

# two\_mobile Turtlebot 1 Report

*Matthew Swartwout*

*August 15, 2016*

This is a summary of the data from the two\_mobile experiment, Turtlebot #1.

The runtime of this experiment was 0 hours, 25 minutes, and 30.6 seconds.

The total number of external pose measurements received by the robot during this time was 312 which means poses were received at an average of 0.2038416 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.
## 1.579e-05 3.865e-03 7.723e-03 7.716e-03 1.156e-02 1.541e-02

summary(continuous$y_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 8.700e-10 5.152e-06 1.972e-05 2.669e-05 4.506e-05 8.032e-05

summary(continuous$yaw_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 4.973e-05 2.498e-03 5.010e-03 5.221e-03 8.035e-03 1.059e-02

summary(continuous$dist_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 1.579e-05 3.865e-03 7.723e-03 7.716e-03 1.156e-02 1.541e-02

summary(discrete$x_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.24700 -0.57000 -0.01042 -0.12550  0.36060  2.04500

summary(discrete$y_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.95100 -0.49420 -0.05571 -0.04074  0.38770  2.58700

summary(discrete$yaw_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -6.824e-05 1.012e-05 2.985e-05 3.407e-05 5.510e-05 1.660e-04

summary(discrete$dist_error)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 0.000016 0.463700 0.860200 1.006000 1.397000 4.112000

summary(noisy_odom$x_err)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -5.928e-05 -5.272e-05 -4.797e-05 -4.612e-05 -4.092e-05 -2.796e-05
```

```

summary(noisy_odom$y_err)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 6.815e-08 1.536e-07 1.943e-07 2.092e-07 2.635e-07 3.885e-07

summary(noisy_odom$dist_err)

##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 2.797e-05 4.092e-05 4.797e-05 4.612e-05 5.272e-05 5.928e-05

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

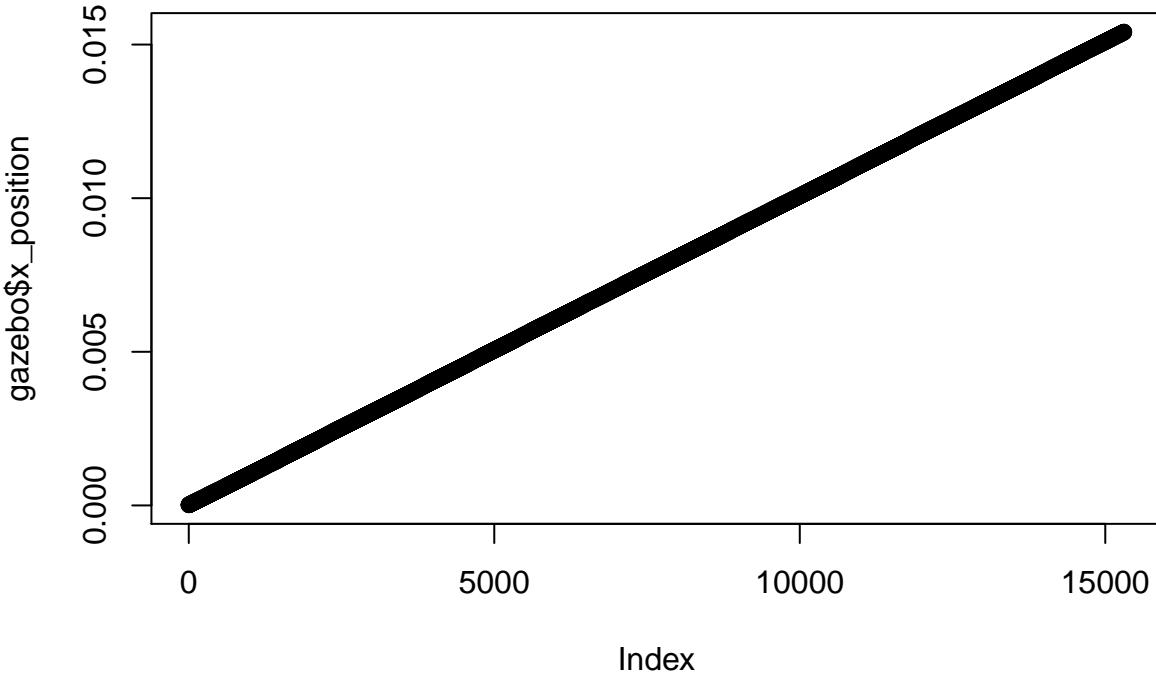
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 0.01277 0.59970 1.26000 1.49400 2.07600 5.50800

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

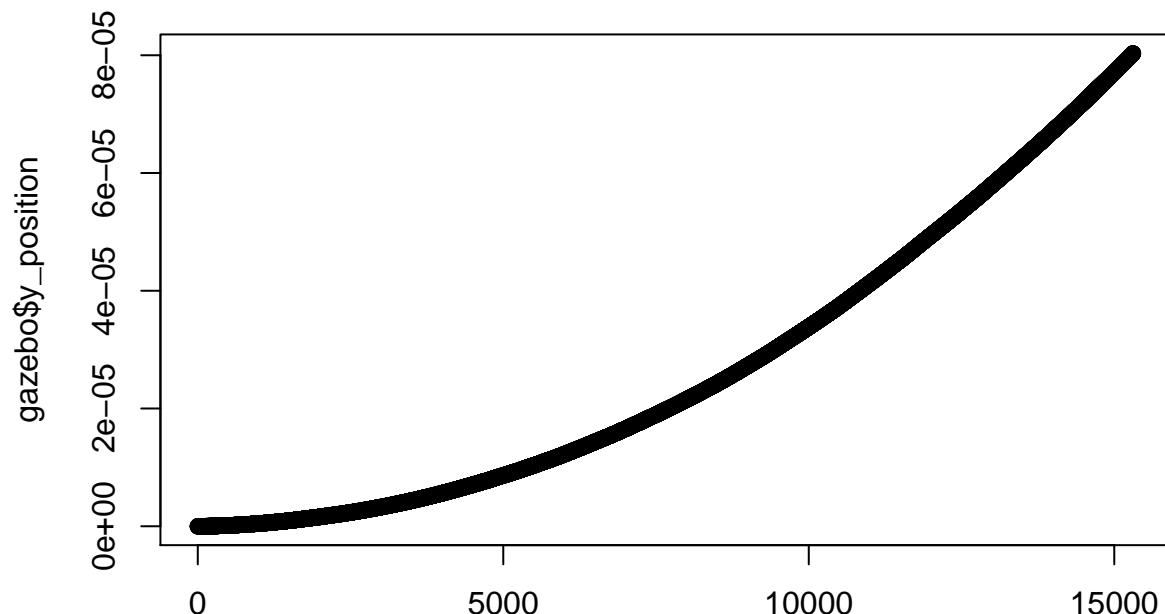
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 6.361e-16 8.670e-15 1.789e-14 2.402e-14 3.227e-14 3.467e-13

```

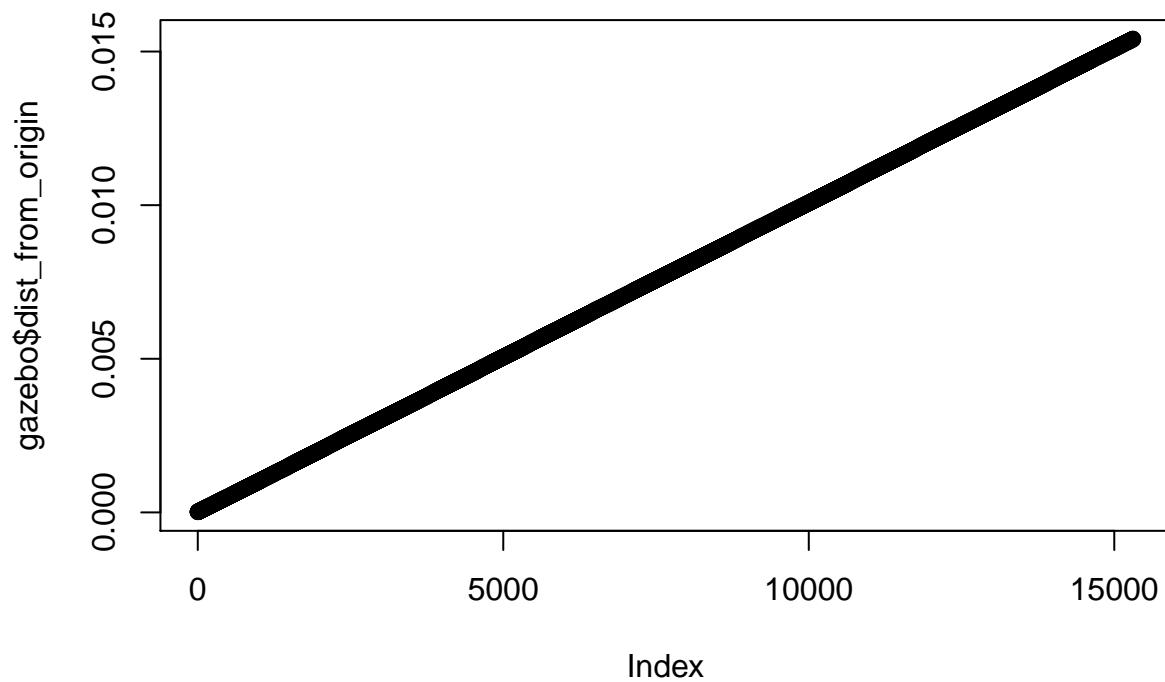
### X coordinate of robot over time



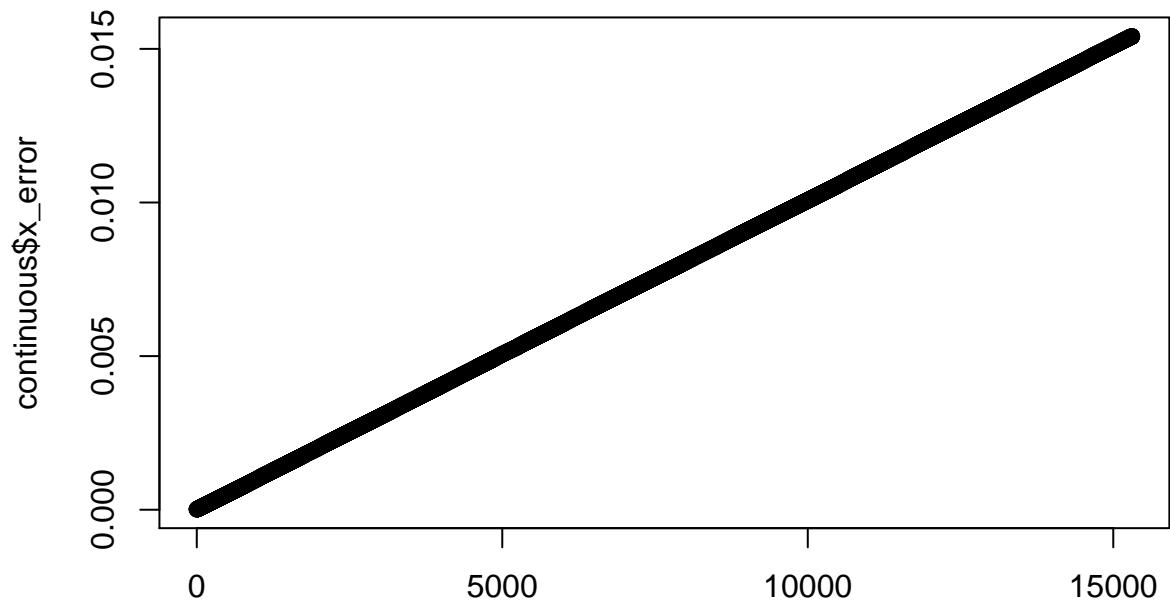
**Y coordinate of robot over time**



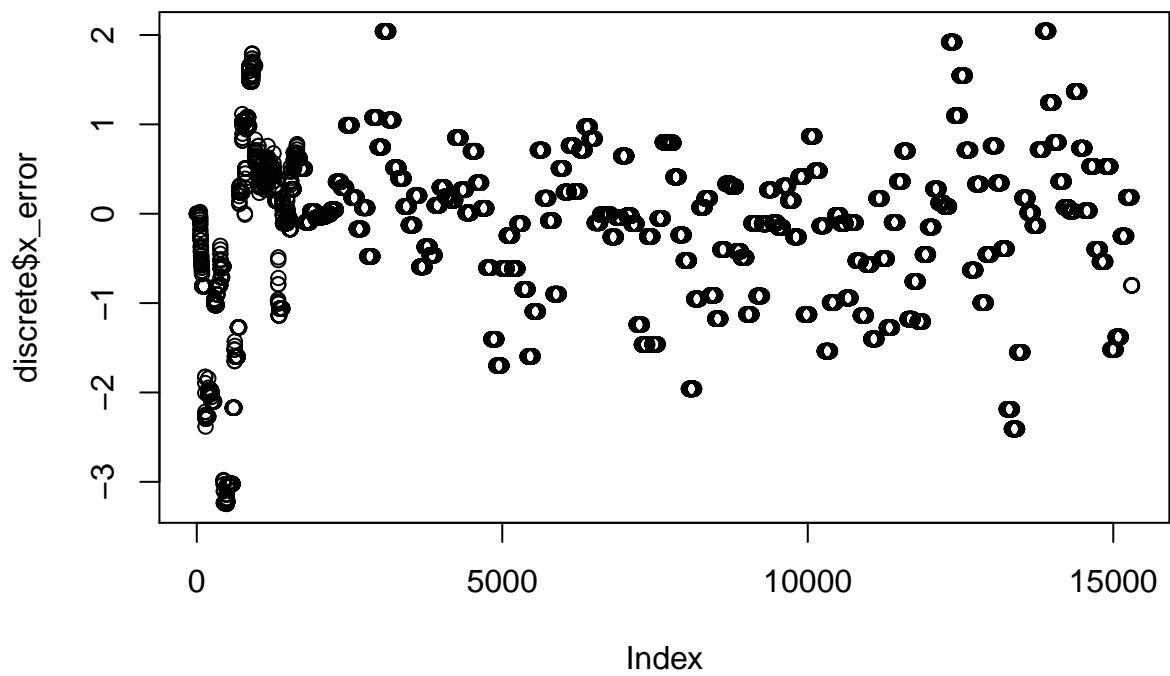
**Distance from origin vs. time**



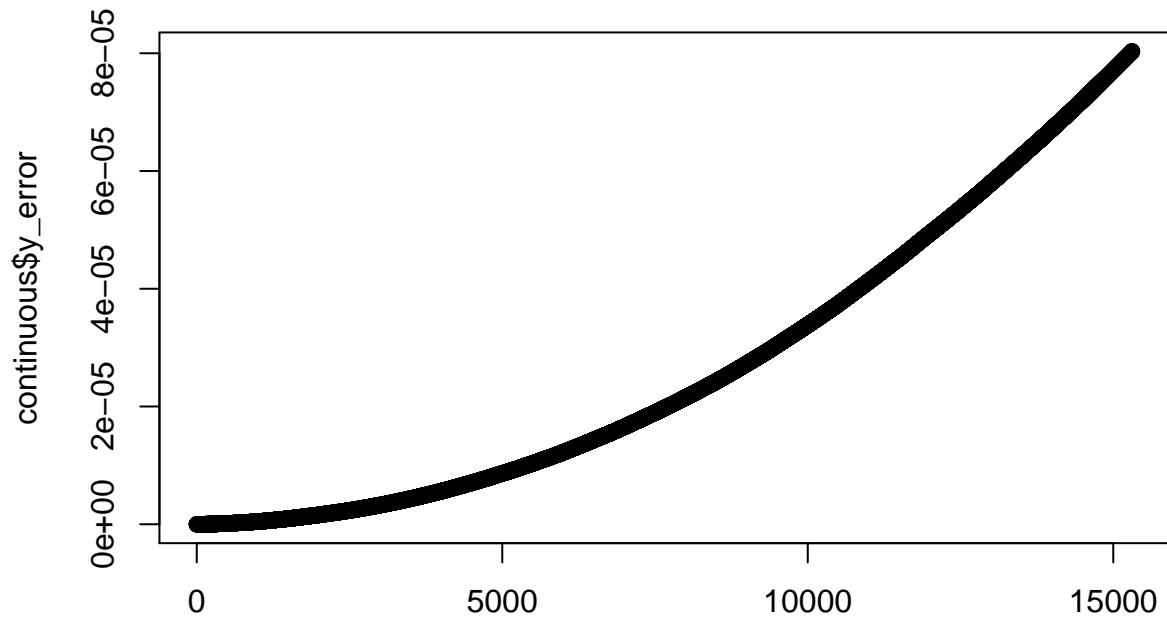
**Continuous x\_error over time**



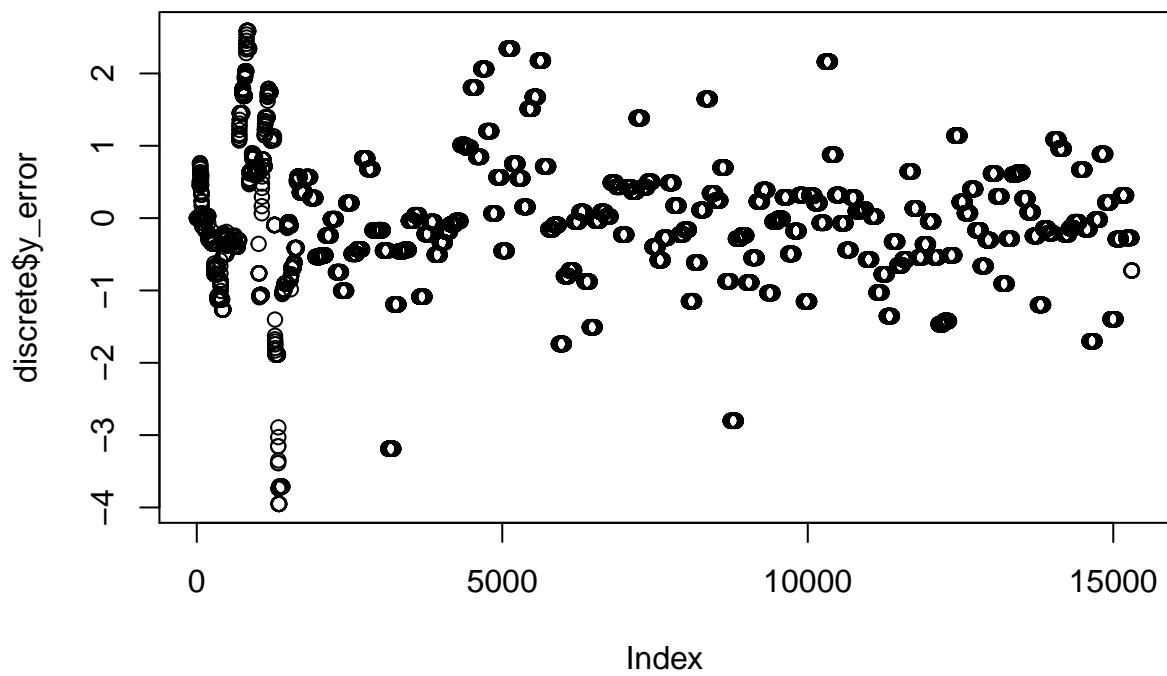
**Discrete x\_error over time**



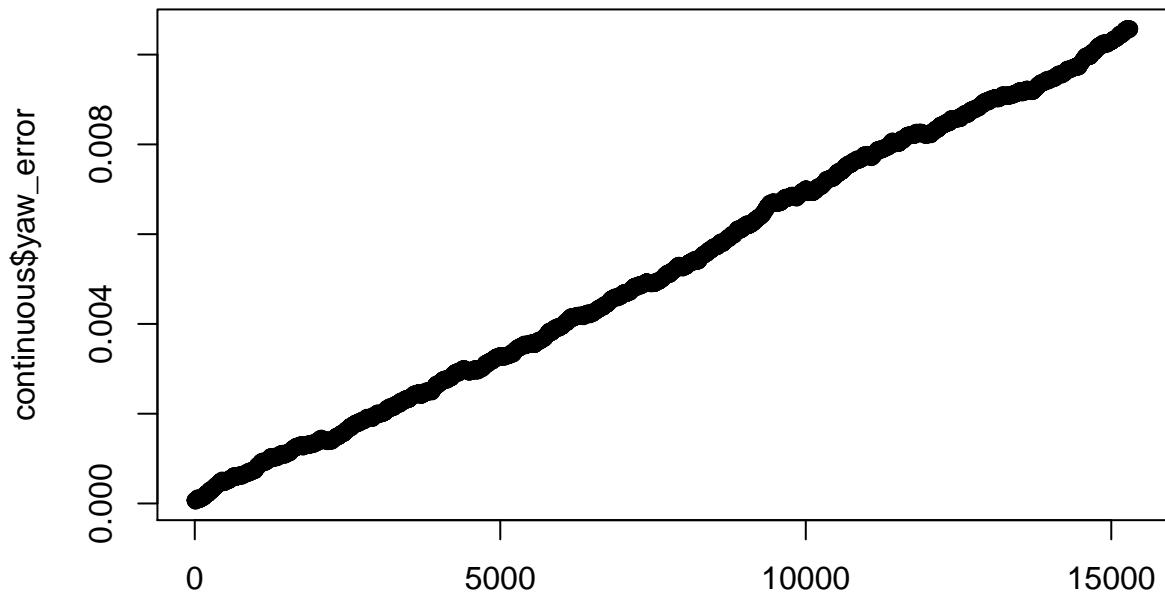
**Continuous y\_error over time**



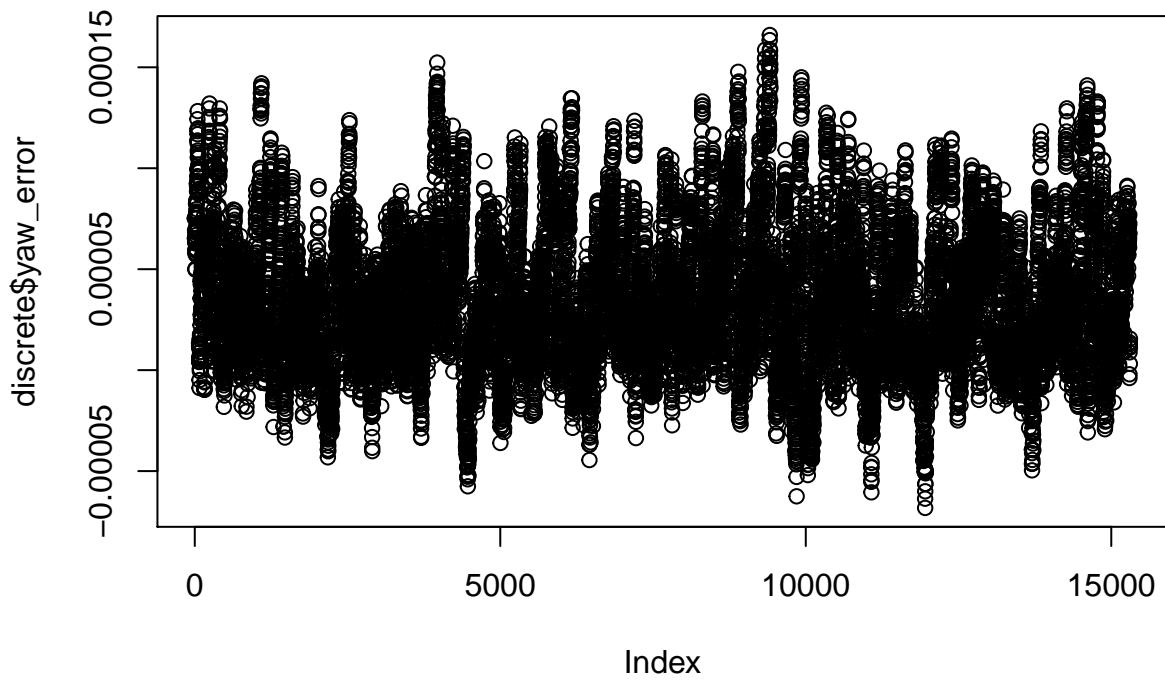
**Discrete y\_error over time**



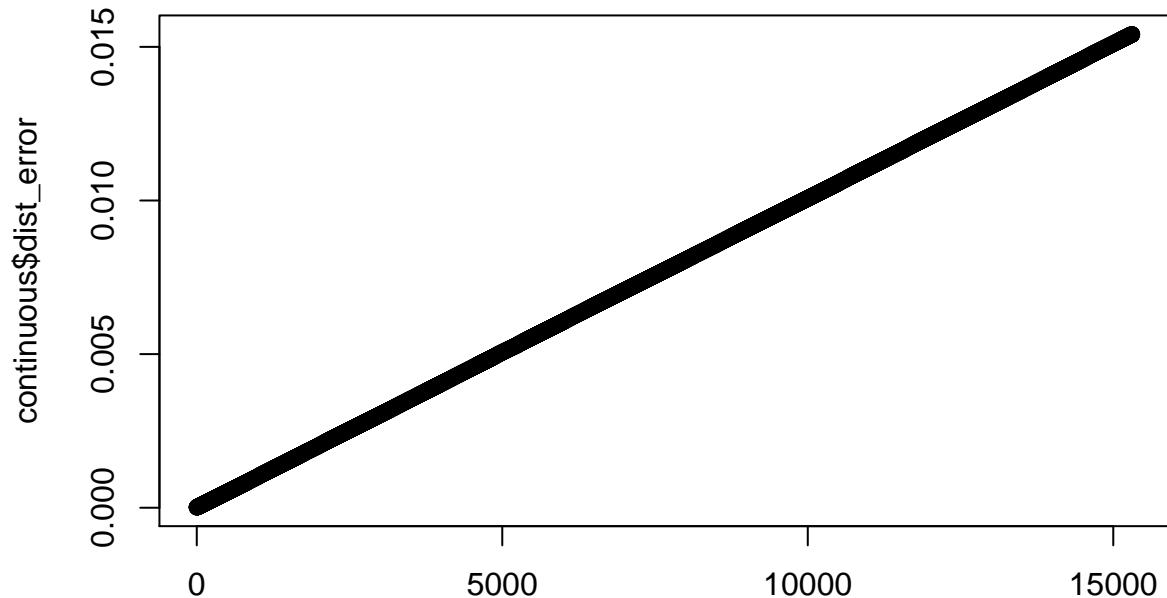
**Continuous yaw error over time**



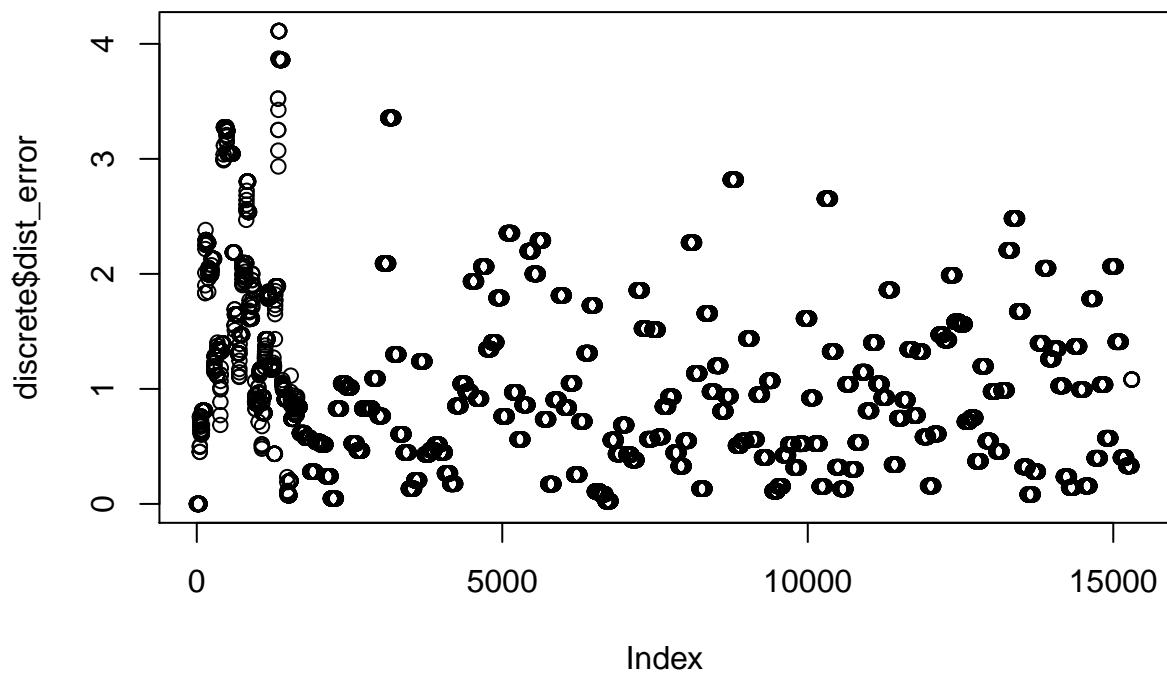
**Discrete yaw error over time**



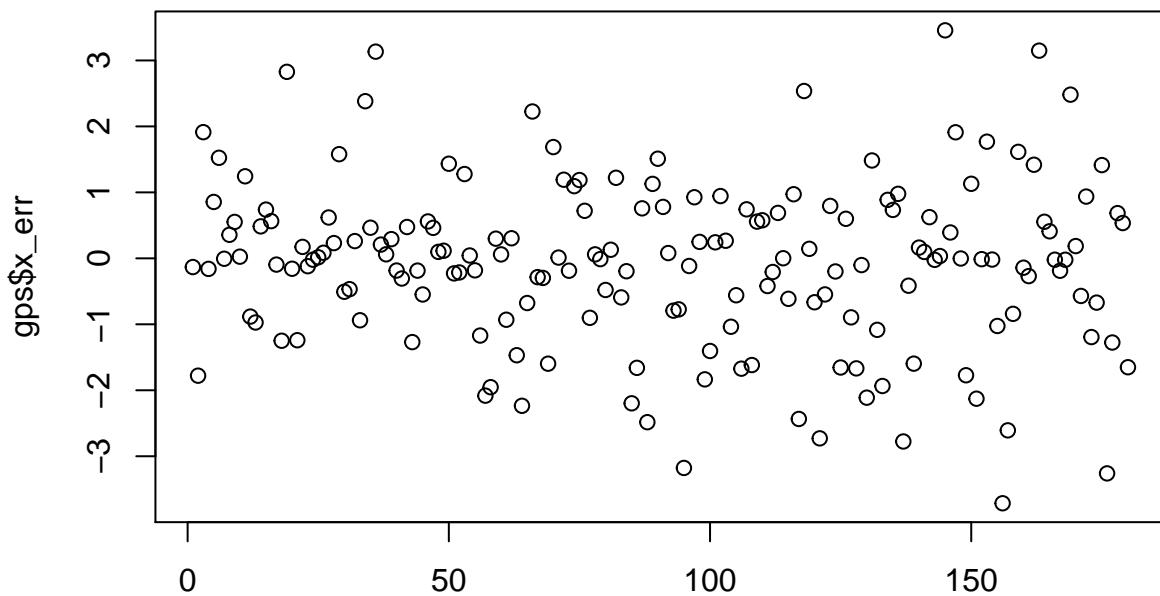
**Continuous total distance error over time**



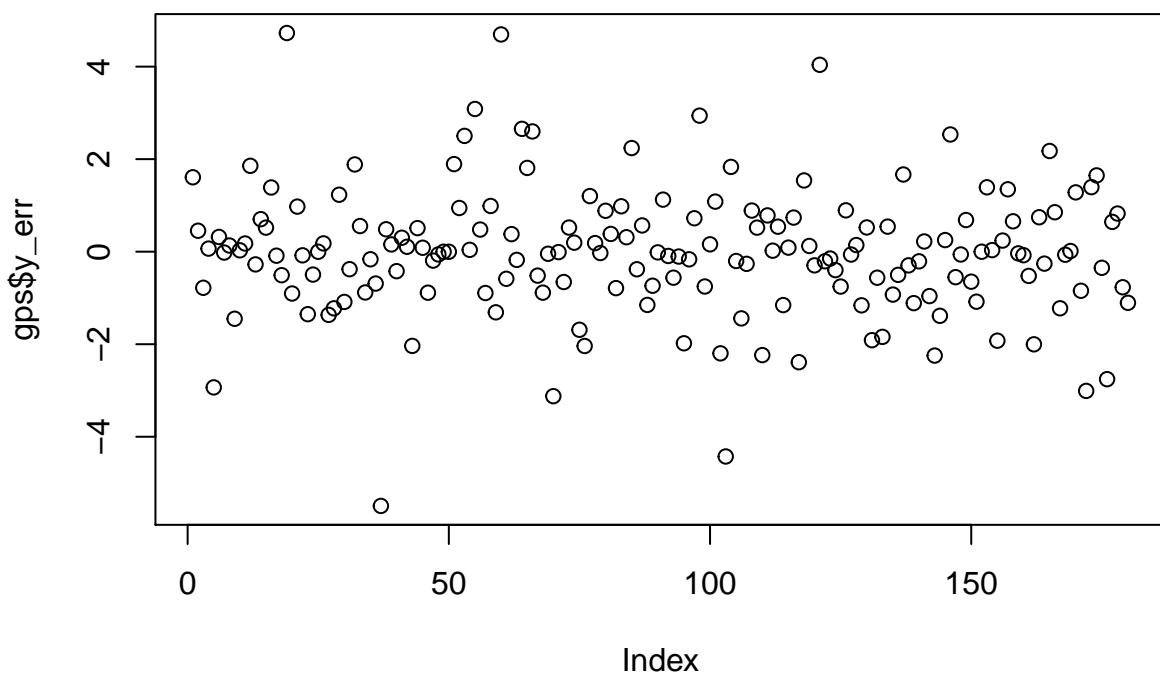
**Discrete total distance error over time**



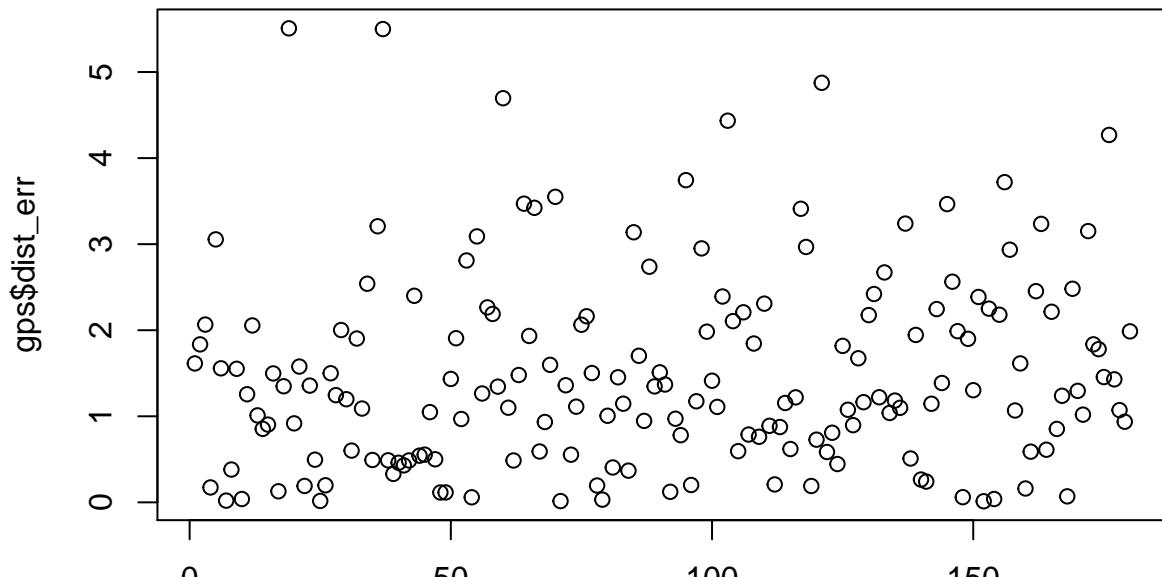
**GPS X Error Over Time**



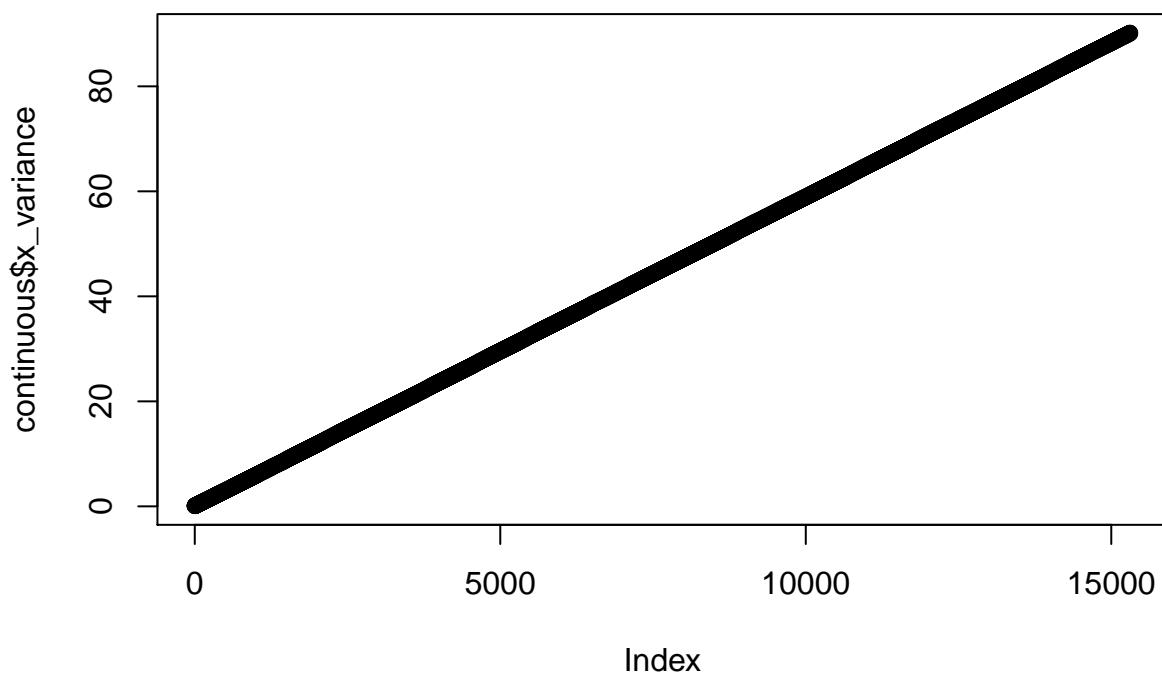
**GPS Y Error Over Time**



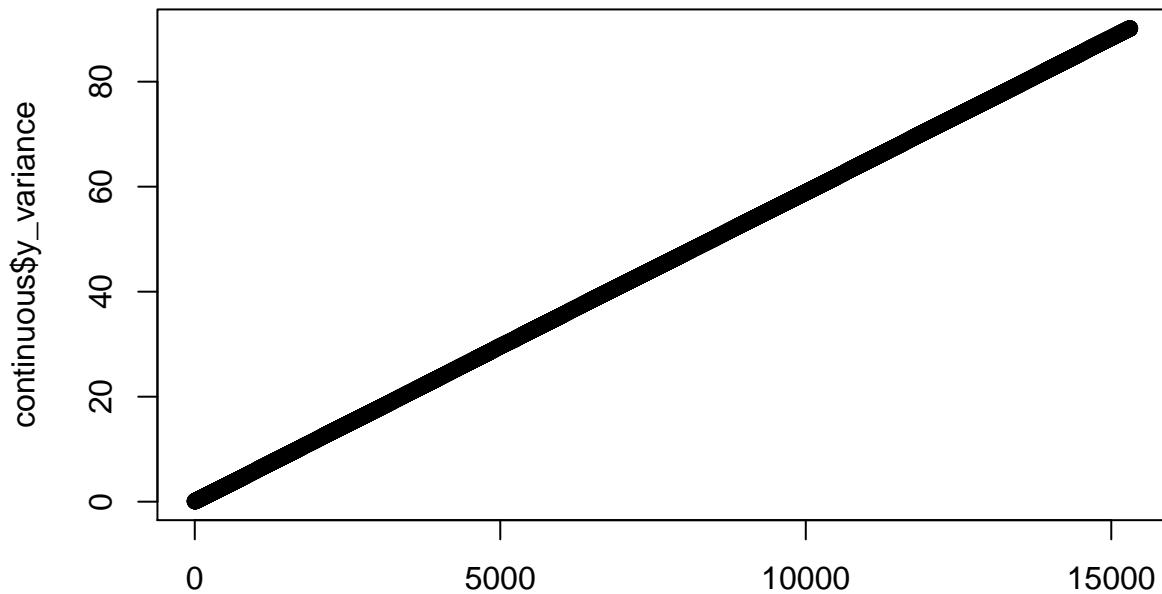
**GPS Horizontal Distance Error Over Time**



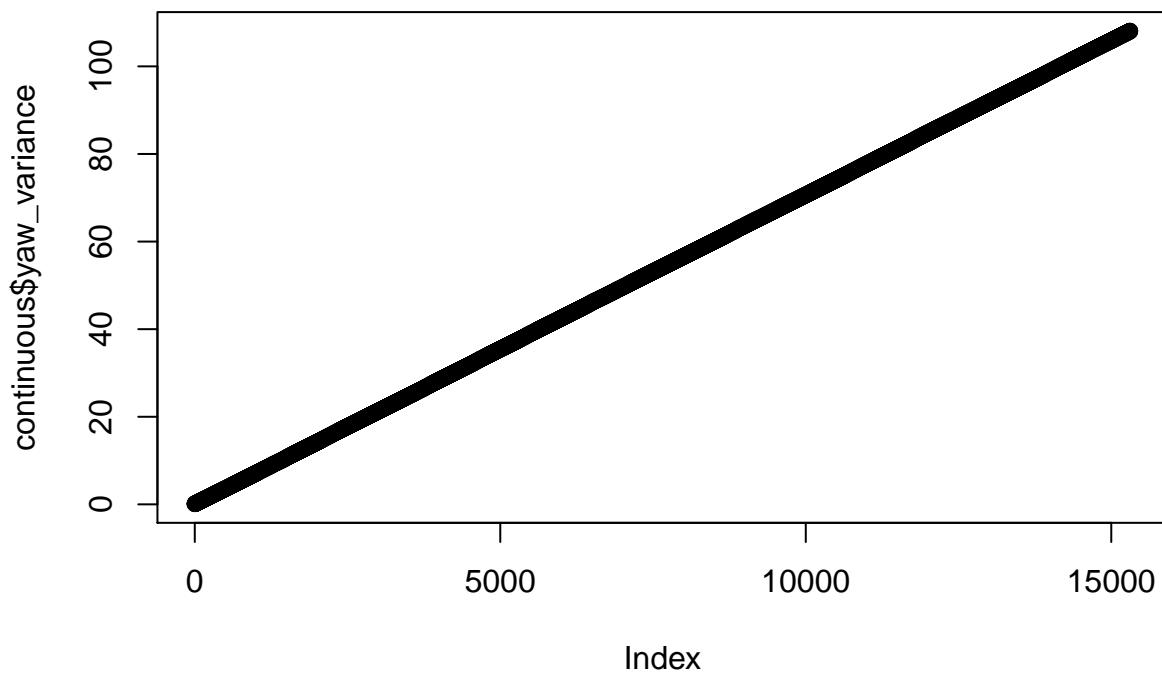
**Continuous Filter X Variance Over Time**



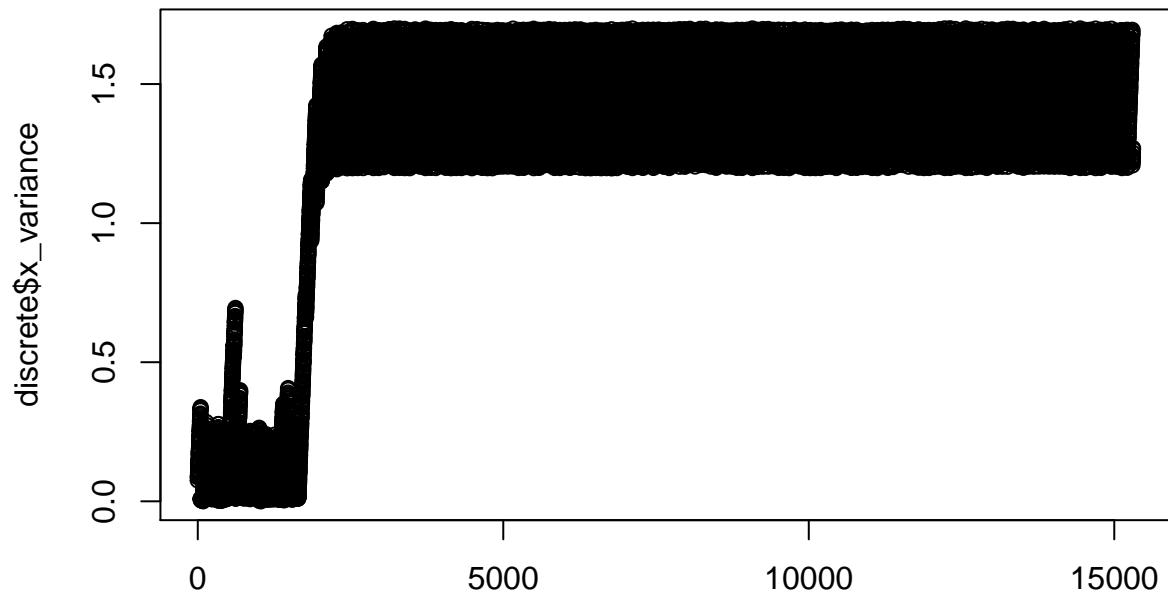
**Continuous Filter Y Variance Over Time**



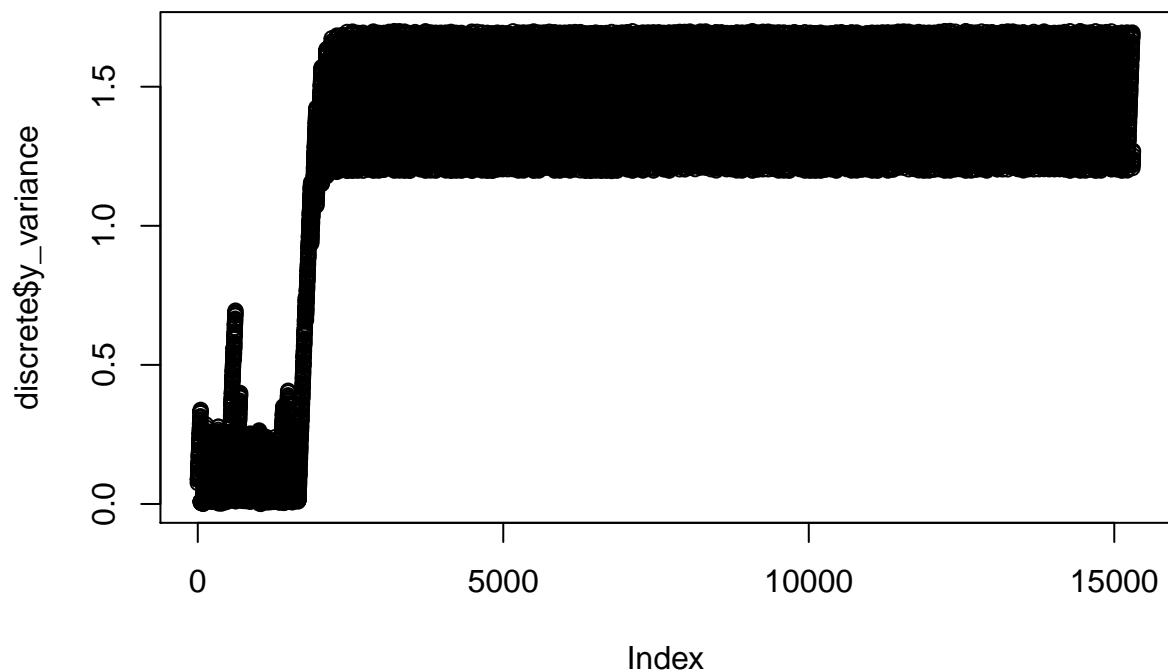
**Continuous Filter Yaw Variance Over Time**



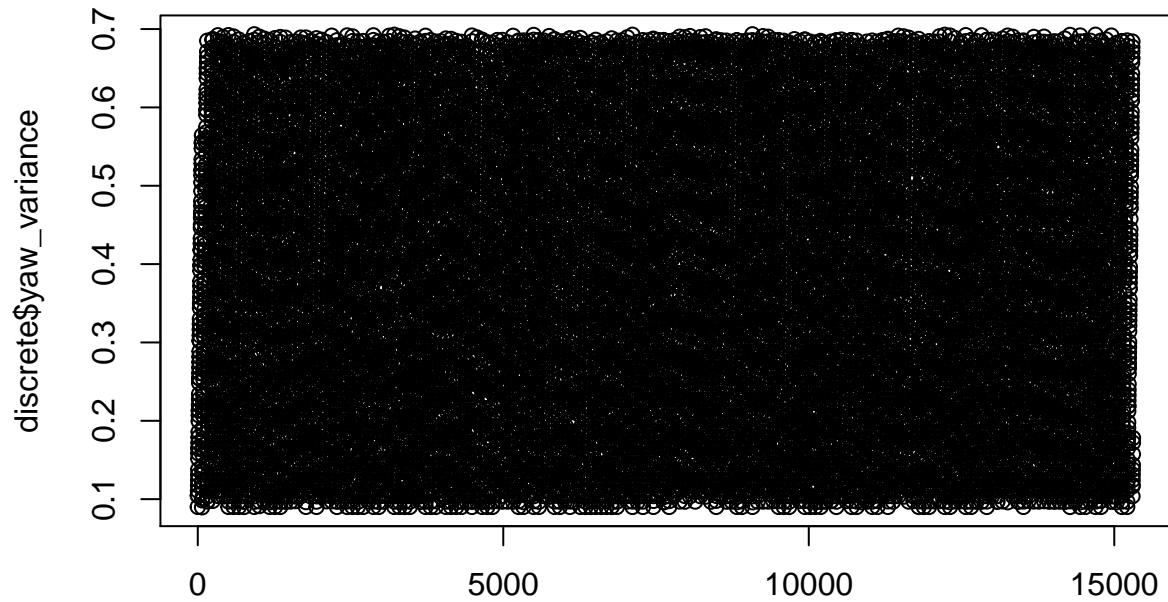
**Discrete Filter X Variance Over Time**



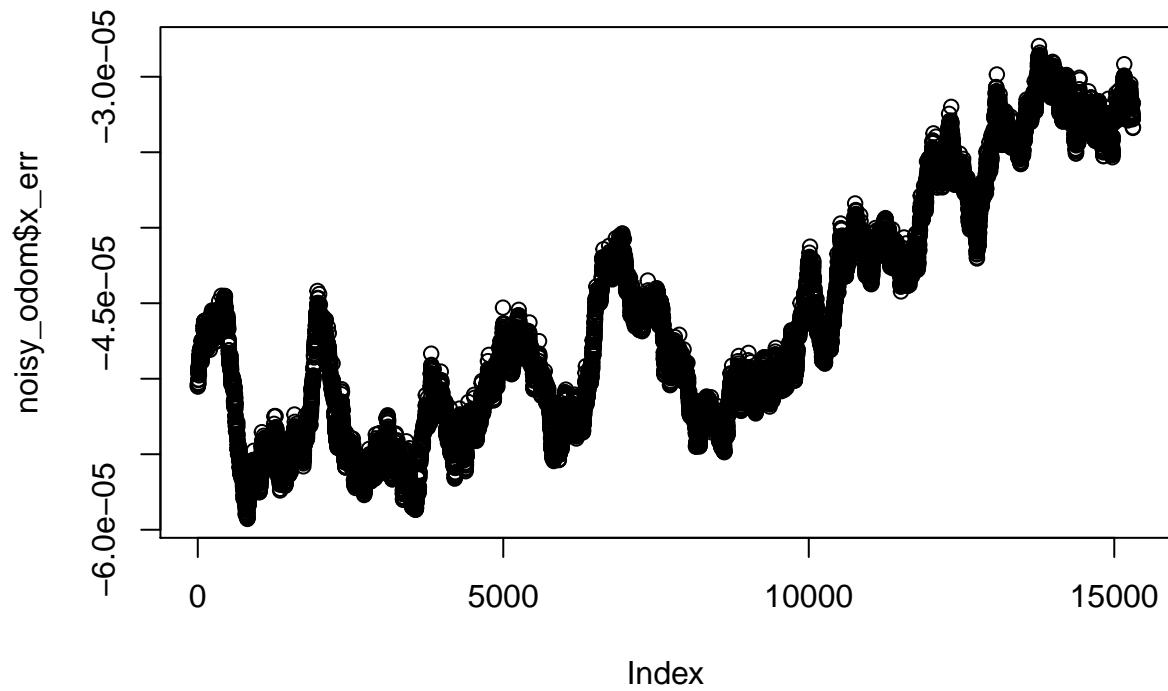
**Discrete Filter Y Variance Over Time**



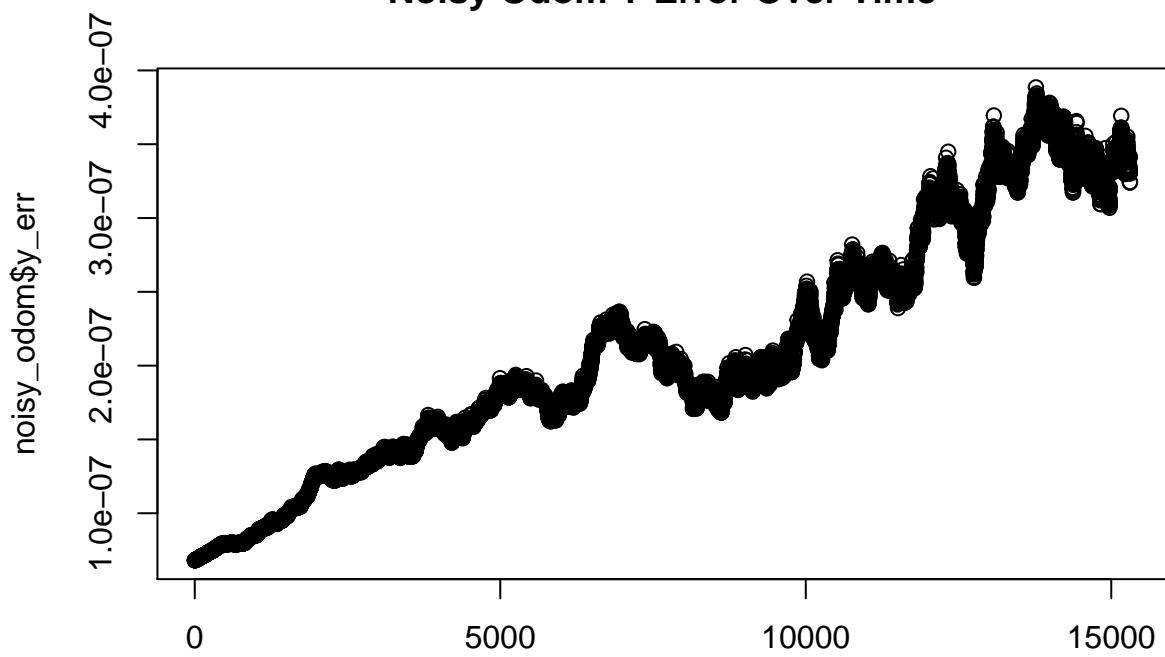
**Discrete Filter Yaw Variance Over Time**



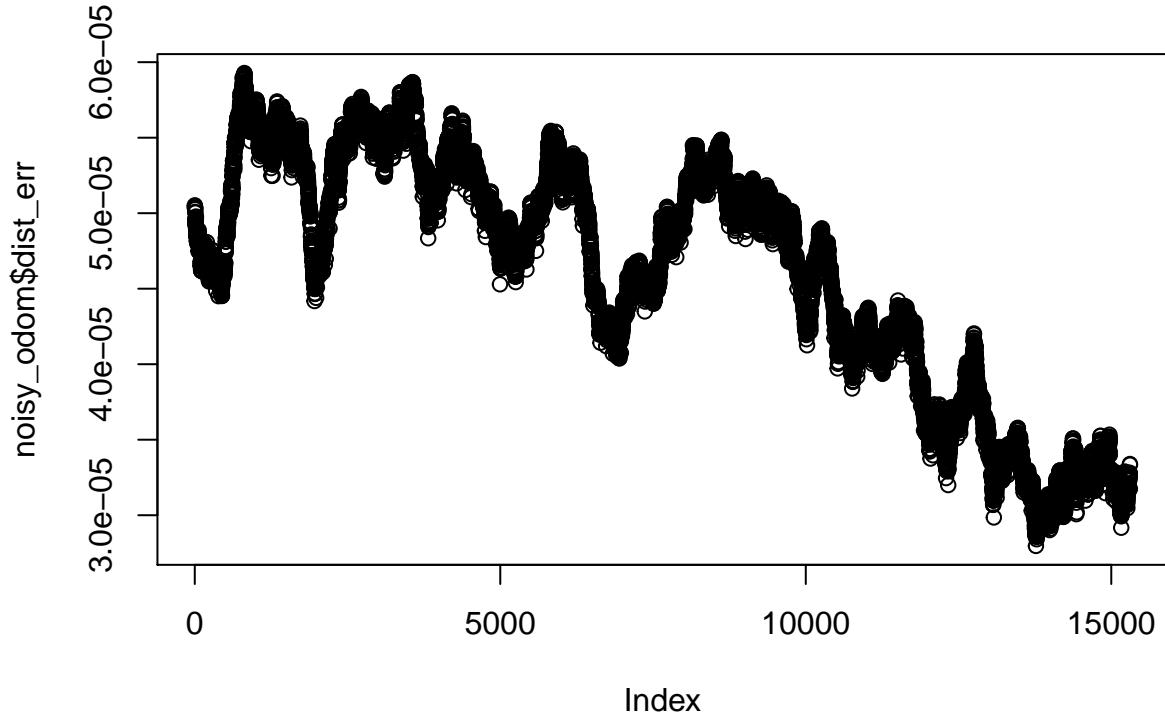
**Noisy Odom X Error Over Time**



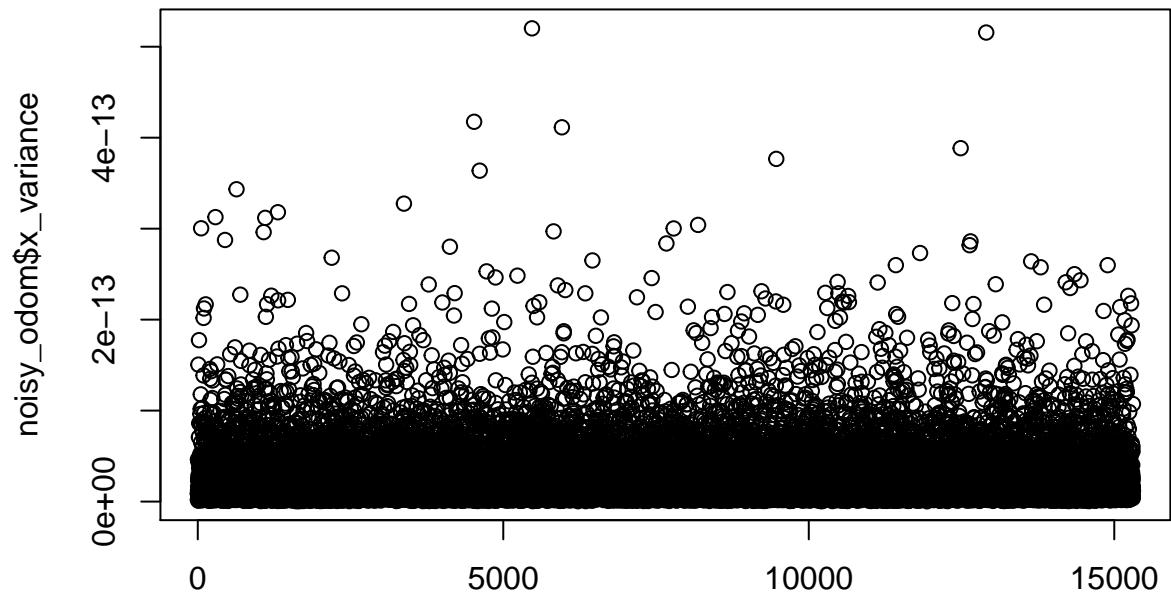
**Noisy Odom Y Error Over Time**



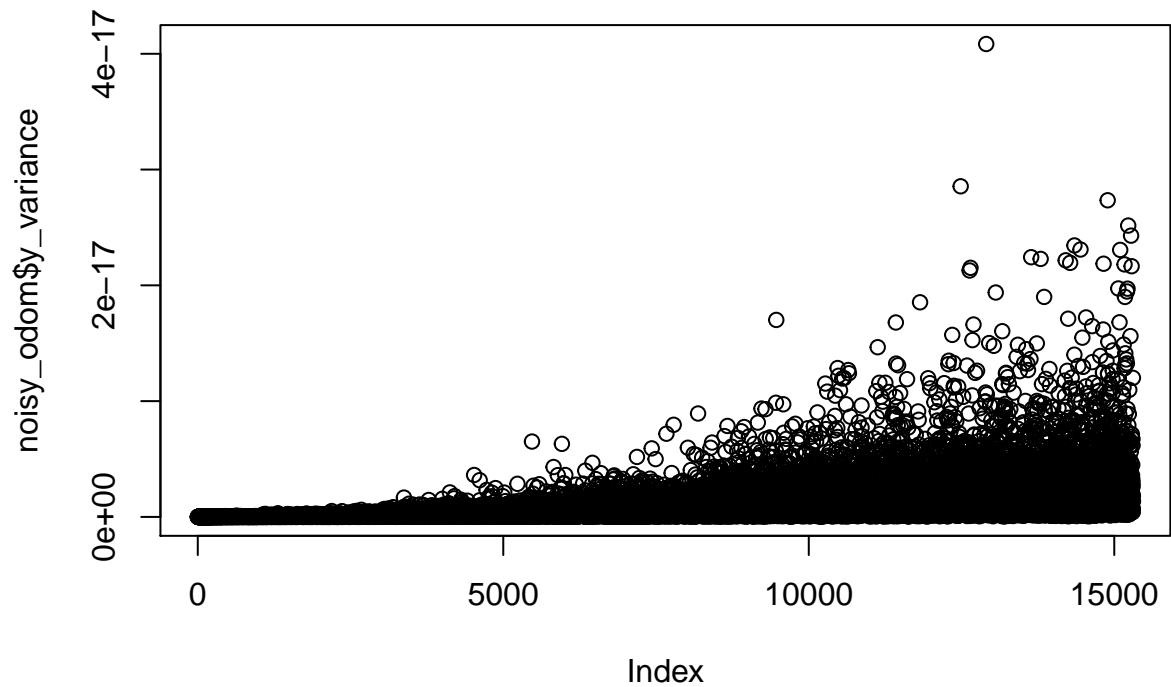
**Noisy Odom Horizontal Distance Error Over Time**



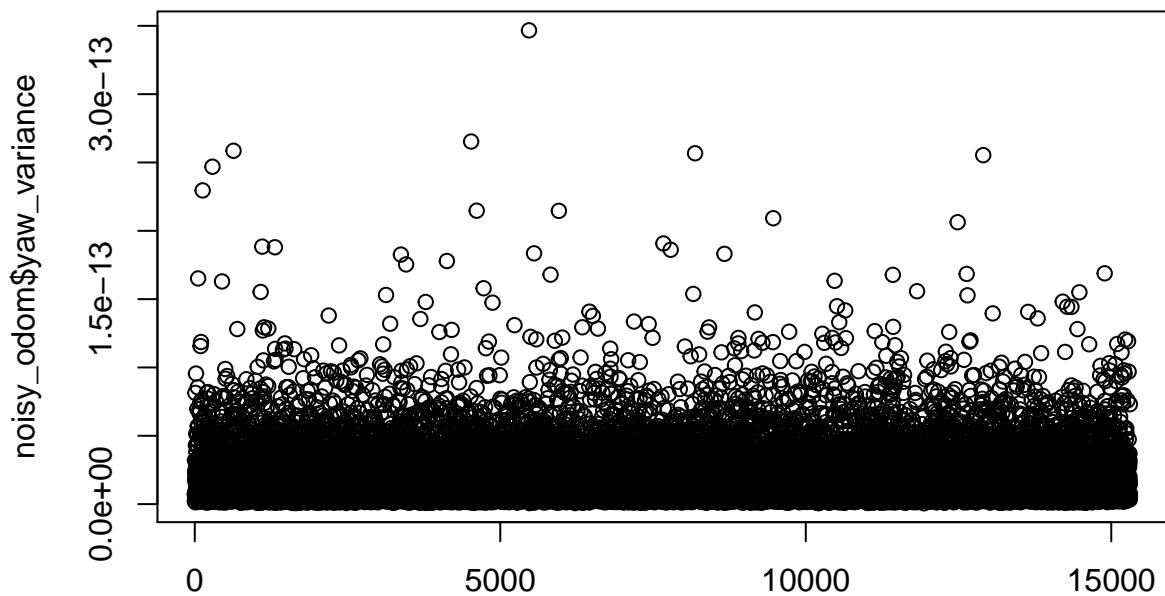
**Variance of X Coordinate in Noisy Odometry**



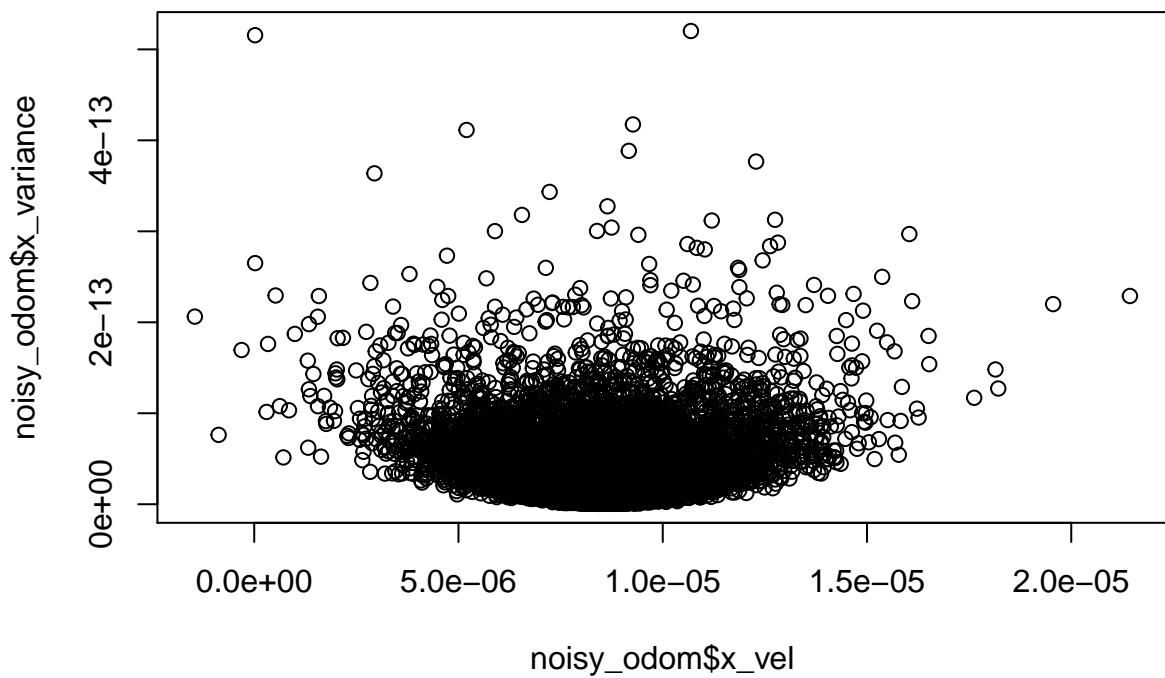
**Variance of Y Coordinate in Noisy Odometry**



### Variance of Yaw Coordinate in Noisy Odometry



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



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

