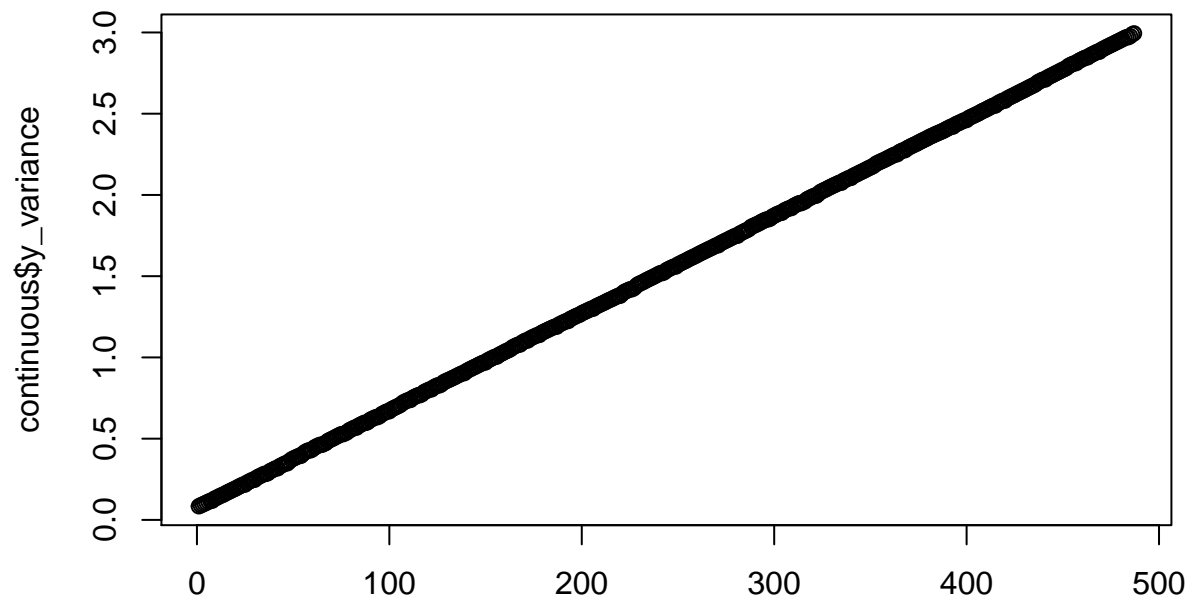
**GPS Horizontal Distance Error Over Time**



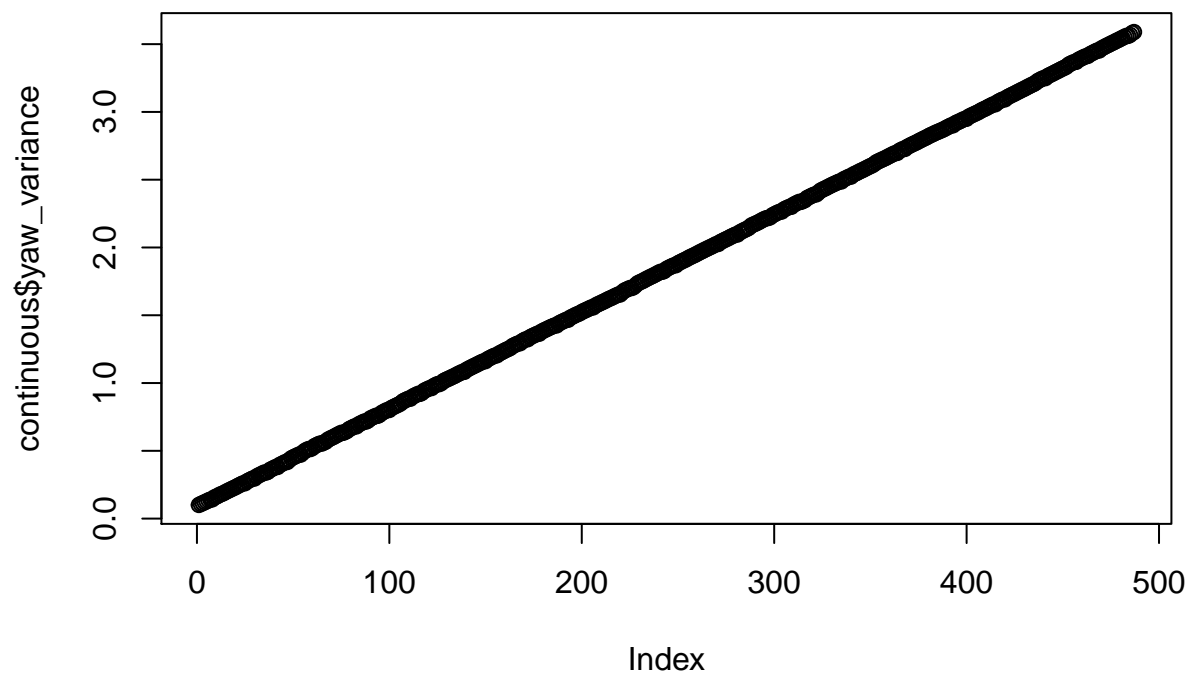
**Continuous Filter X Variance Over Time**



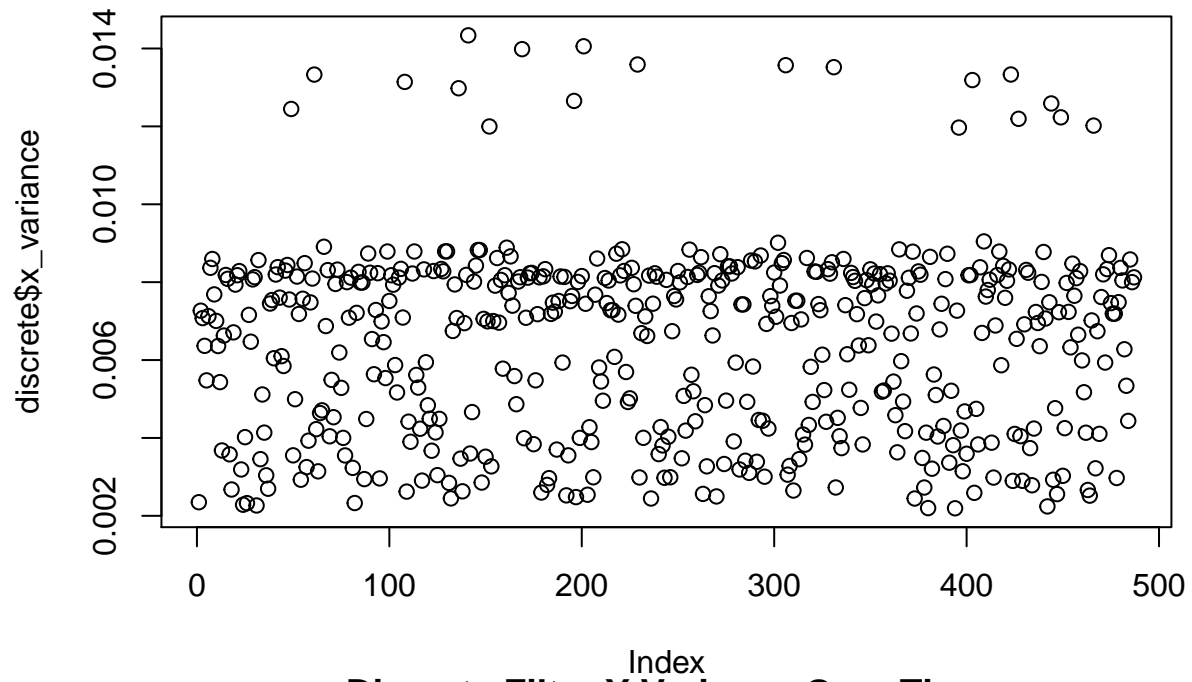
**Continuous Filter Y Variance Over Time**



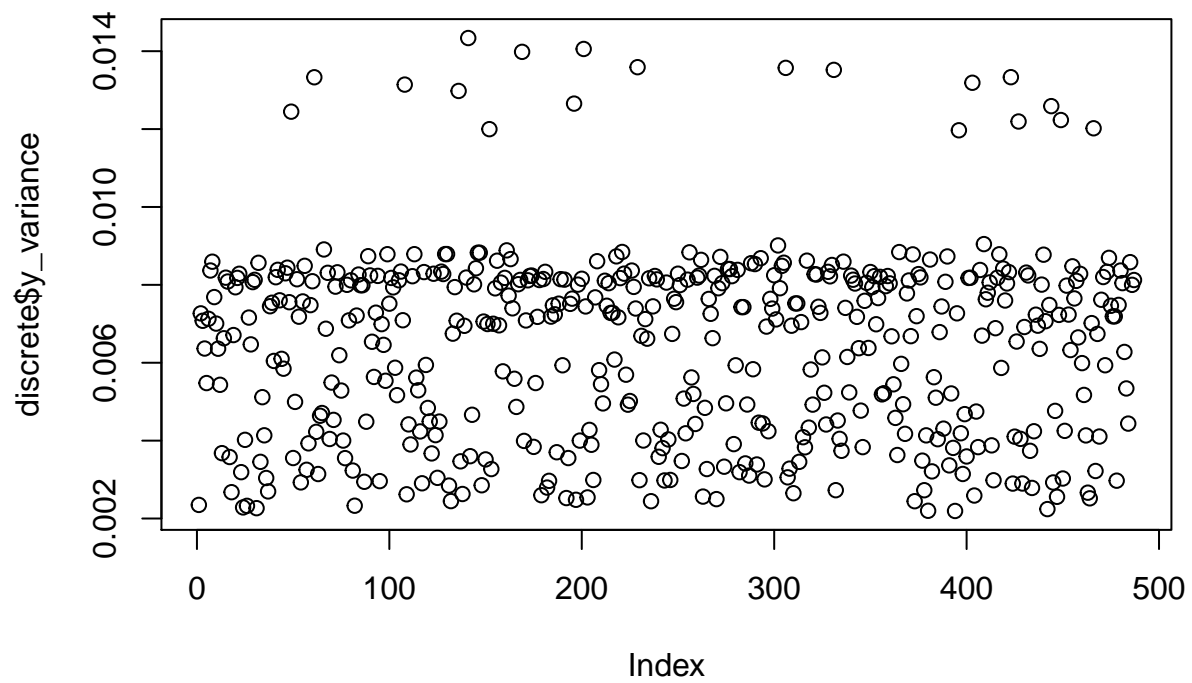
**Continuous Filter Yaw Variance Over Time**



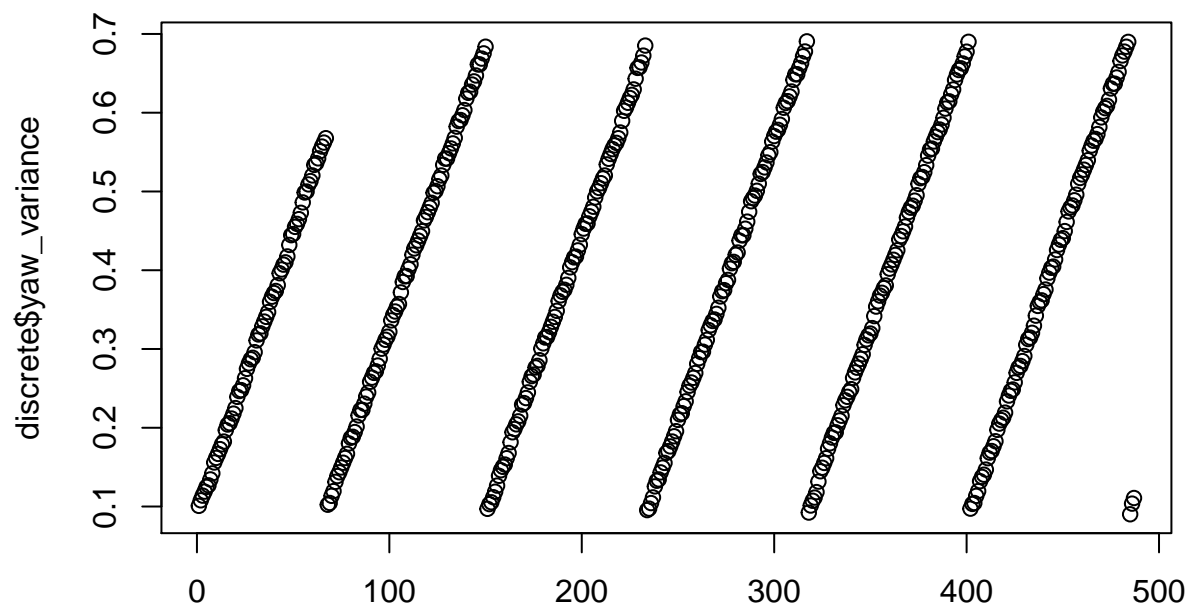
**Discrete Filter X Variance Over Time**



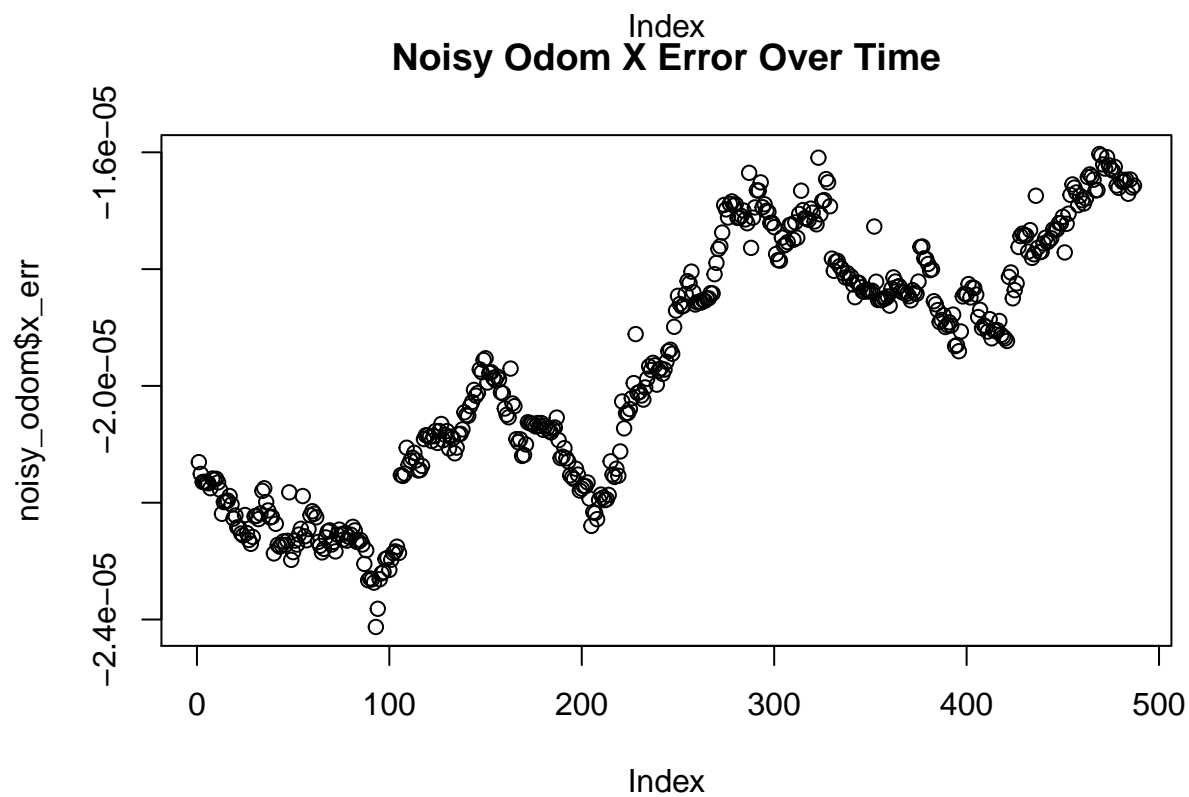
**Discrete Filter Y Variance Over Time**



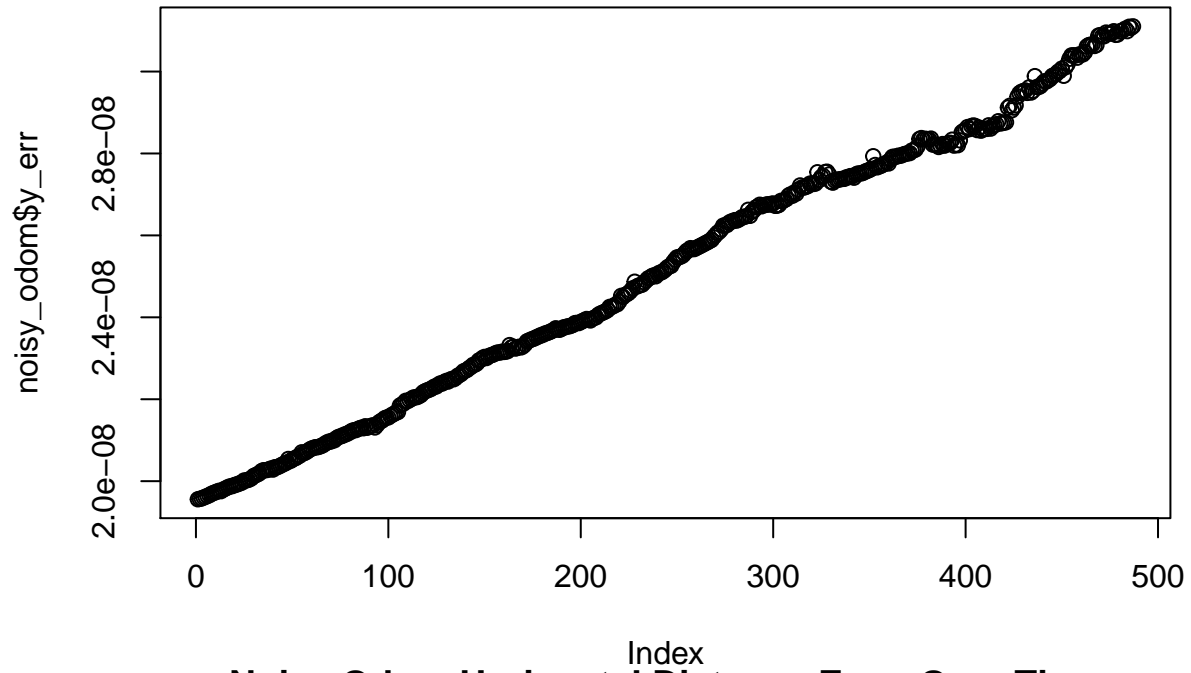
**Discrete Filter Yaw Variance Over Time**



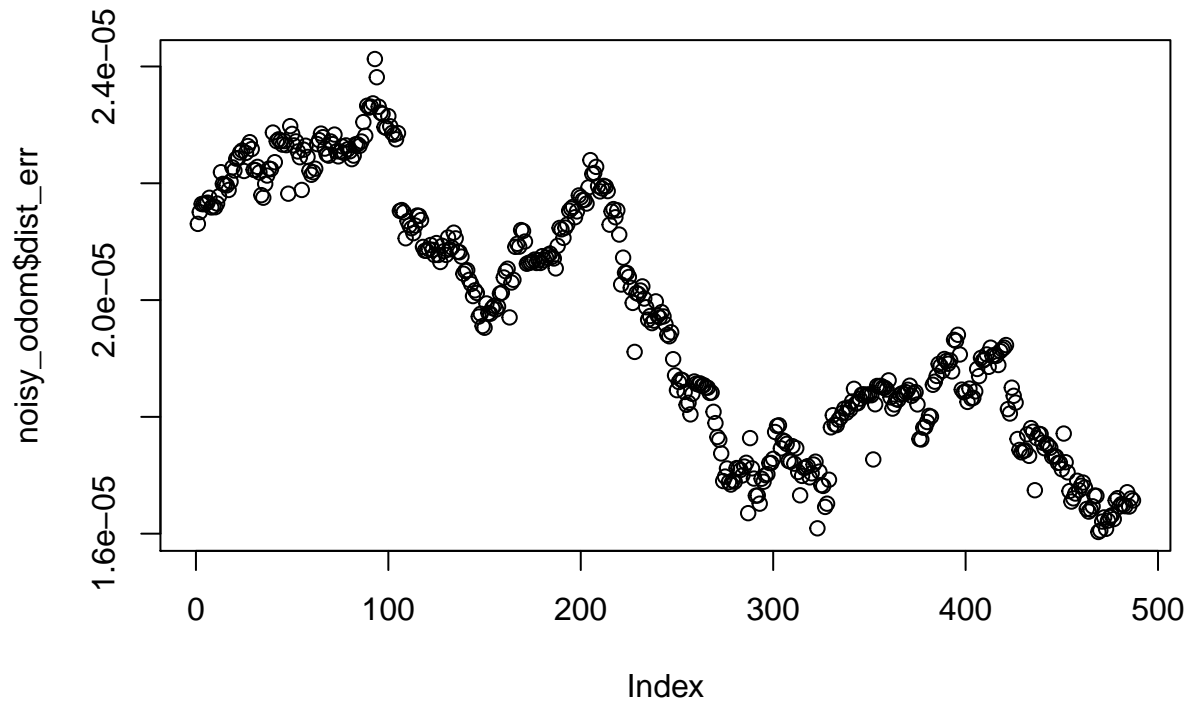
**Noisy Odom X Error Over Time**



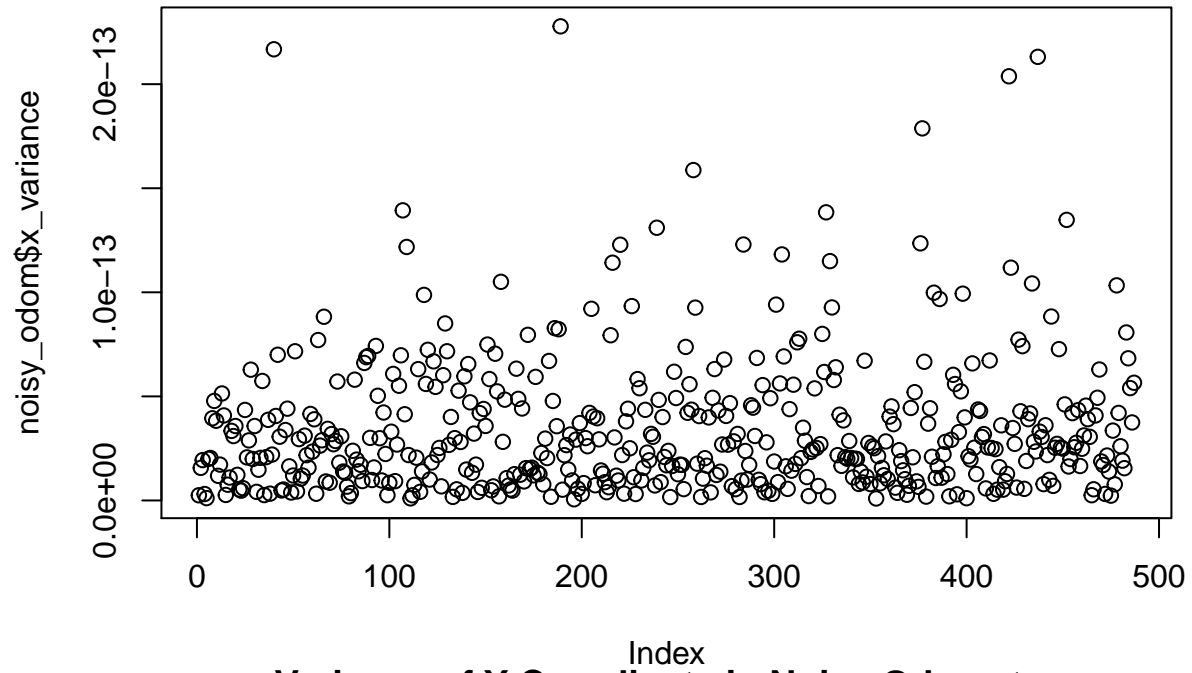
**Noisy Odom Y Error Over Time**



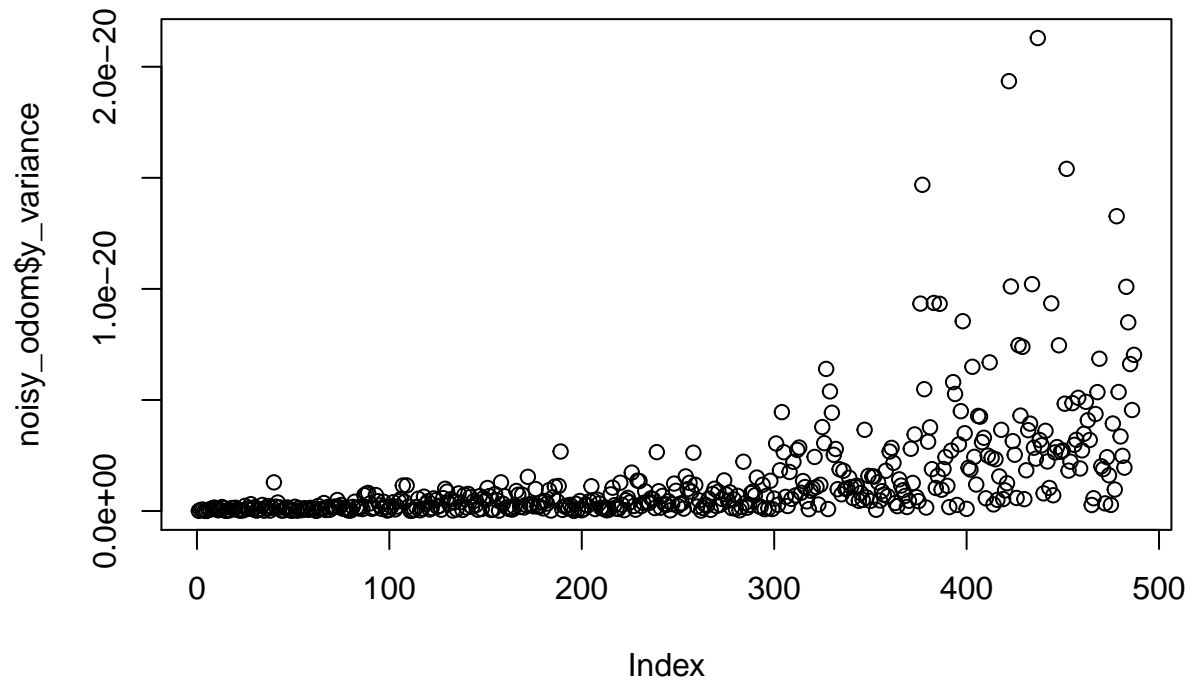
**Noisy Odom Horizontal Distance Error Over Time**



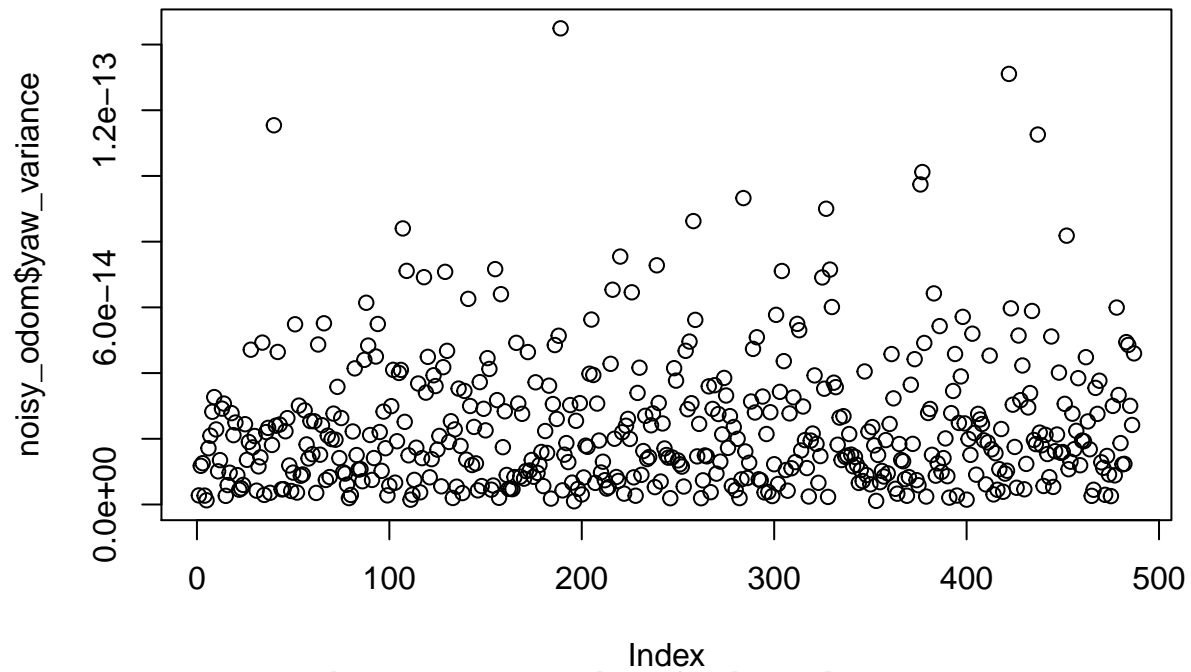
**Variance of X Coordinate in Noisy Odometry**



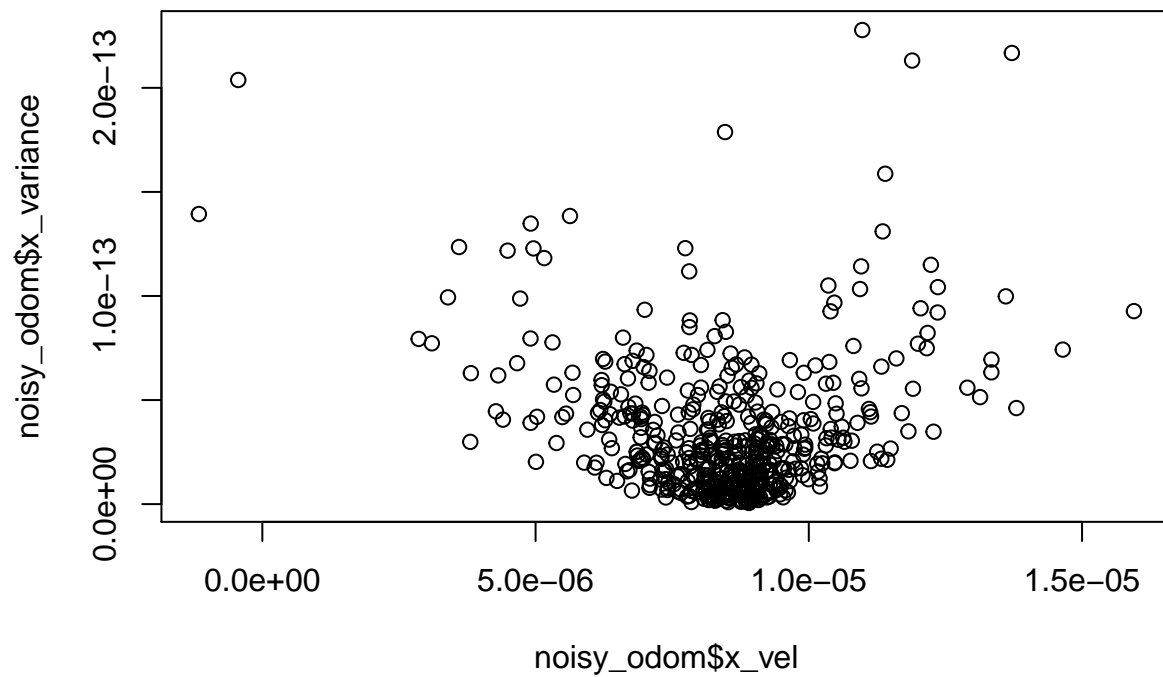
**Variance of Y Coordinate in Noisy Odometry**



**Variance of Yaw Coordinate in Noisy Odometry**



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



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

