two_stationary_noiseless Turtlebot 2 Report

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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 49 seconds.

The total number of external pose measurements recieved by the robot during this time was 490 which means poses were received at an average of 10 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.
## 0.0000166 0.0001396 0.0002620 0.0002629 0.0003870 0.0005118
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 8.426e-10 2.203e-08 5.351e-08 5.934e-08 9.392e-08 1.421e-07
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.553e-05 2.185e-04 3.001e-04 2.846e-04 3.472e-04 4.257e-04
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000166 0.0001396 0.0002620 0.0002629 0.0003870 0.0005118
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.02802 0.03018 0.03020 0.03018 0.03022 0.03024
```

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

```
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.003440 -0.003233 -0.003043 -0.003035 -0.002858 -0.002638
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.344e-05  4.324e-06  3.136e-05  4.034e-05  6.040e-05  1.979e-04
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.02821 0.03032 0.03035 0.03034 0.03037 0.03043
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 5.702e-05 5.929e-05 6.047e-05 6.018e-05 6.115e-05 6.234e-05
```

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

```
##       Min.    1st Qu.    Median       Mean    3rd Qu.       Max.
## -1.493e-07 -1.443e-07 -1.388e-07 -1.389e-07 -1.336e-07 -1.291e-07
```

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

```
##       Min.    1st Qu.    Median       Mean    3rd Qu.       Max.
## 5.702e-05 5.929e-05 6.047e-05 6.018e-05 6.115e-05 6.234e-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.
##   2.000   2.000   2.000   2.000   2.000   2.001
```

```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.
## 1.006e-15 9.153e-15 1.881e-14 2.477e-14 3.431e-14 1.407e-13
```

X coordinate of robot over time
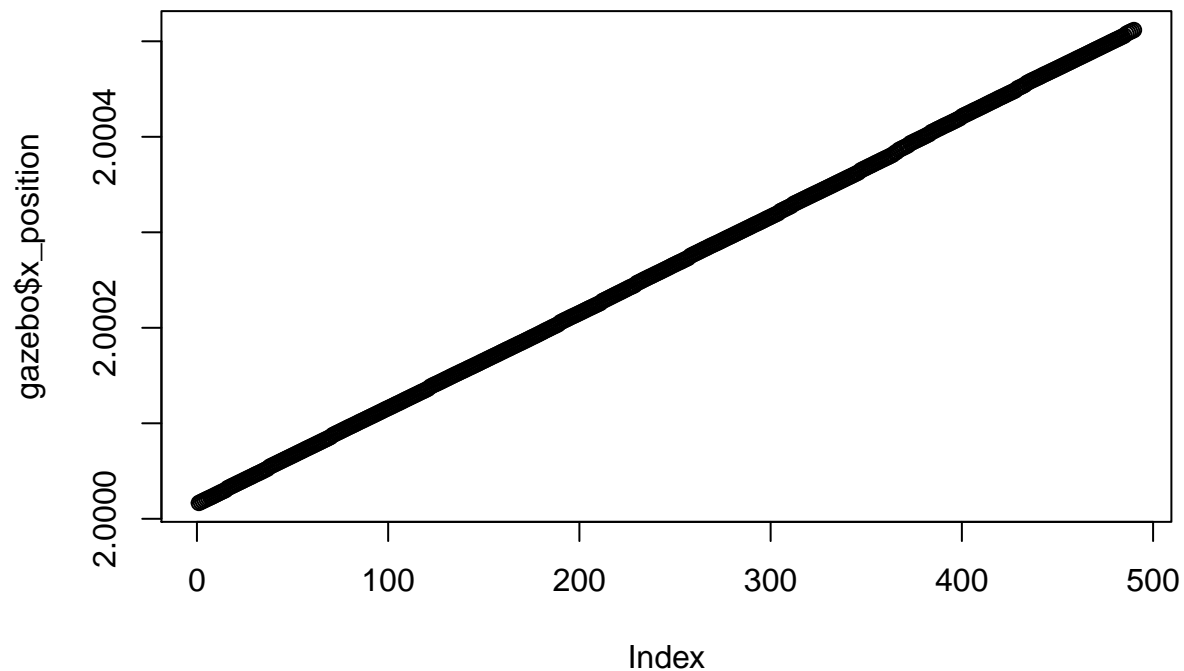
Y coordinate of robot over time
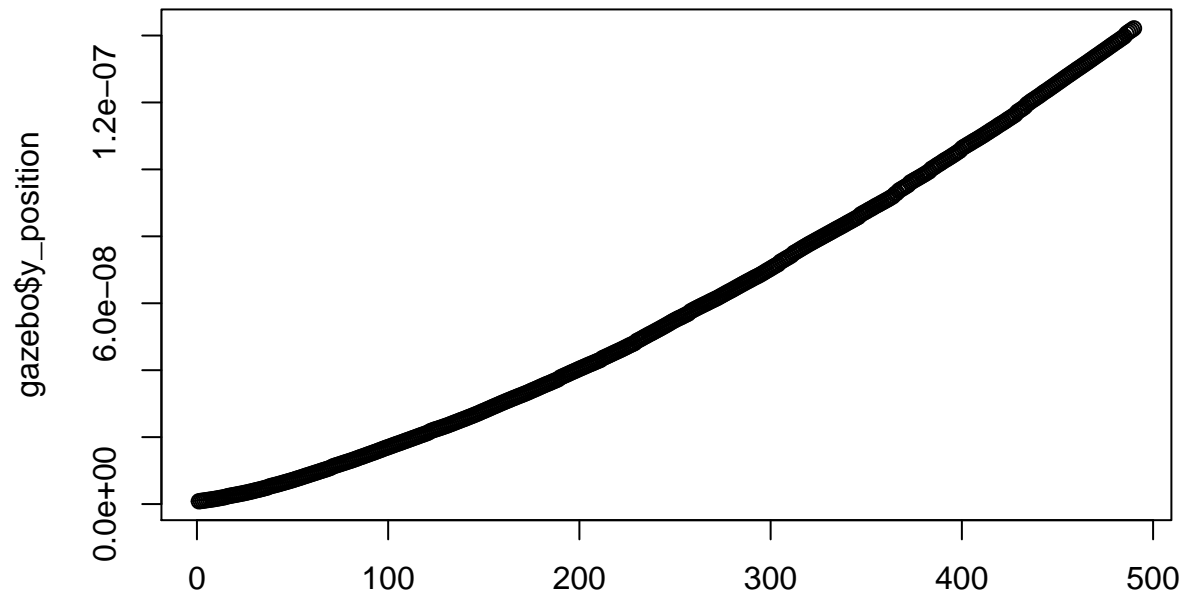
Distance from origin vs. time
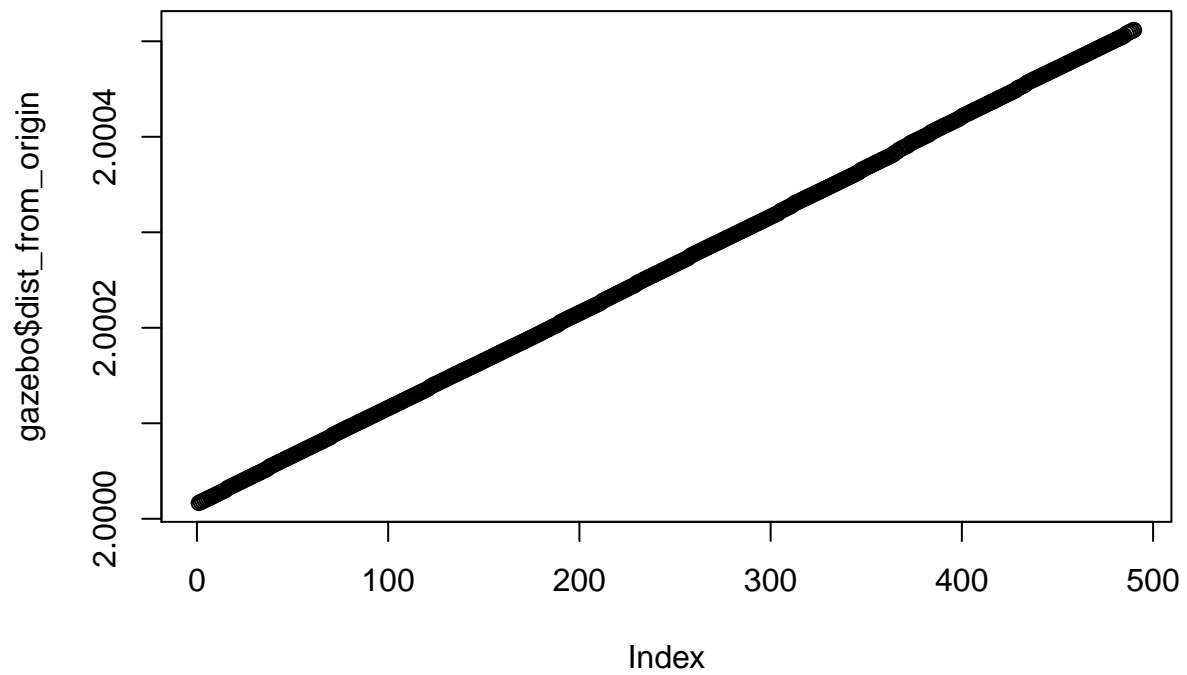
Continuous x_error over time
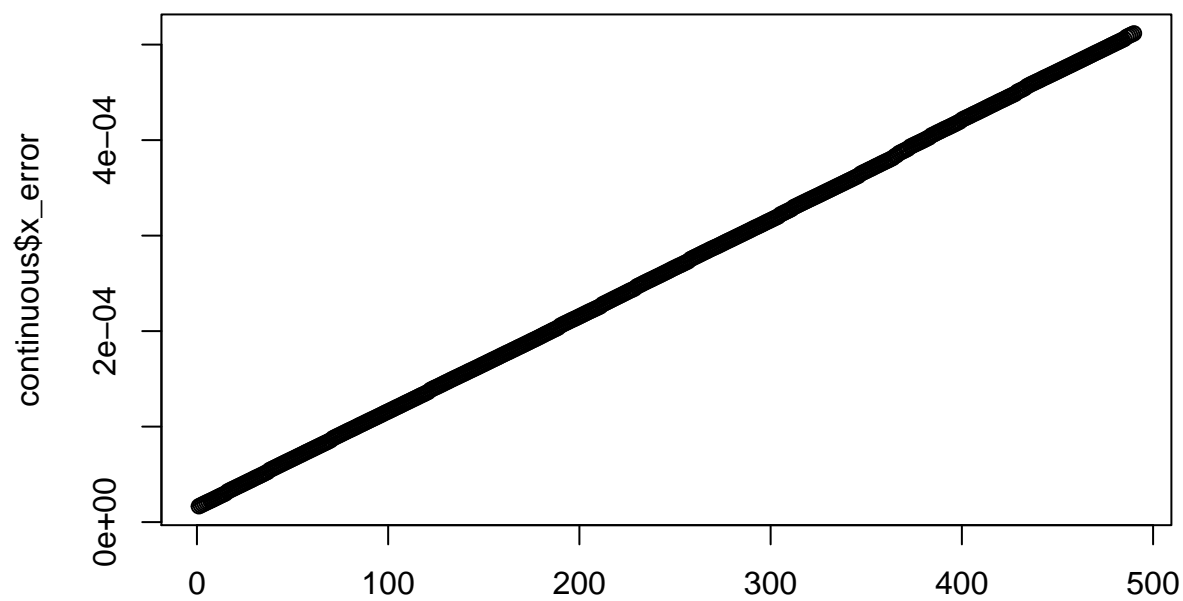
Discrete x_error over time
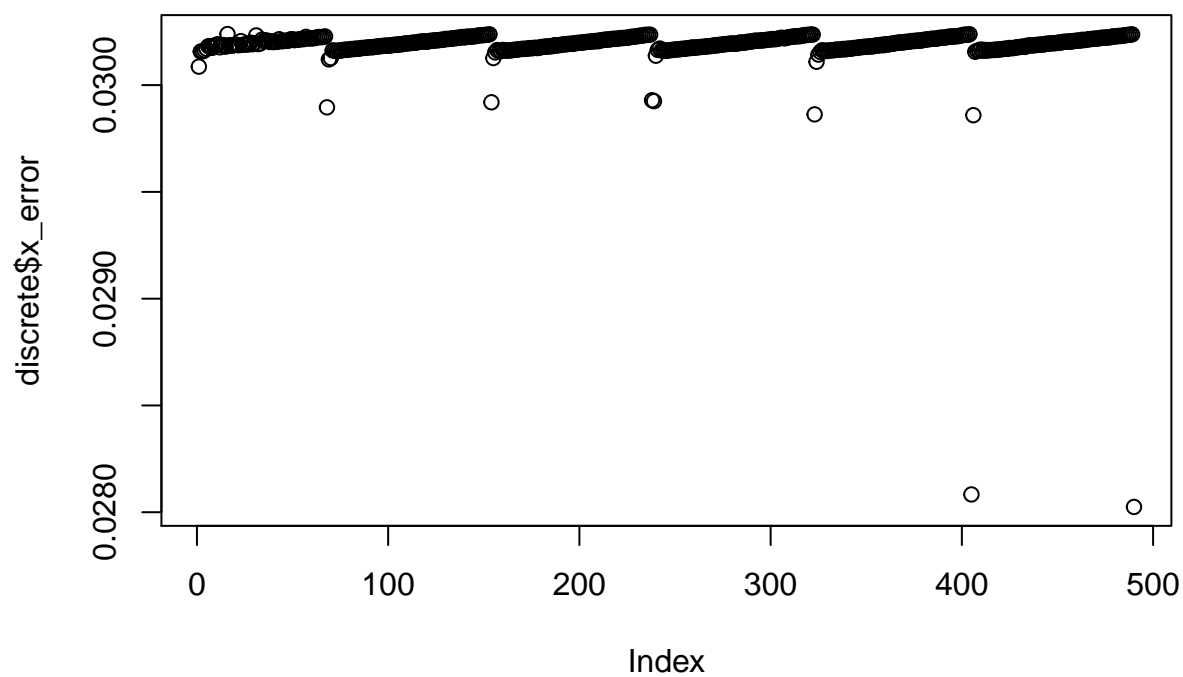
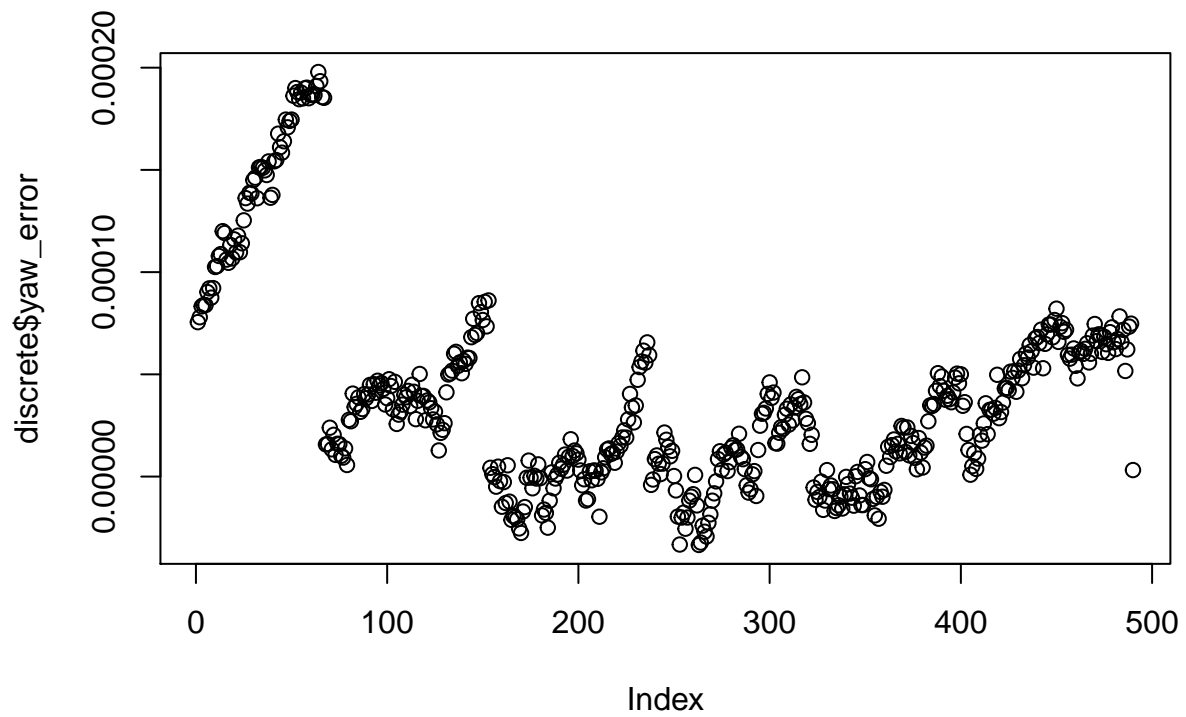## Continuous y_error over time
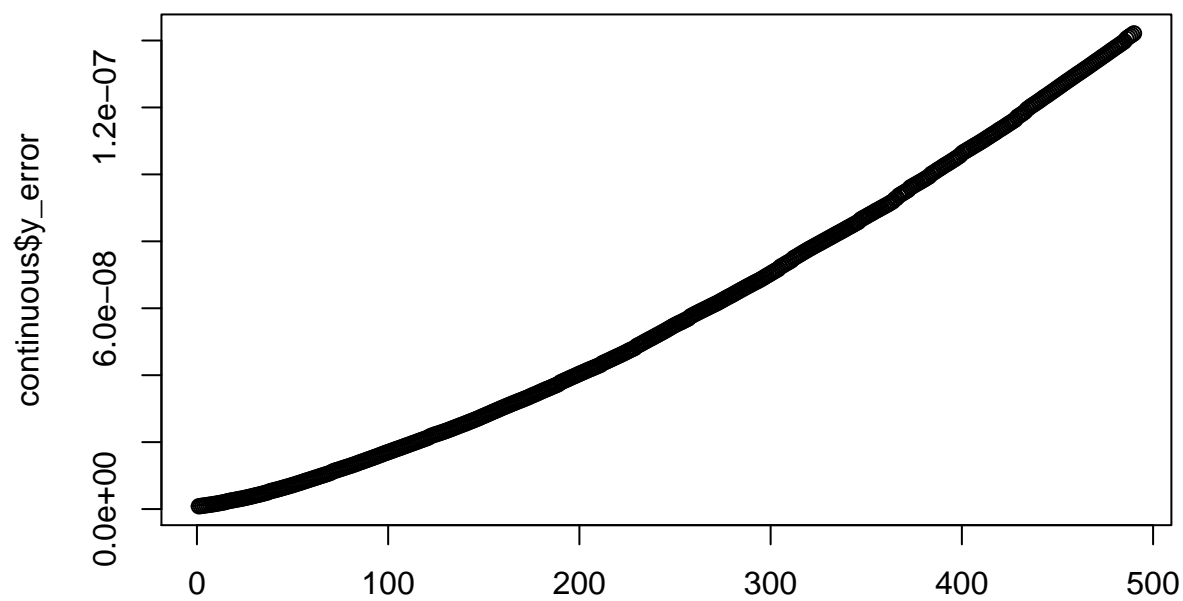
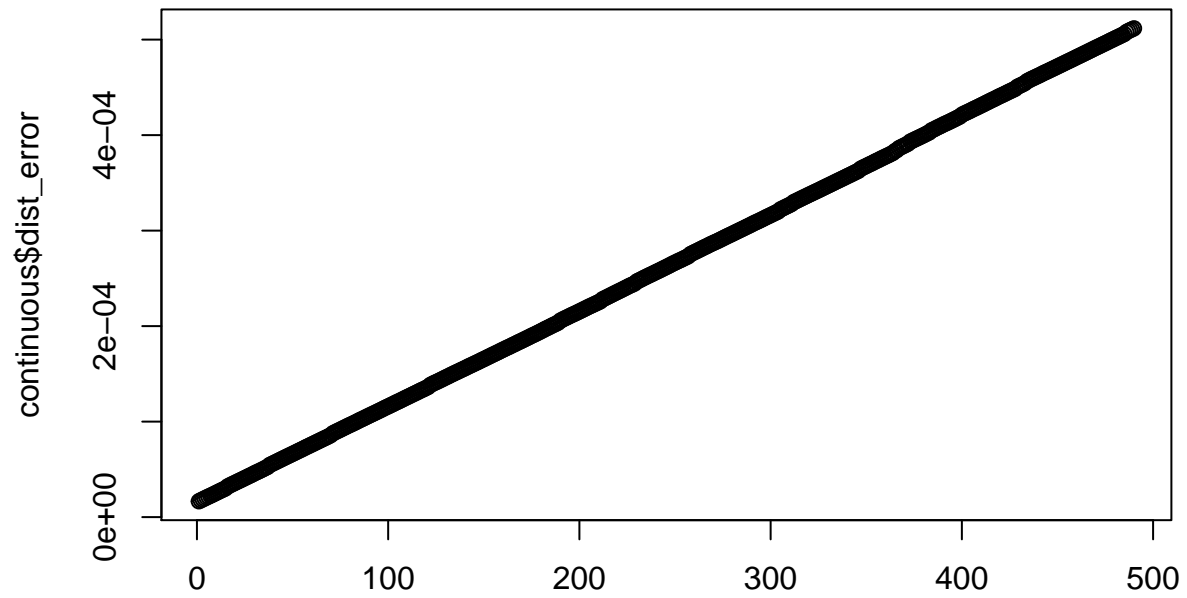
Discrete y_error over time
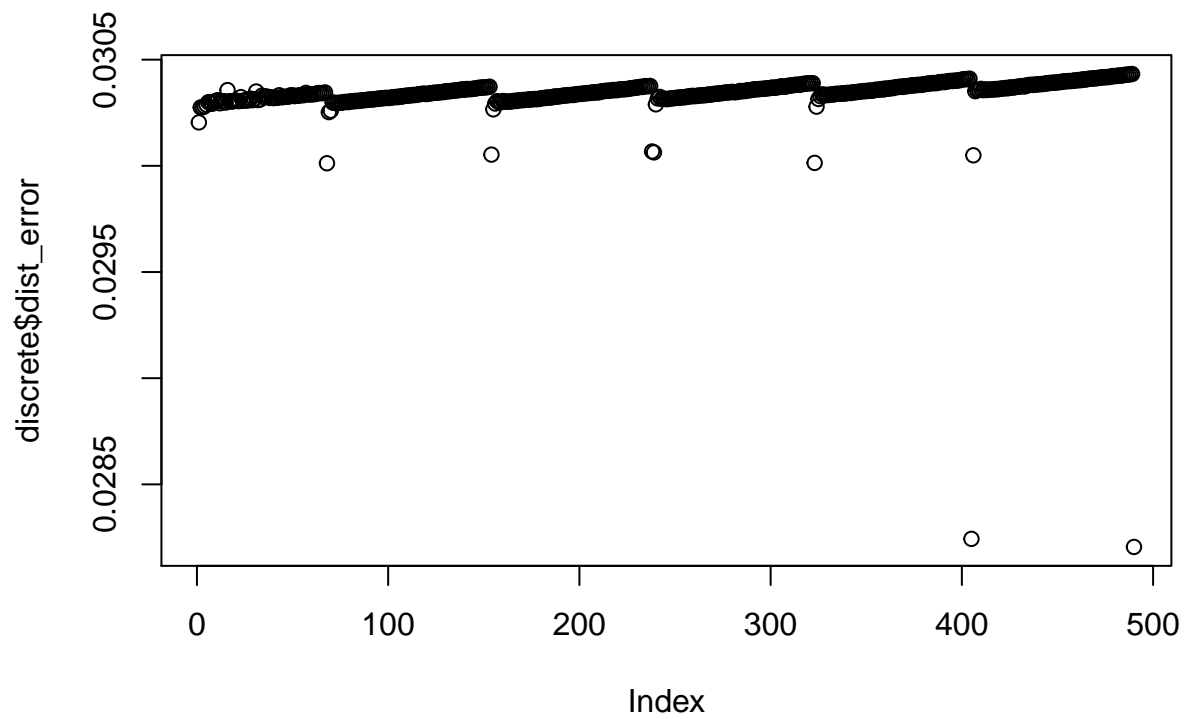

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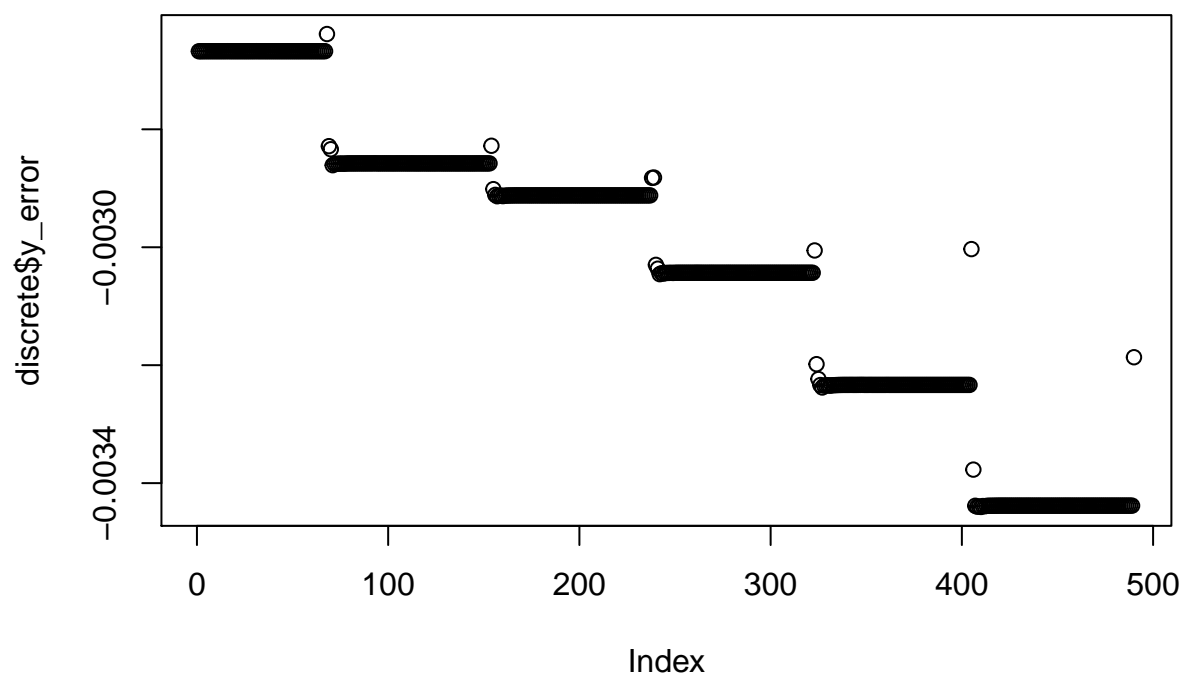
Continuous yaw error over time
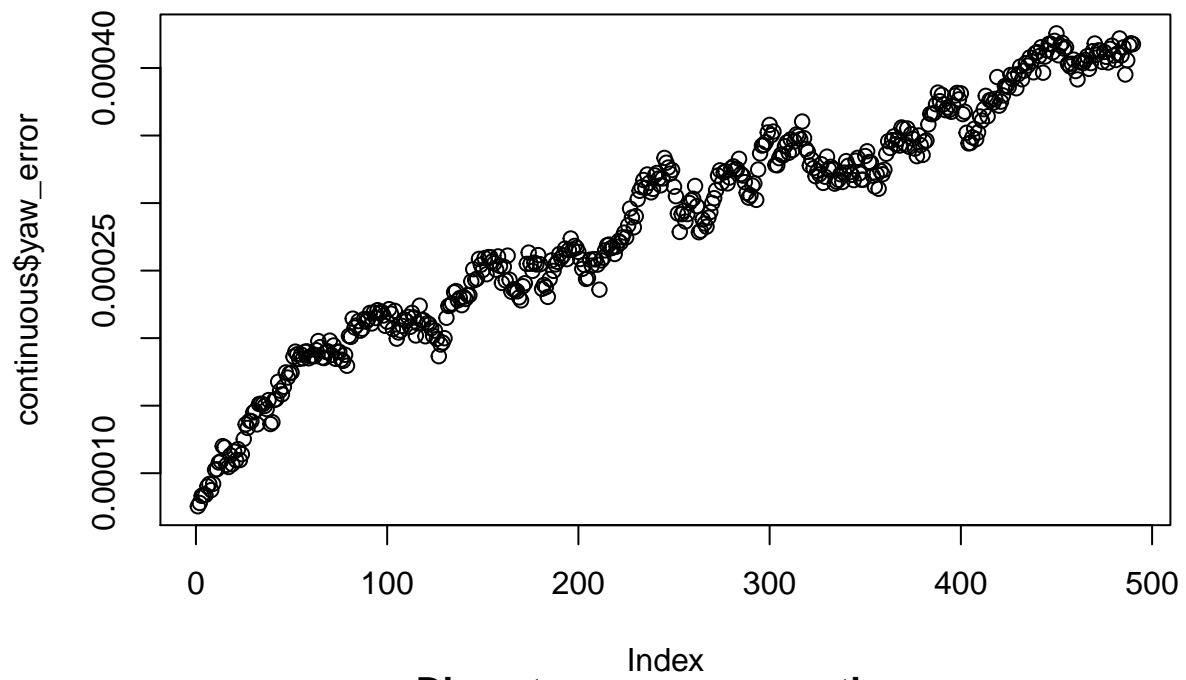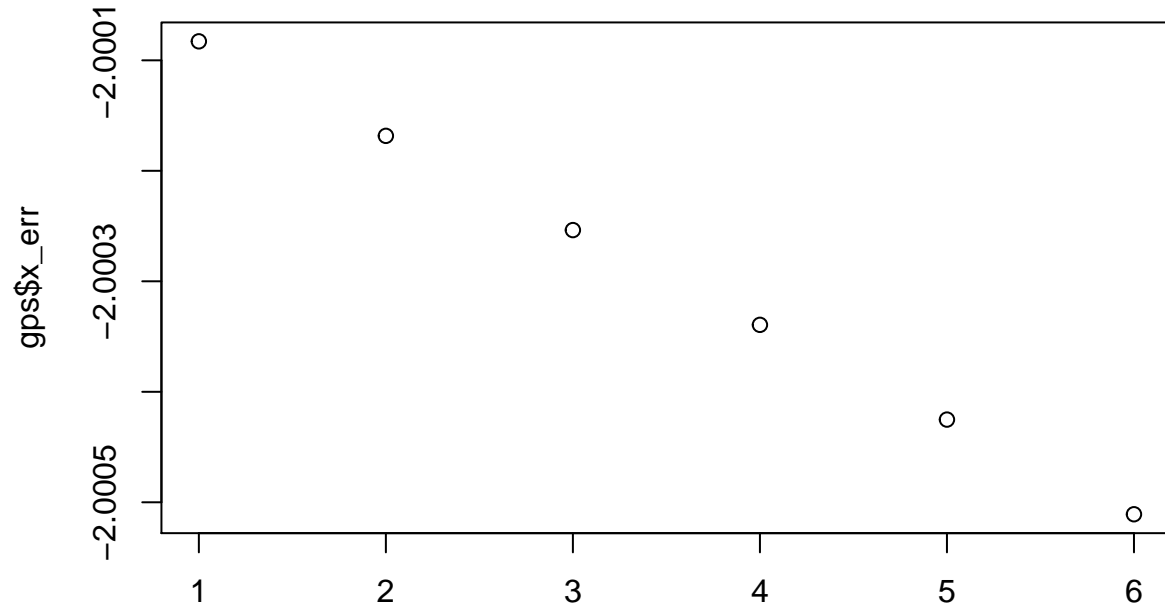

Discrete yaw error over time
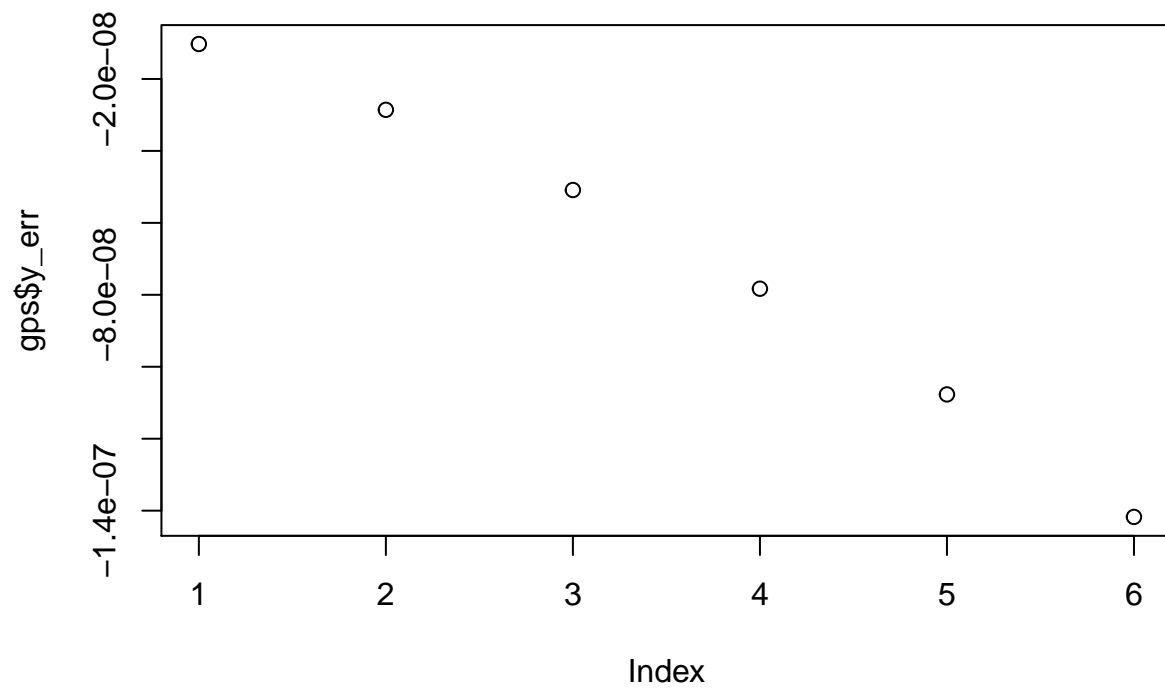
Continuous total distance error over time
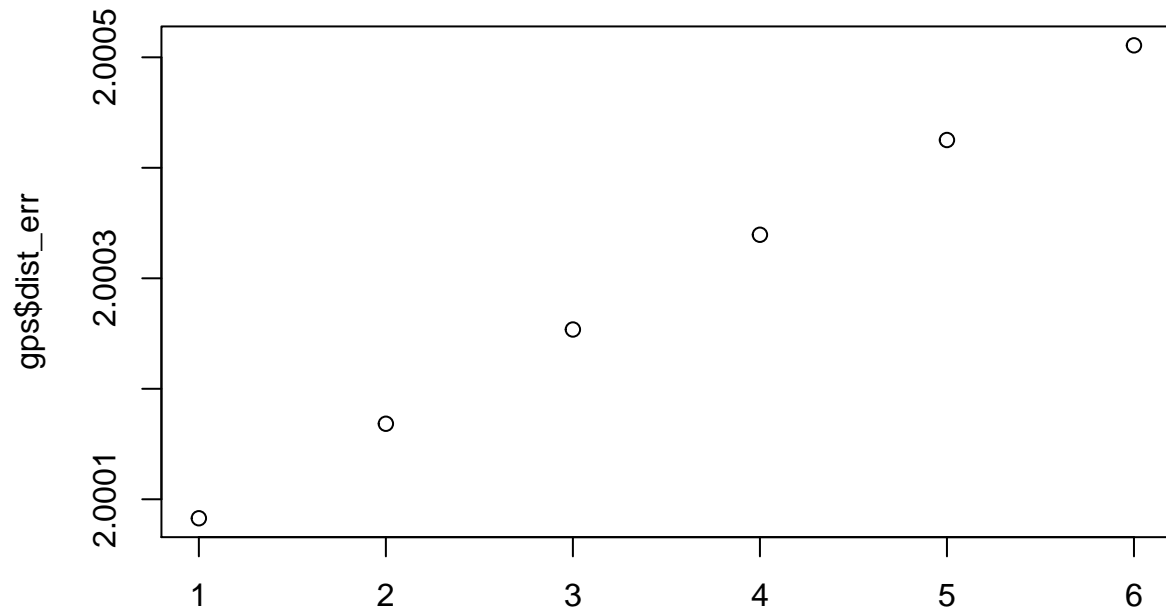

Discrete total distance error over time
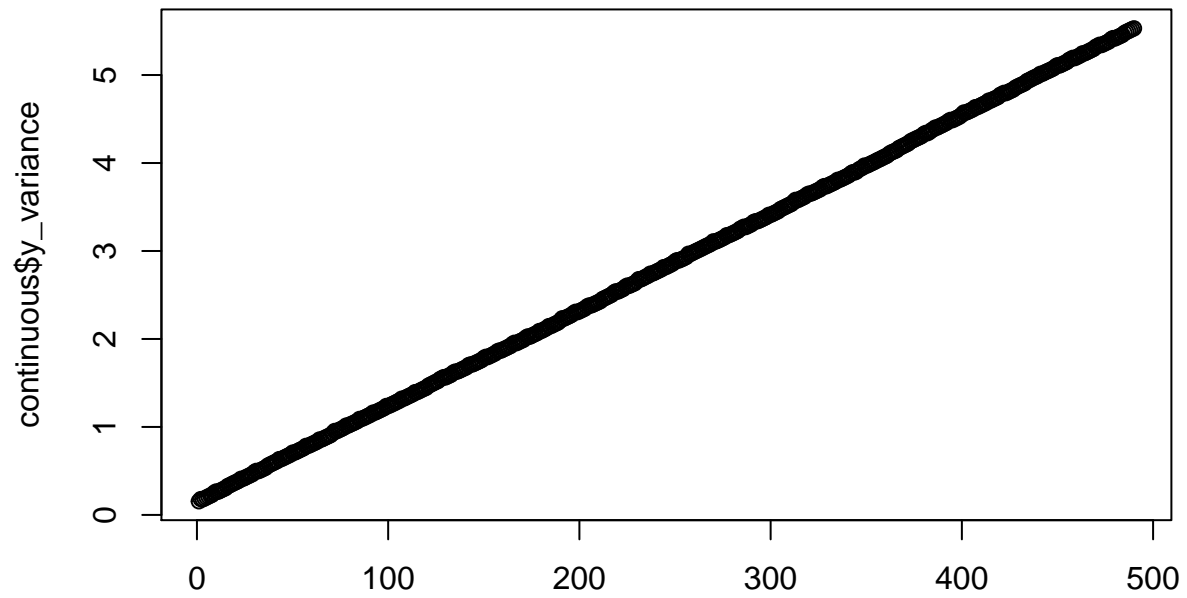
GPS X Error Over Time

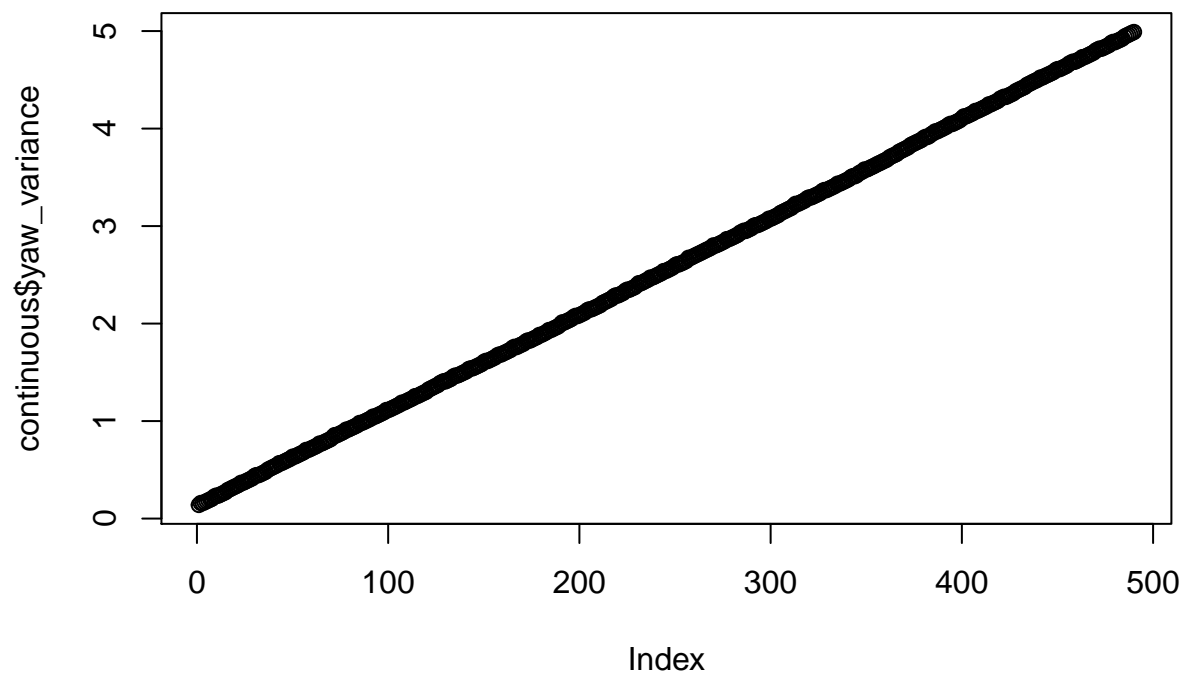# GPS Y Error Over Time

GPS Horizontal Distance Error Over Time

Continuous Filter X Variance Over Time
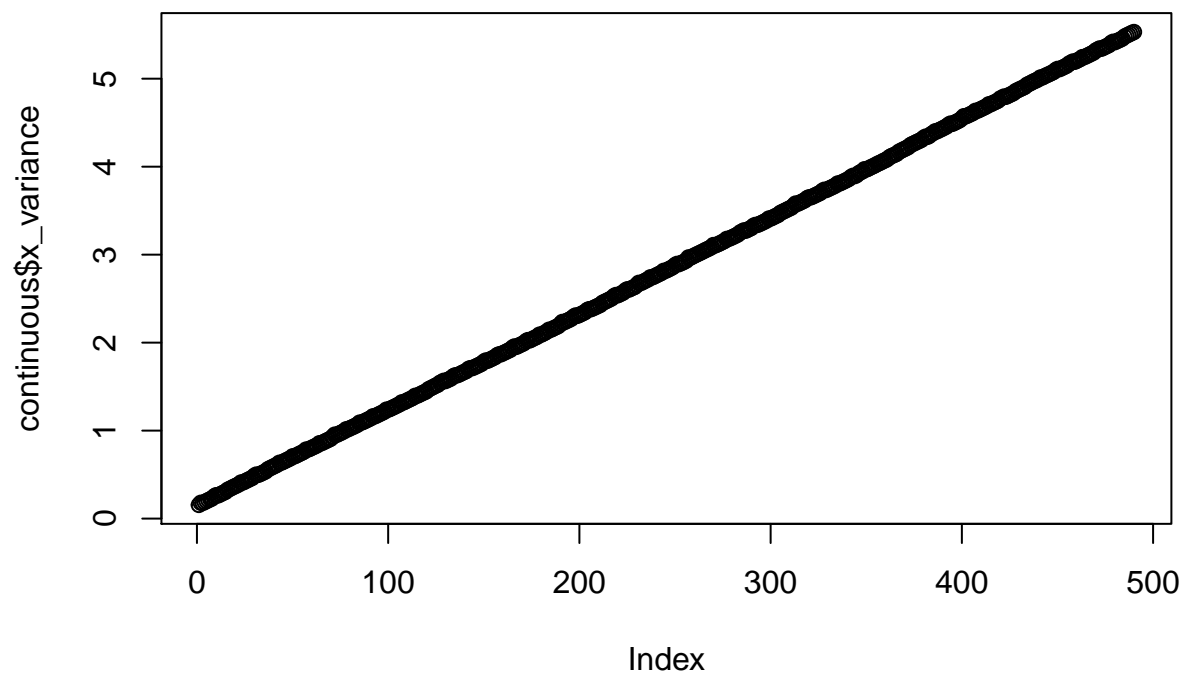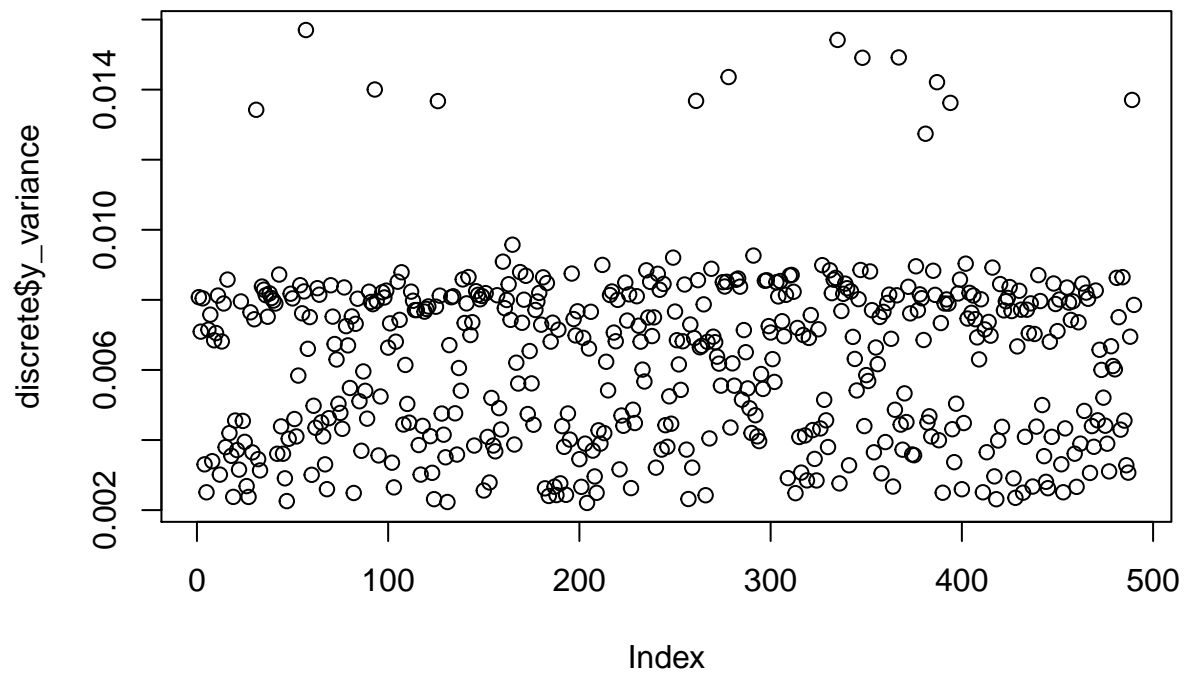
Continuous Filter Y Variance Over Time

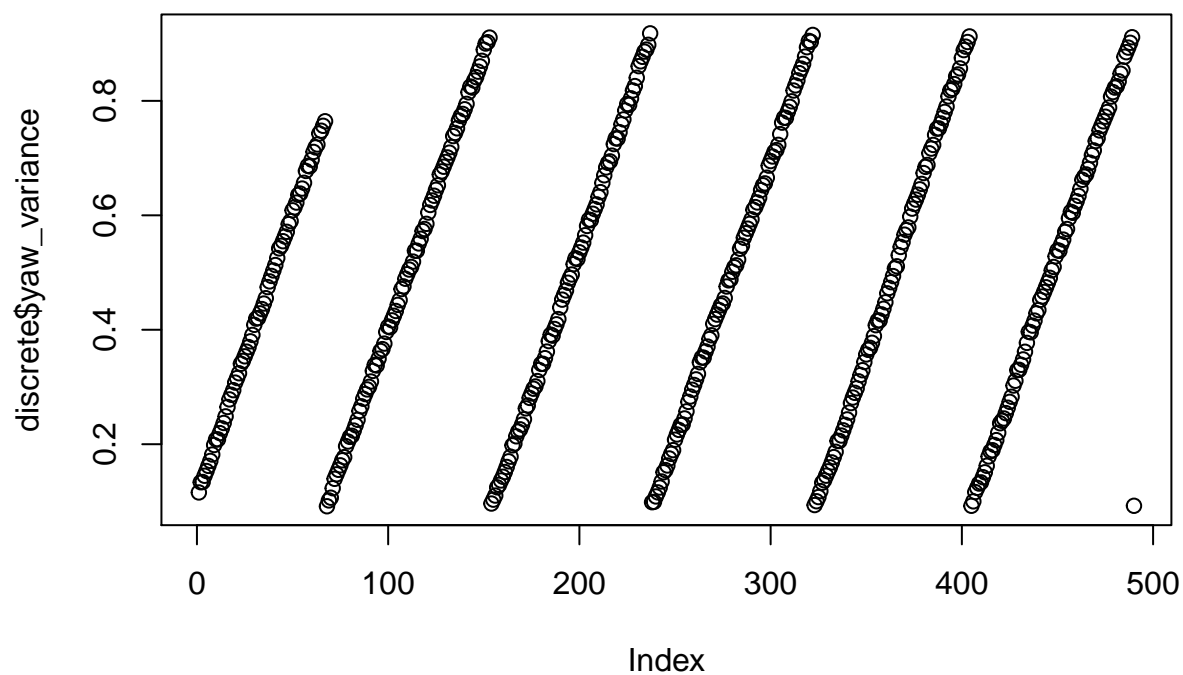## Continuous Filter Yaw Variance Over Time
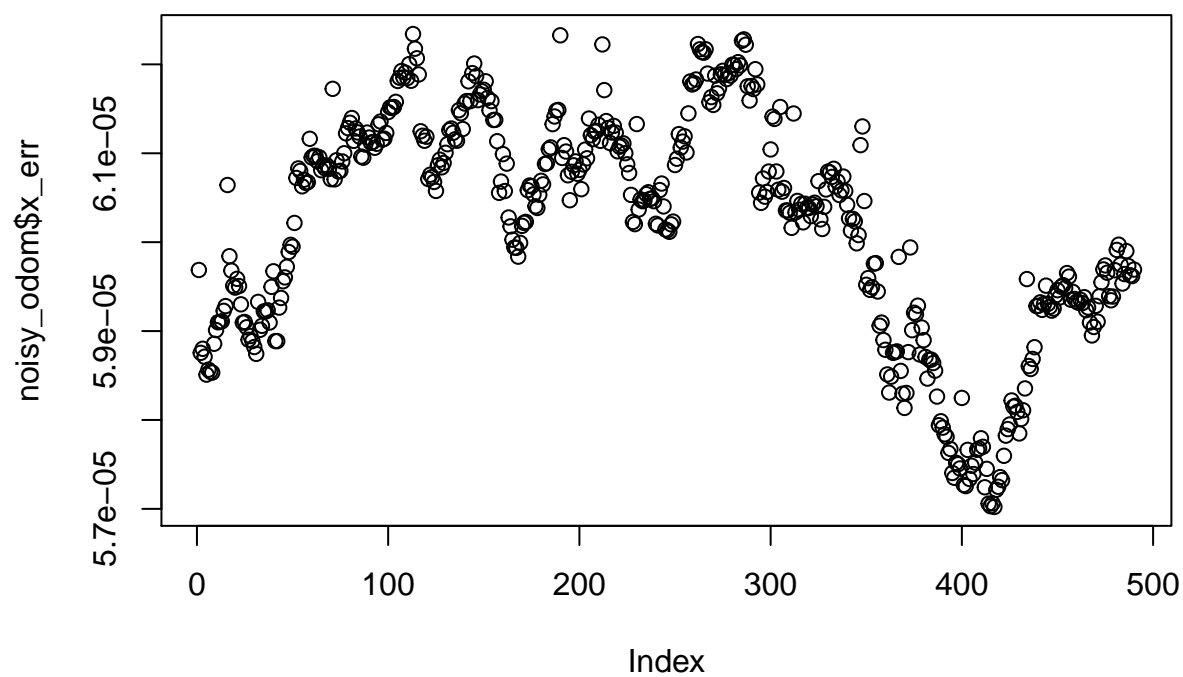
Discrete Filter X Variance Over Time
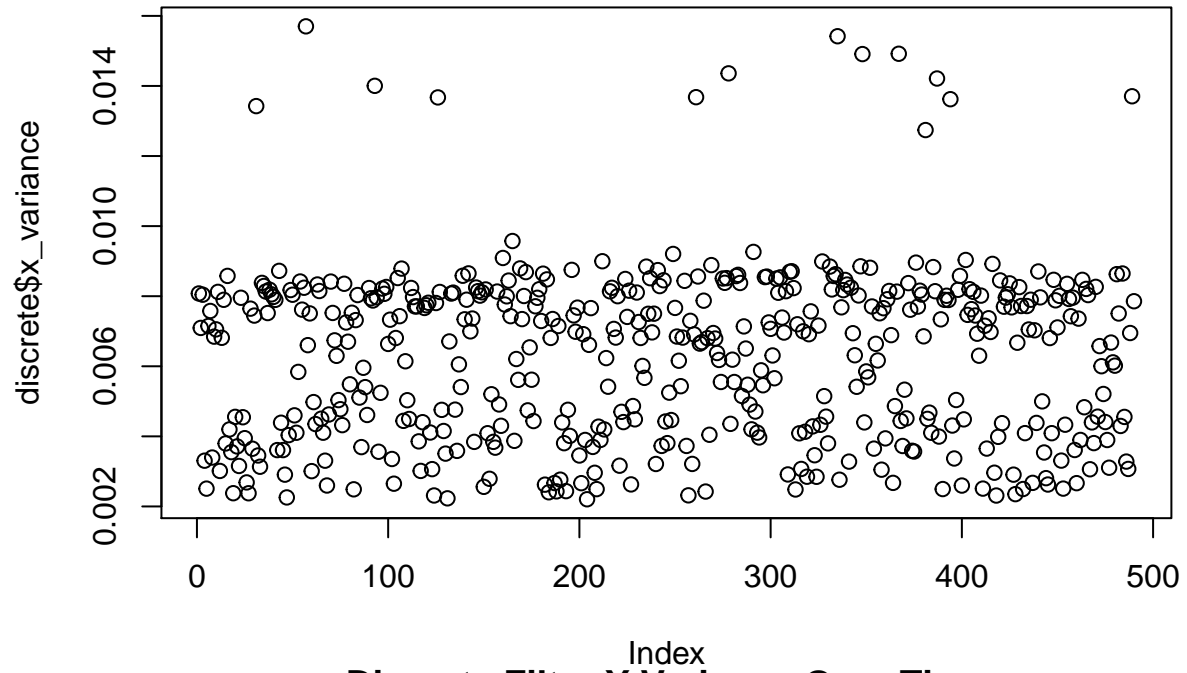
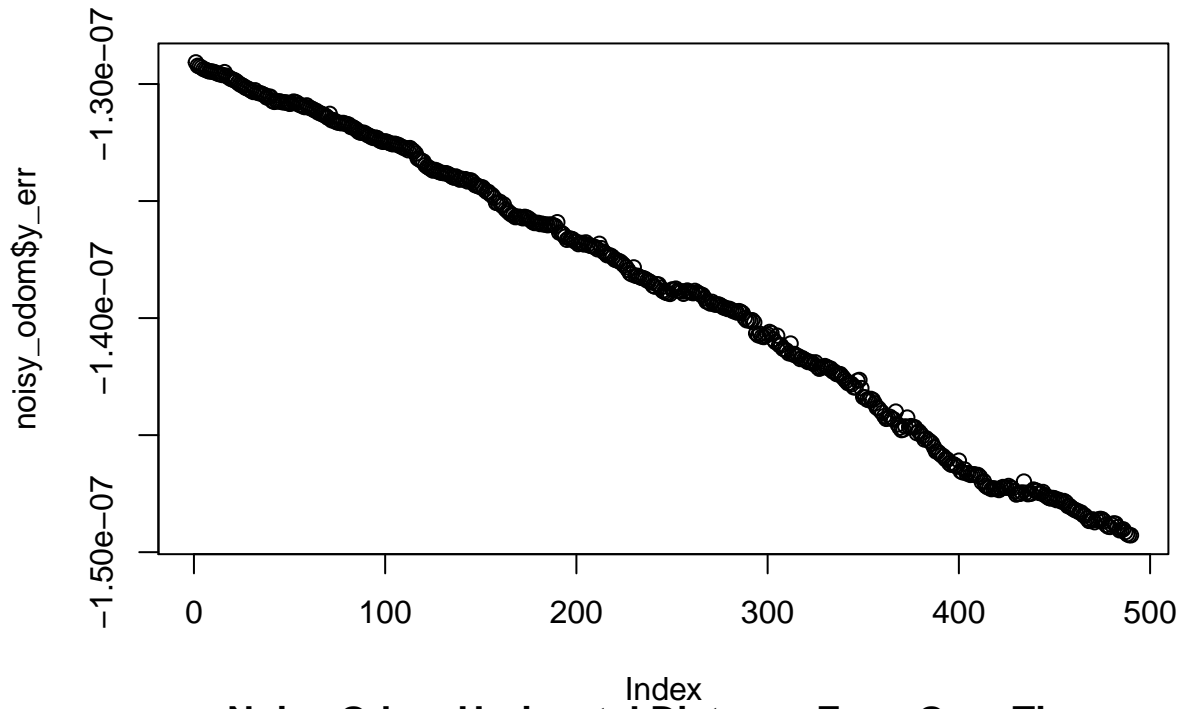## Discrete Filter Y Variance Over Time
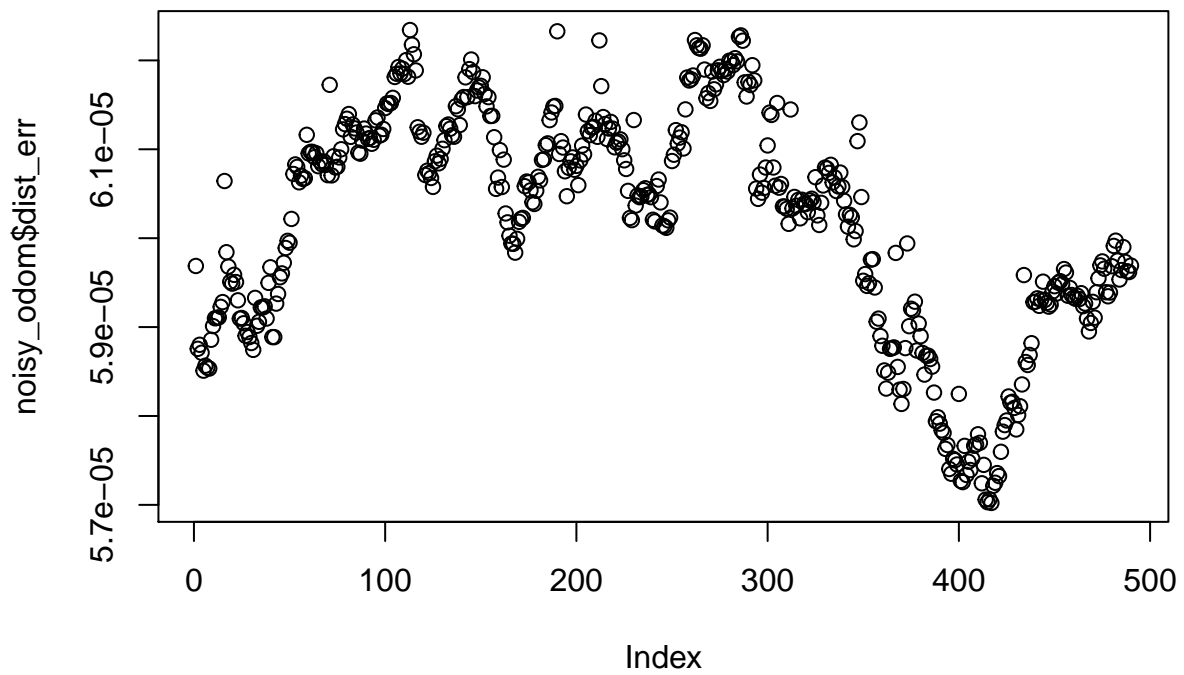
Discrete Filter Yaw Variance Over Time
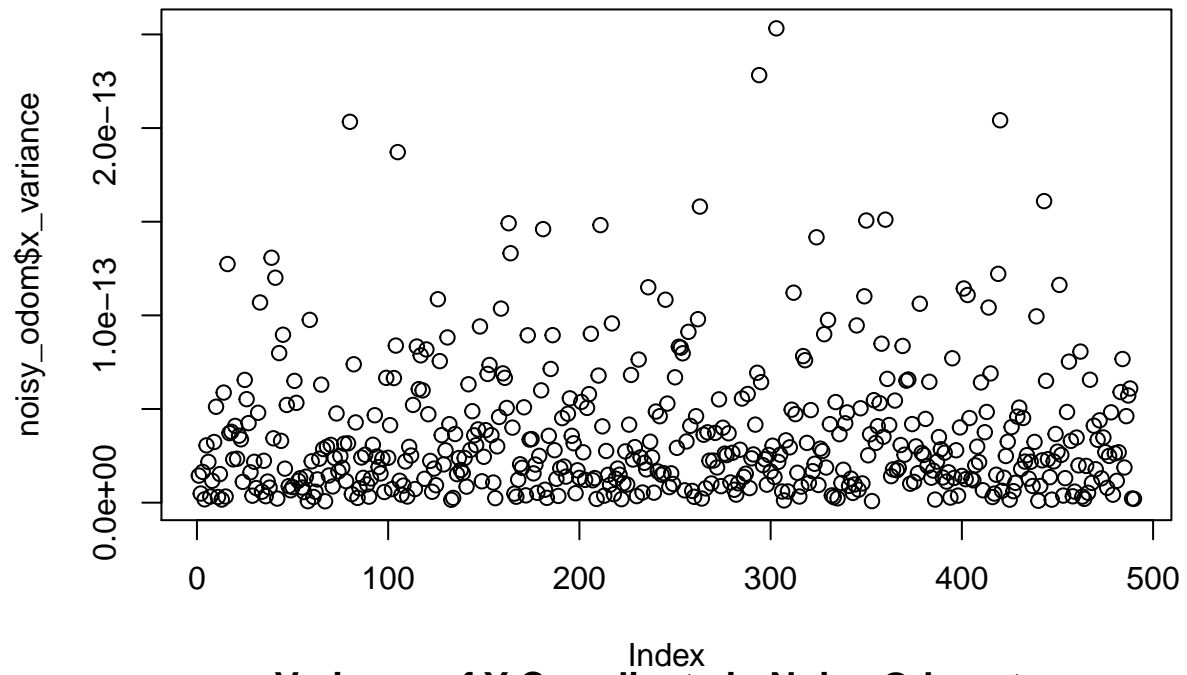
Noisy Odom X Error Over Time

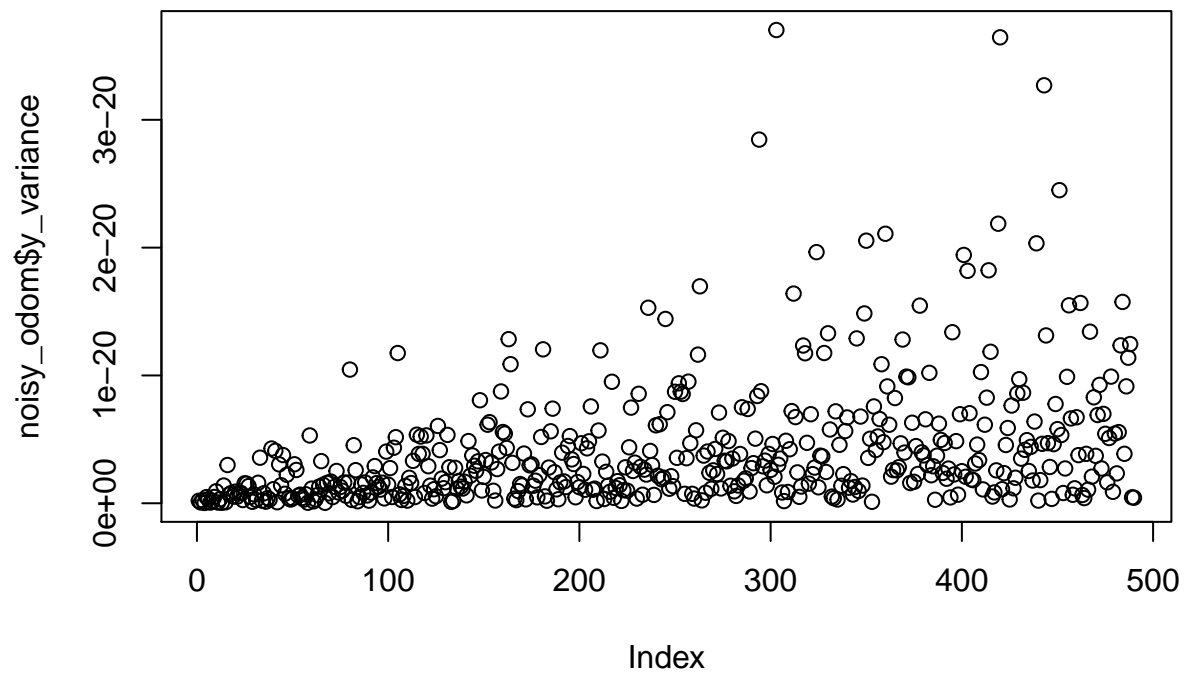## Noisy Odom Y Error Over Time

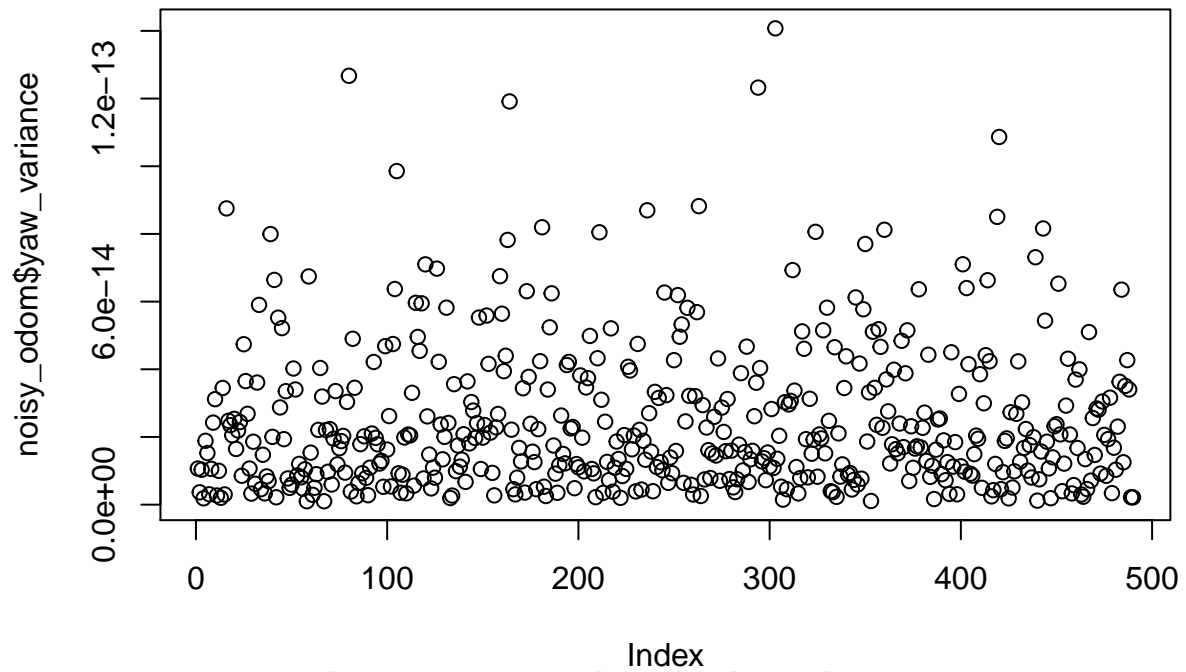## Noisy Odom Horizontal Distance Error Over Time

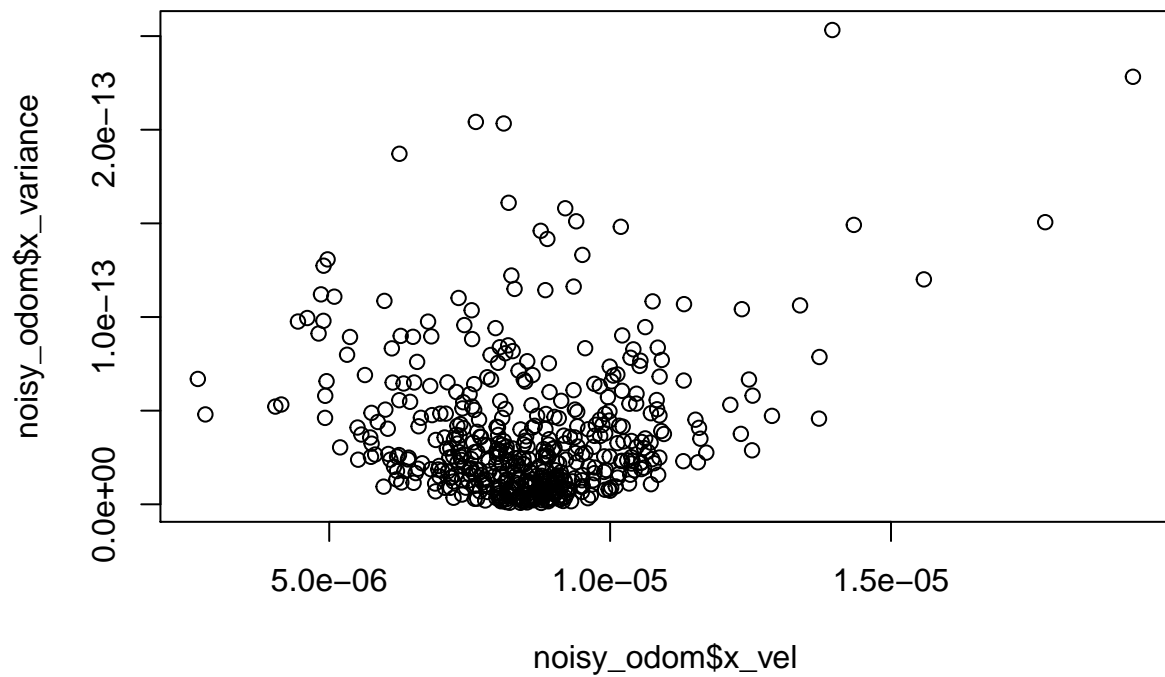**Variance of X Coordinate in Noisy Odometry**

Variance of Y Coordinate in Noisy Odometry

Variance of Yaw Coordinate in Noisy Odometry

Variance vs. Velocity of X in Noisy Odometry

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Variance vs. Velocity of Yaw in Noisy Odometry