

# two\_stationary Turtlebot 2 Report

Matthew Swartwout

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```
## Warning in gazebo$x_position - gps$x: longer object length is not a
## multiple of shorter object length

## Warning in `[<-.data.table`(x, j = name, value = value): Supplied 11256
## items to be assigned to 180 items of column 'x_err' (11076 unused)

## Warning in gazebo$y_position - gps$y: longer object length is not a
## multiple of shorter object length

## Warning in `[<-.data.table`(x, j = name, value = value): Supplied 11256
## items to be assigned to 180 items of column 'y_err' (11076 unused)
```

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

The runtime of this experiment was 0 hours, 18 minutes, and 45.6 seconds.

The total number of external pose measurements received by the robot during this time was 14144 which means poses were received at an average of 12.5657427 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.
## -8.667e-05 -7.815e-05 -7.458e-05 -7.441e-05 -7.124e-05 -5.903e-05
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 9.368e-08 1.709e-07 3.001e-07 3.087e-07 4.197e-07 5.772e-07
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -1.541e-05 2.375e-05 2.872e-05 2.845e-05 3.262e-05 6.449e-05
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 5.903e-05 7.124e-05 7.458e-05 7.442e-05 7.815e-05 8.667e-05
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -2.4990 -0.1698 -0.1698 -0.1683 -0.1698  3.1190
```

```

summary(discrete$y_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -2.243000 -0.007697 -0.006127 -0.008285 -0.004887 4.180000

summary(discrete$yaw_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -8.301e-05 1.239e-06 2.232e-05 2.918e-05 5.145e-05 2.083e-04

summary(discrete$dist_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.007963 0.169900 0.169900 0.179400 0.170000 4.187000

summary(noisy_odom$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
##        2        2        2        2        2        2

summary(noisy_odom$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 9.366e-08 1.697e-07 2.978e-07 3.059e-07 4.149e-07 5.699e-07

summary(noisy_odom$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
##        2        2        2        2        2        2

summary(gps$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -4.07500 -0.65940 -0.05687 -0.09660 0.41680 4.46500

summary(gps$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -3.01800 -0.68110 -0.06218 -0.11850 0.35640 4.18000

summary(gps$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.003993 0.432100 0.974700 1.272000 2.003000 4.485000

```

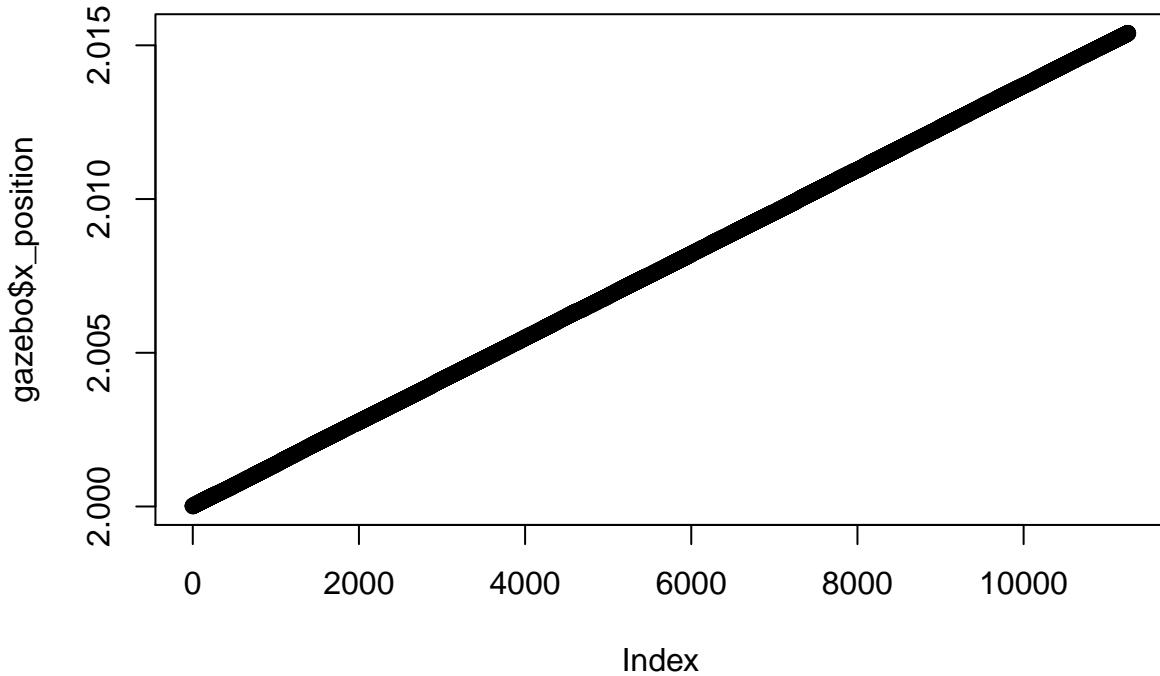
```

#sum(continuous$dist_error <= 0.25) / length(continuous$dist_error)
#sum(discrete$dist_error <= 0.25) / length(discrete$dist_error)

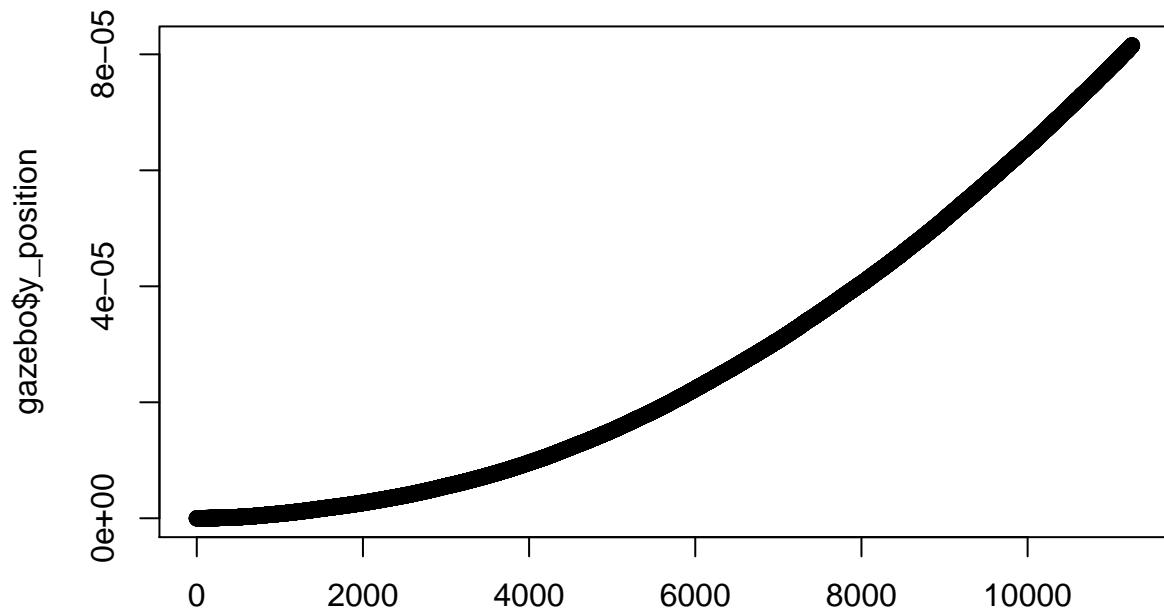
# shapiro.test(noisy_odom$x_err)
# shapiro.test(noisy_odom$y_err)
# shapiro.test(noisy_odom$dist_err)
#
# shapiro.test(gps$x_err)
# shapiro.test(gps$y_err)
# shapiro.test(gps$dist_err)
#
# noisy_odom_fit_x <- fitdist(noisy_odom$x_err, "norm")
# noisy_odom_fit_y <- fitdist(noisy_odom$y_err, "norm")
# noisy_odom_fit_dist <- fitdist(noisy_odom$dist_err, "norm")
#
# summary(noisy_odom_fit_x)
# summary(noisy_odom_fit_y)
# summary(noisy_odom_fit_dist)
#
# gps_fit_x <- fitdist(gps$x_err, "norm")
# gps_fit_y <- fitdist(gps$y_err, "norm")
# gps_fit_dist <- fitdist(gps$dist_err, "norm")
#
# summary(gps_fit_x)
# summary(gps_fit_y)
# summary(gps_fit_dist)

```

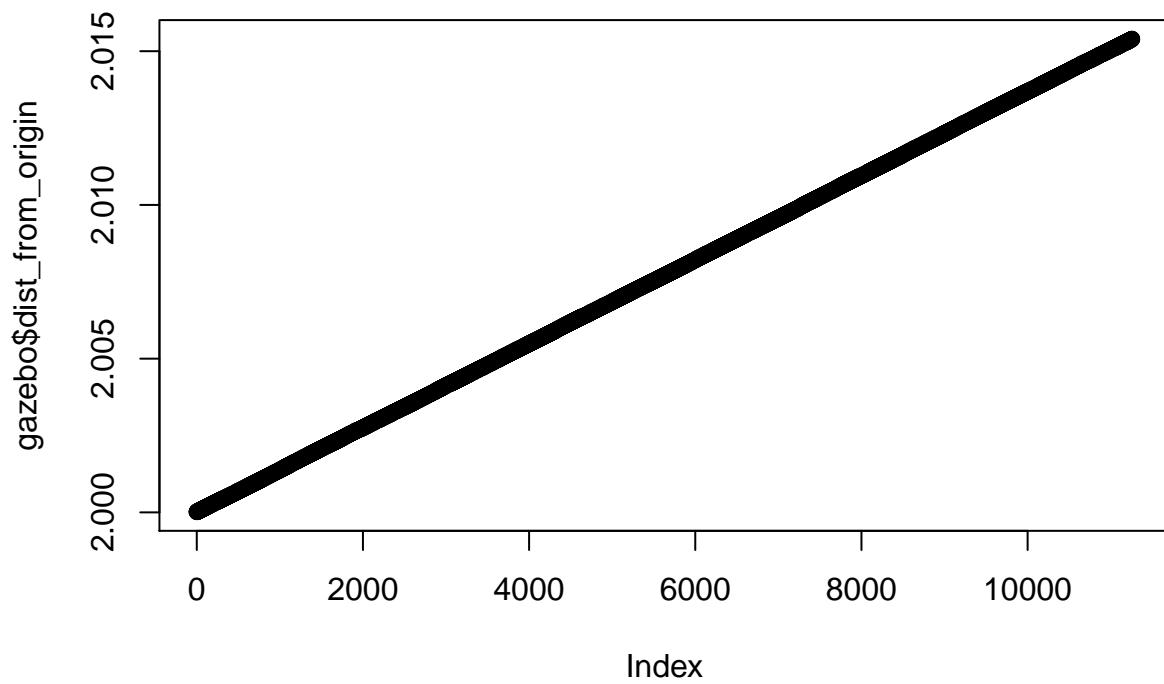
## X coordinate of robot over time



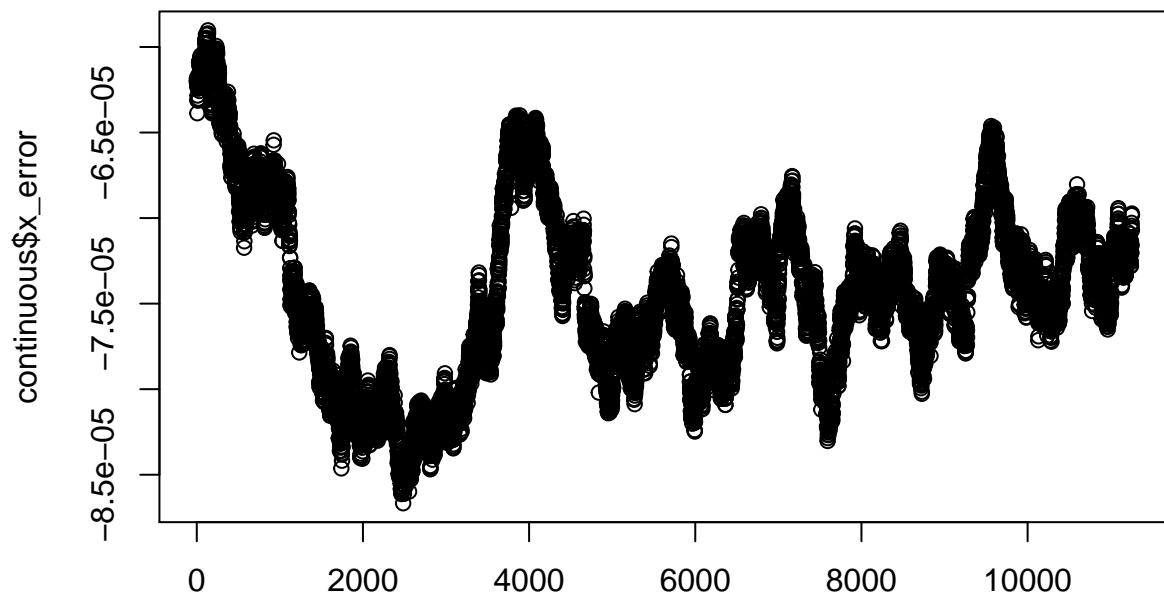
**Y coordinate of robot over time**



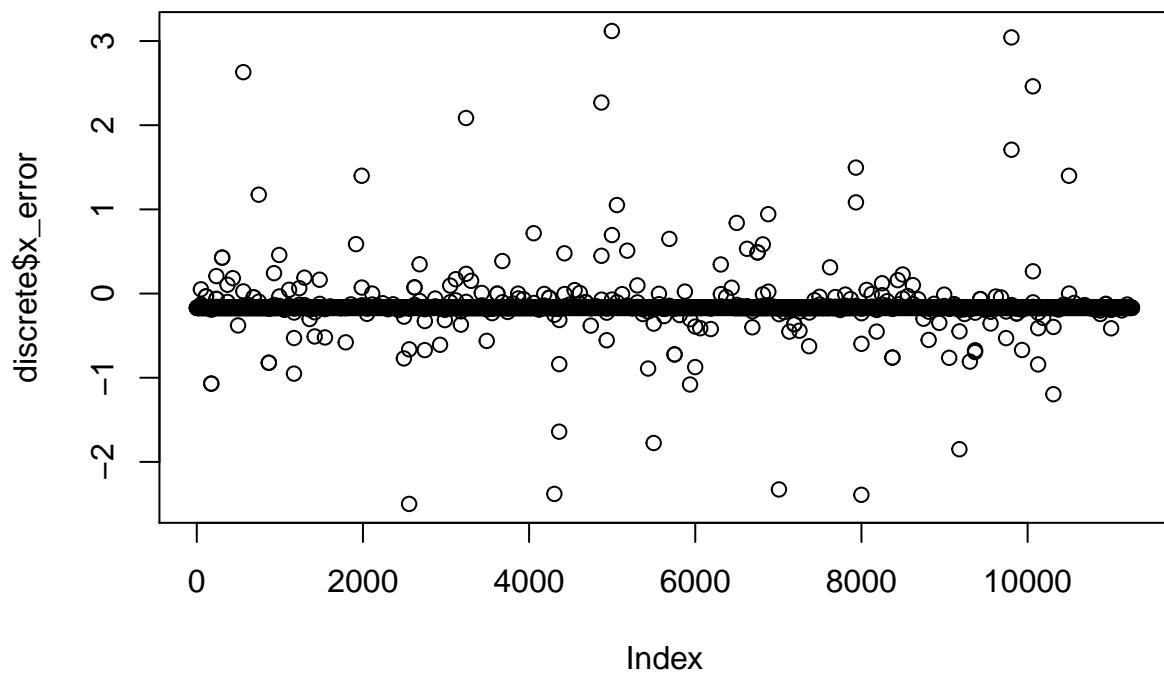
**Distance from origin vs. time<sup>Index</sup>**



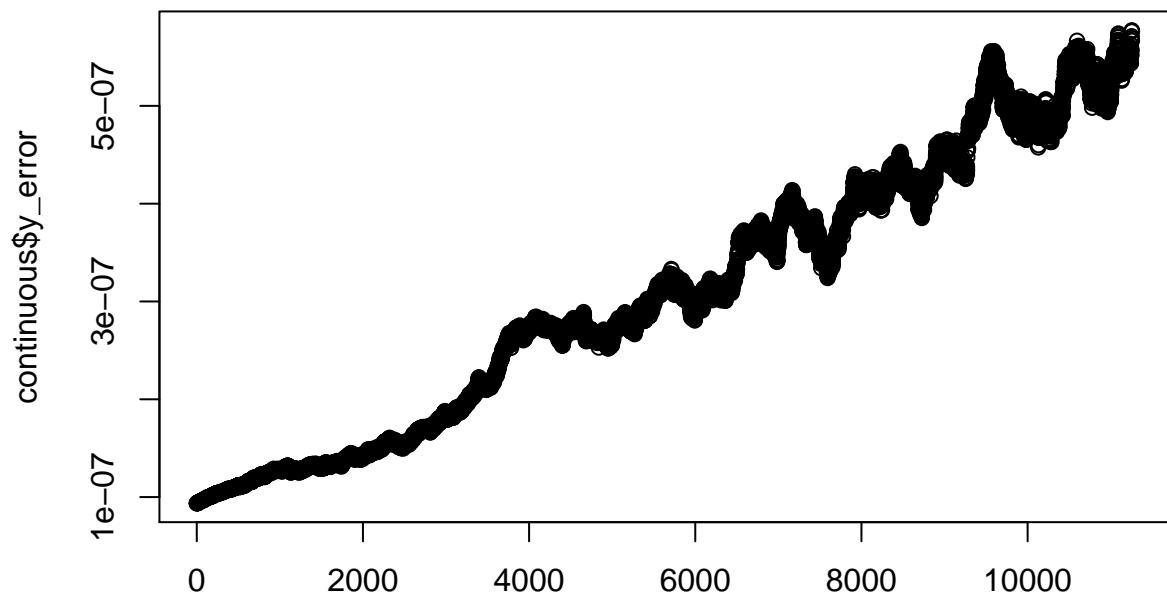
**Continuous x\_error over time**



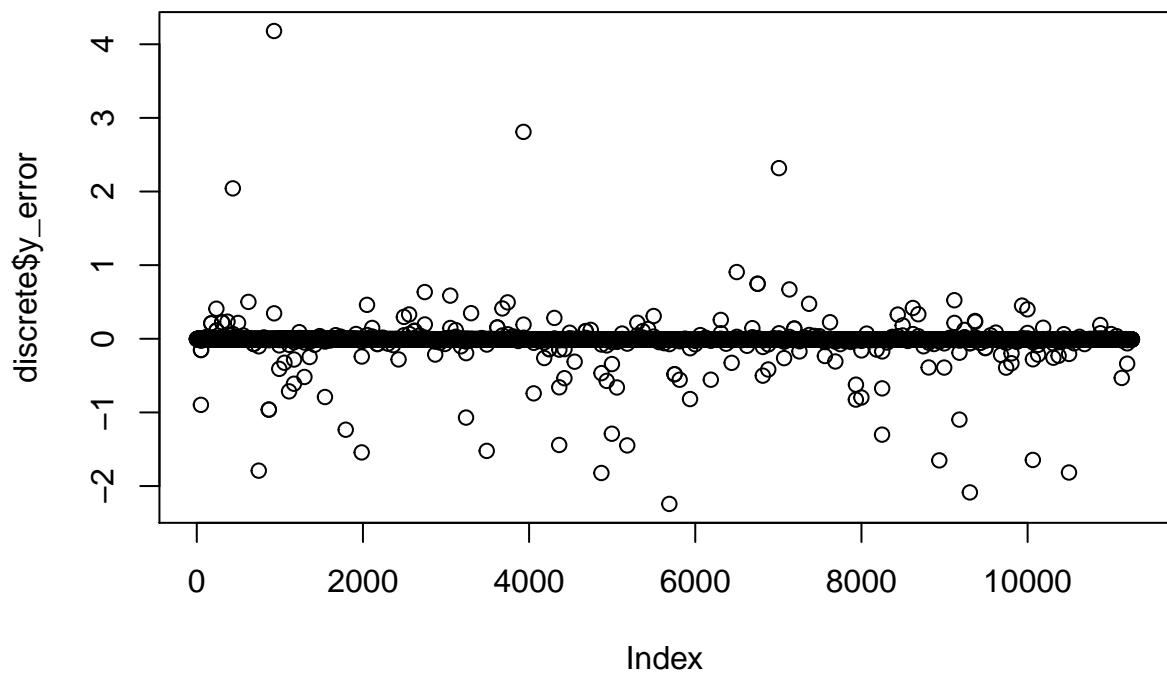
**Discrete x\_error over time**



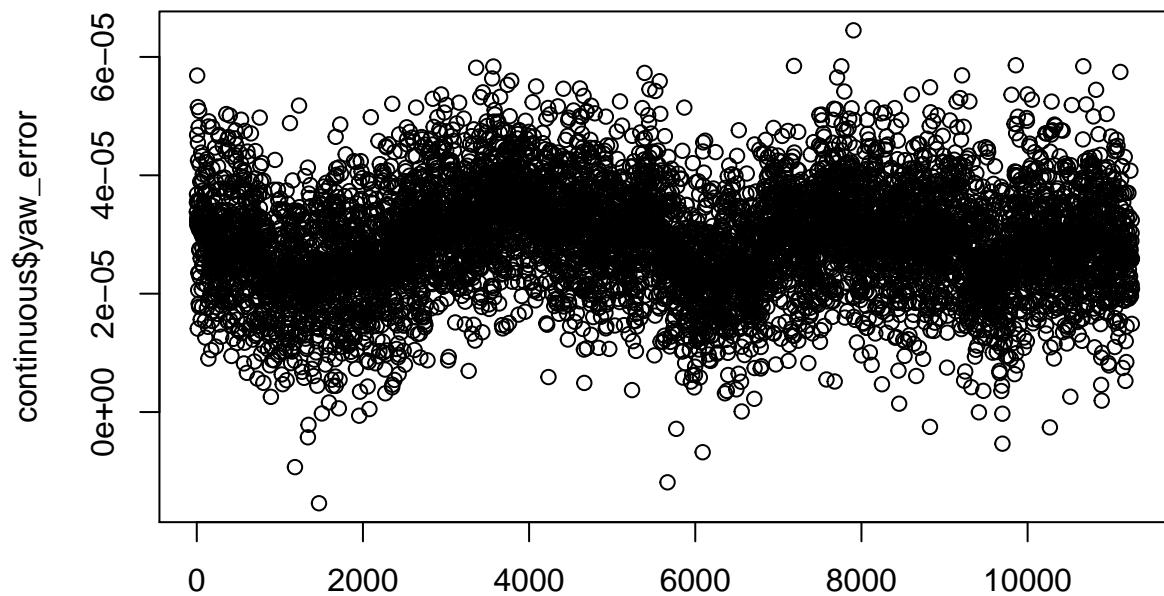
**Continuous y\_error over time**



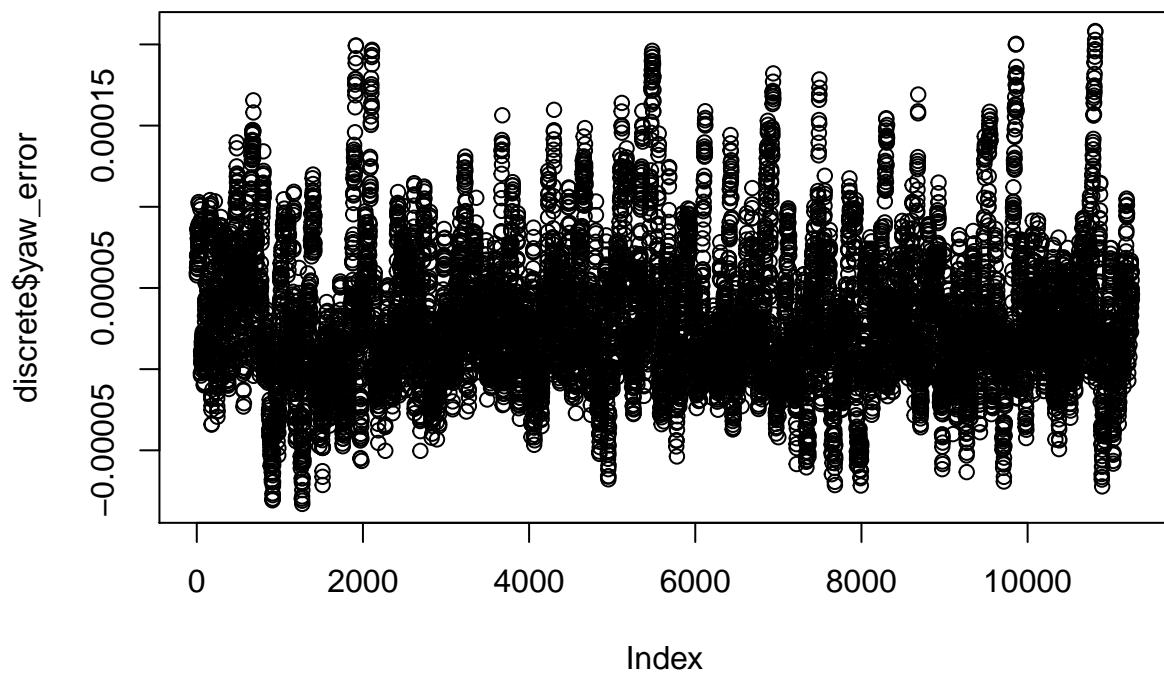
**Discrete y\_error over time**



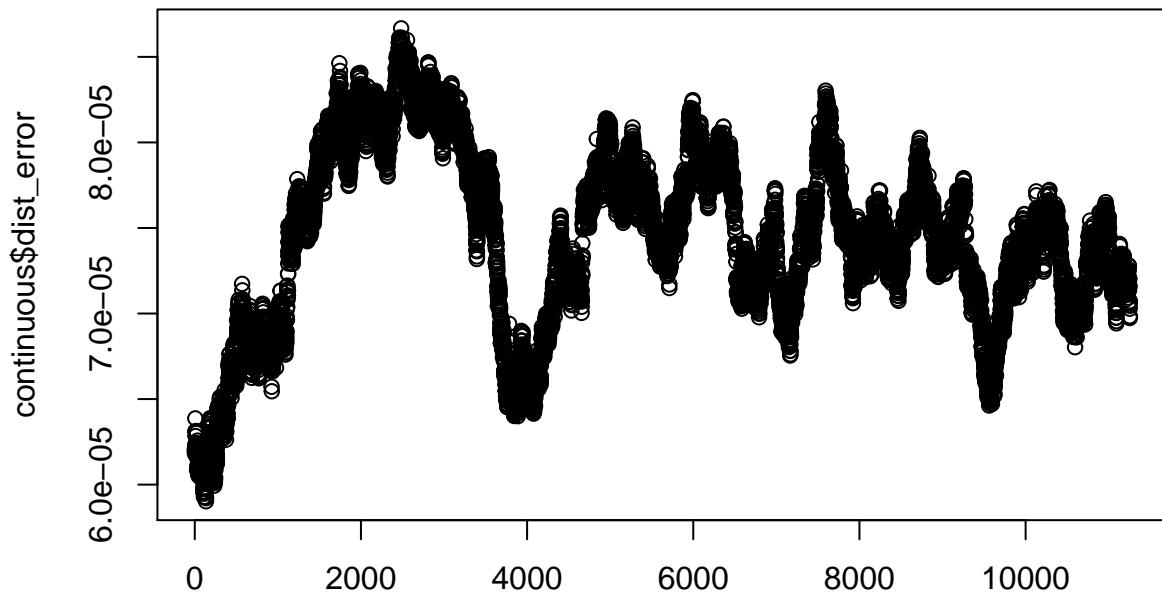
**Continuous yaw error over time**



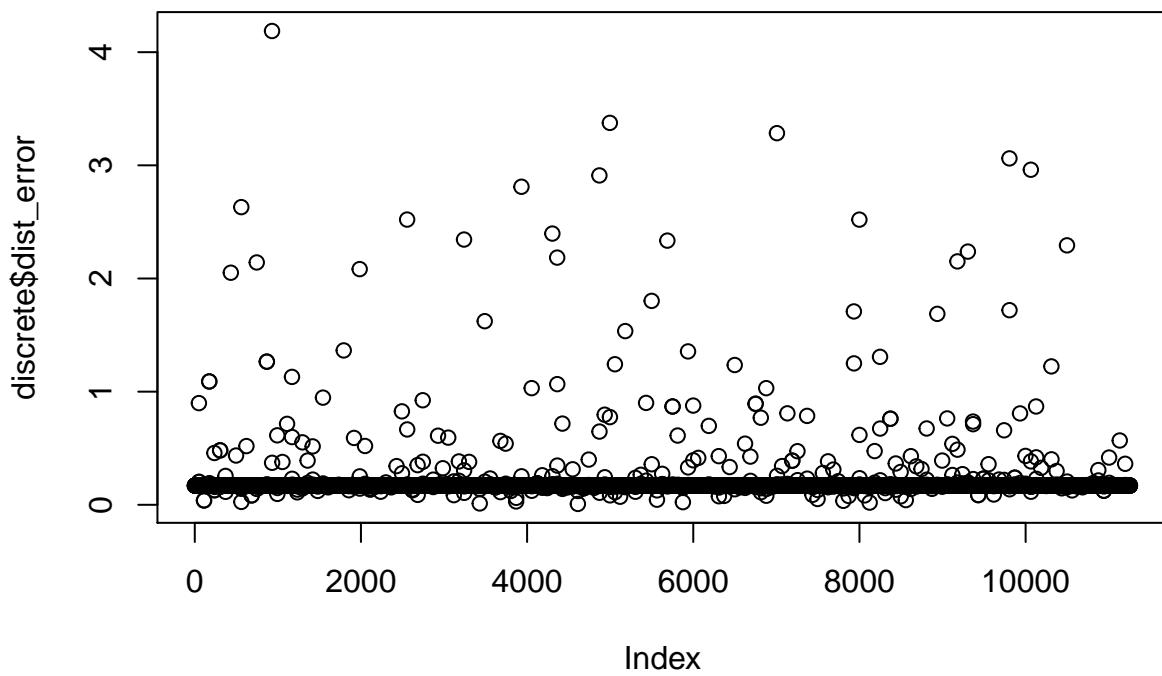
**Discrete yaw error over time**



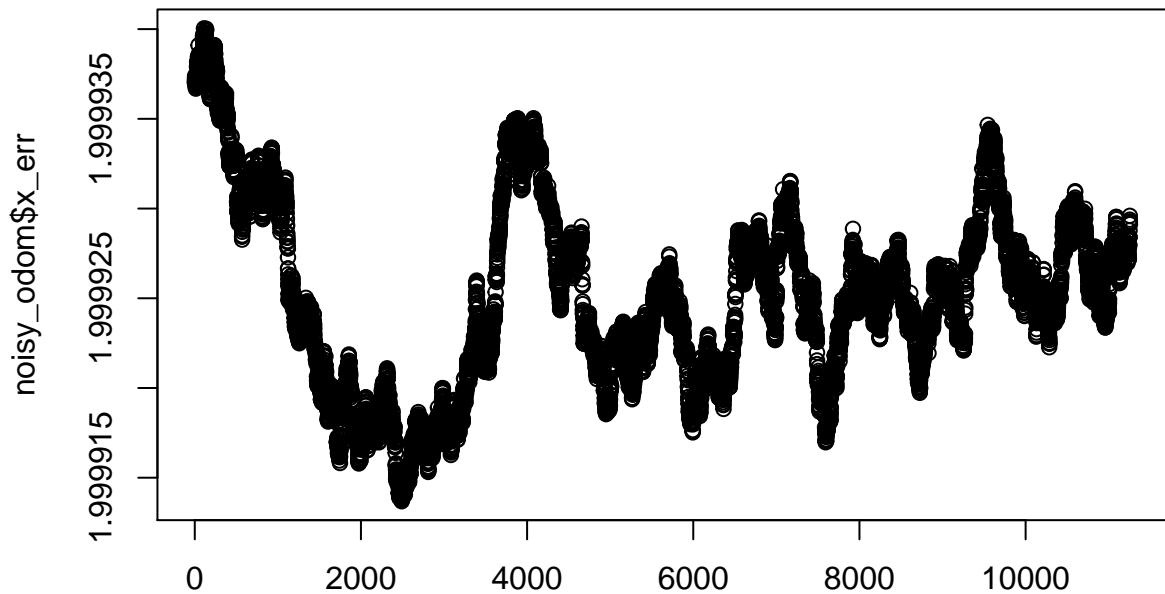
**Continuous total distance error over time**



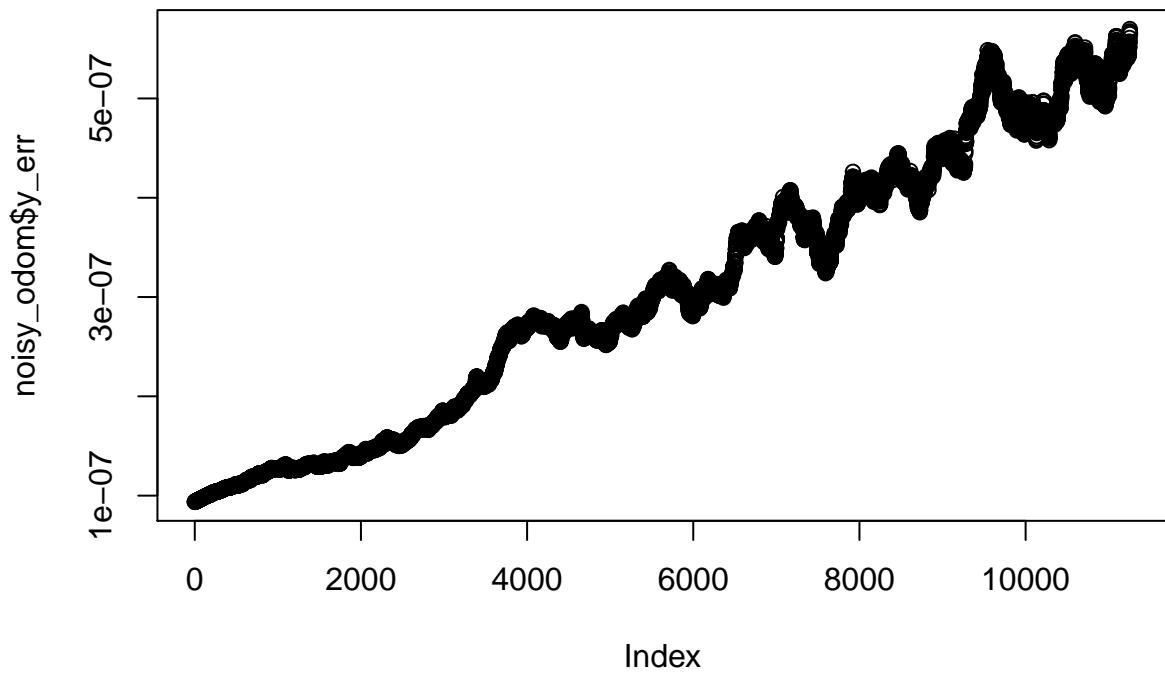
**Discrete total distance error over time**



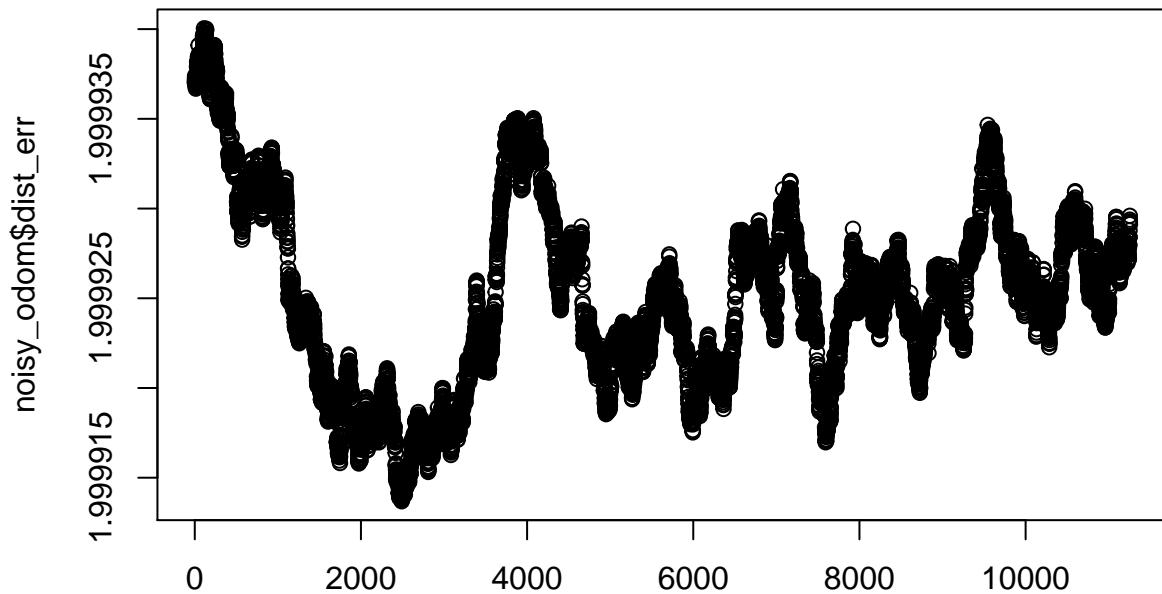
**Noisy Odom X Error Over Time**



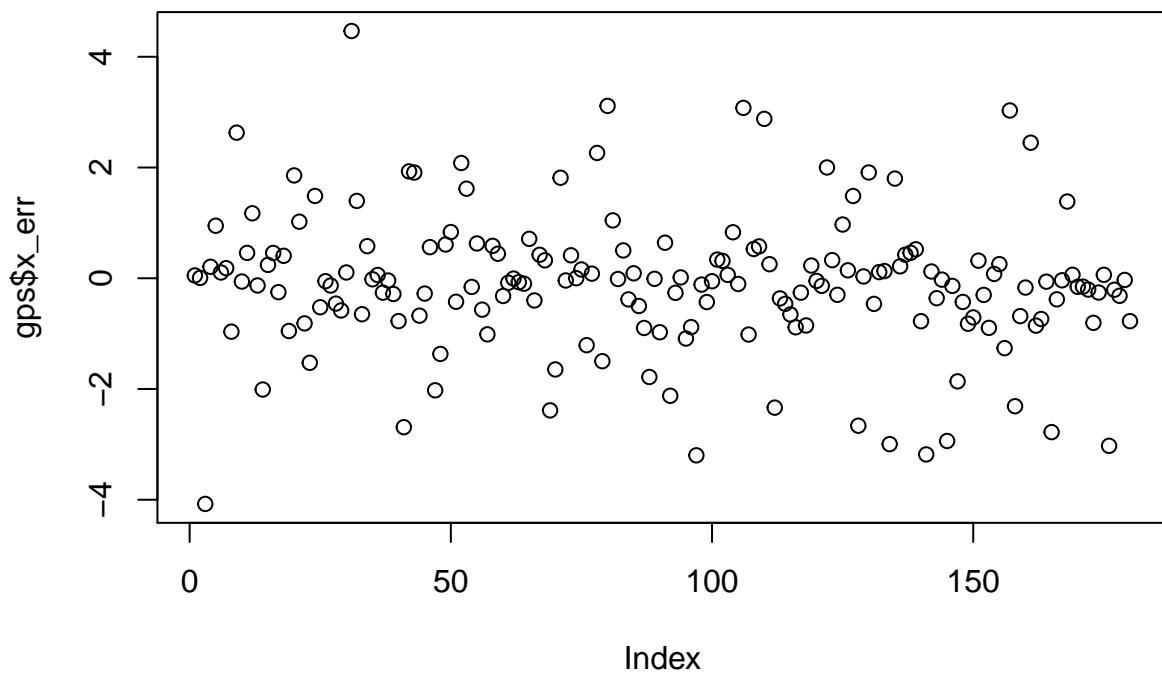
**Noisy Odom Y Error Over Time**



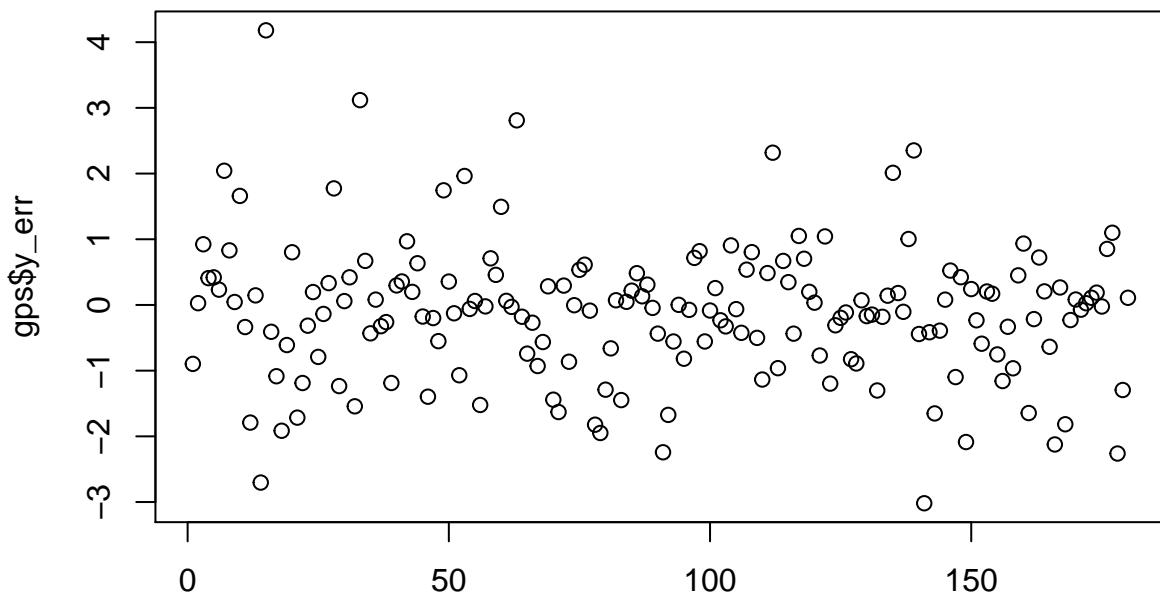
**Noisy Odom Horizontal Distance Error Over Time**



**GPS X Error Over Time**



**GPS Y Error Over Time**



**GPS Horizontal Distance Error Over Time**

