

two_mobile Turtlebot 2 Report

Matthew Swartwout

August 04, 2016

```
## 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 67109
## items to be assigned to 720 items of column 'x_err' (66389 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 67109
## items to be assigned to 720 items of column 'y_err' (66389 unused)
```

This is a summary of the data from the two_mobile experiment, Turtlebot #2.

The runtime of this experiment was 1 hours, 51 minutes, and 50.9 seconds.

The total number of external pose measurements received by the robot during this time was 438 which means poses were received at an average of 0.065267 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.
## -20.930 -10.000 -2.778 -3.804  2.645 10.660
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -11.300 -5.149  1.448  3.978 13.950 28.110
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -6.25600 -1.89200  0.06087  0.01346 1.54900 6.23200
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## 0.000003 8.242000 12.150000 12.740000 17.240000 29.660000
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -5.87000 -0.66760  0.04523  0.02376  0.71240  6.40200
```

```

summary(discrete$y_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -5.110000 -0.634600  0.001483  0.041400  0.678100  5.820000

summary(discrete$yaw_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -6.2410 -1.4940  0.1638  0.2094  1.9600  6.2260

summary(discrete$dist_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.003309 0.623600 1.245000 1.495000 2.109000 6.824000

summary(noisy_odom$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -18.9300 -7.9990 -0.7786 -1.8040  4.6460 12.6600

summary(noisy_odom$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -11.300 -5.146   1.441   3.979  13.950  28.110

summary(noisy_odom$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.08099 7.43800 10.79000 12.27000 16.51000 30.36000

summary(gps$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -15.1000 -8.2890 -3.6600  0.1111  9.4240 16.4800

summary(gps$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -18.79000 -10.49000 -4.41400 -4.76200 -0.06425  9.54100

summary(gps$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.4925  9.2780 11.6400 11.4600 14.0700 21.7600

```

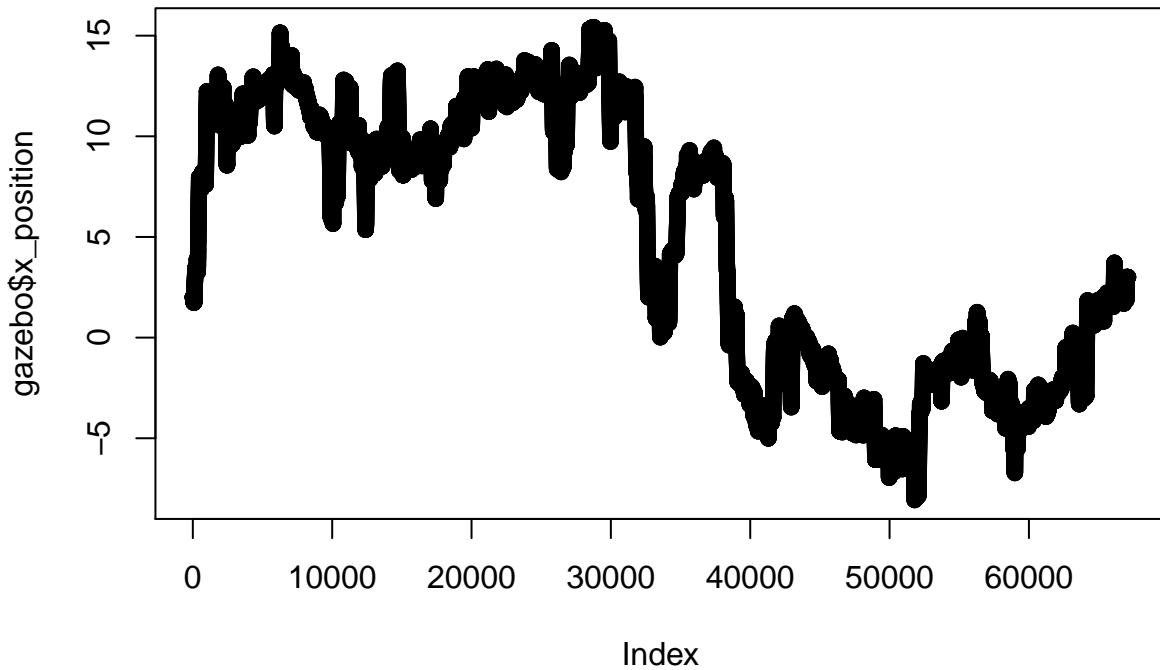
```

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

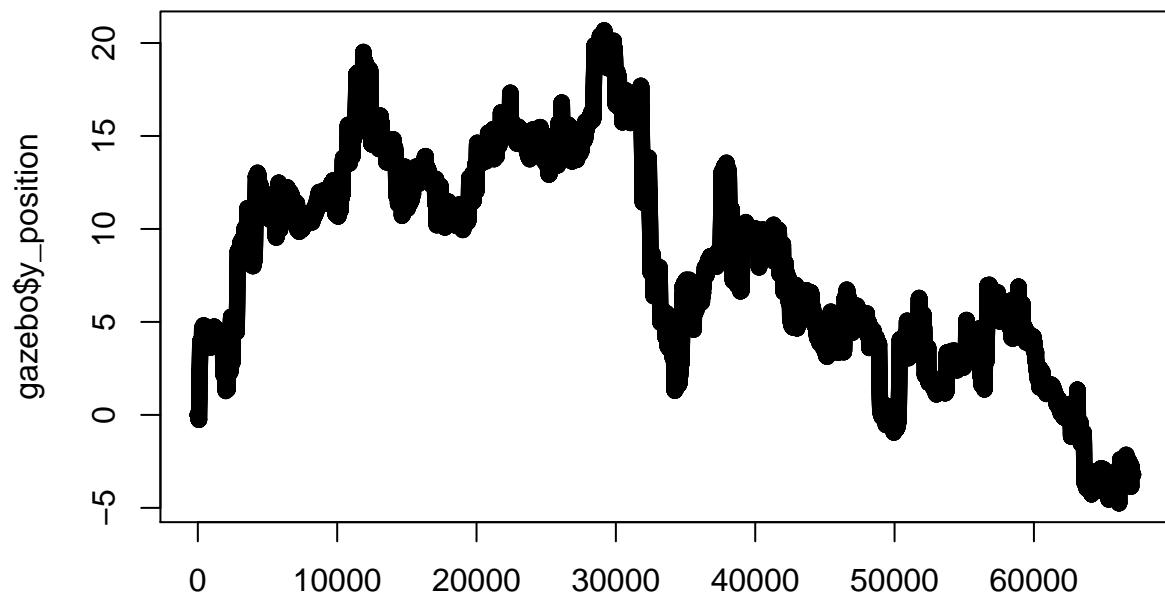
# shapiro.test(noisy_odom$x_err)
# shapiro.test(noisy_odom$y_err)
# shapiro.test(noisy_odom$dist_err)
#
# shapiro.test(gps$x_err)
# shapiro.test(gps$y_err)
# shapiro.test(gps$dist_err)
#
# noisy_odom_fit_x <- fitdist(noisy_odom$x_err, "norm")
# noisy_odom_fit_y <- fitdist(noisy_odom$y_err, "norm")
#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

```

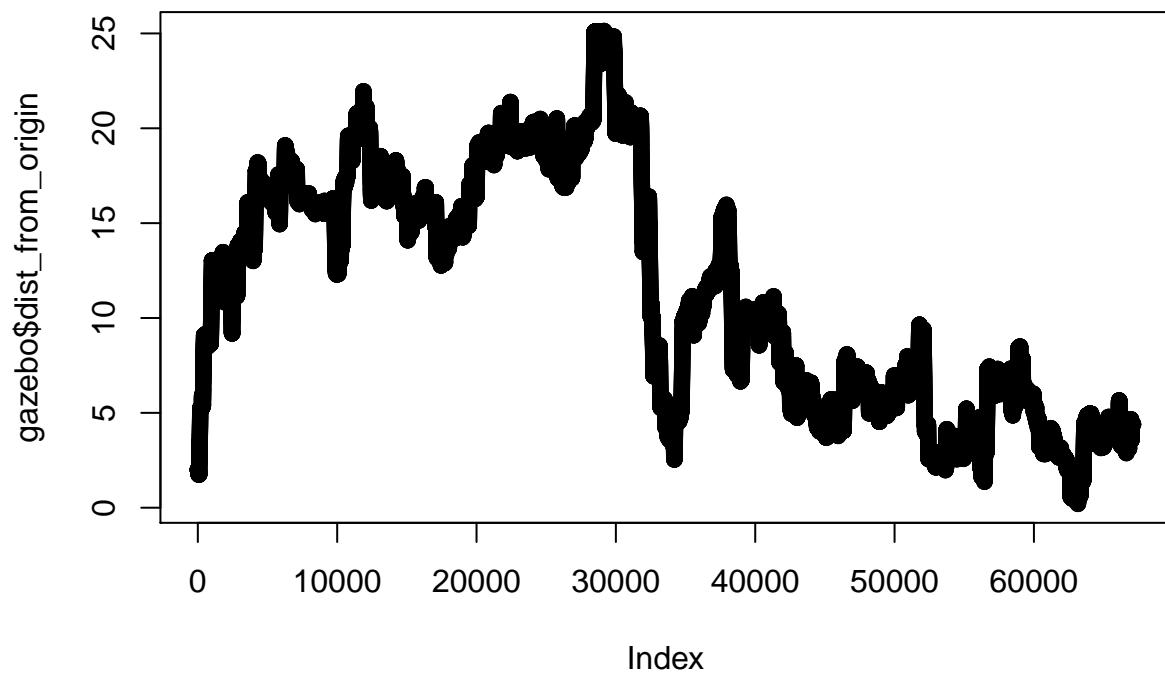
X coordinate of robot over time



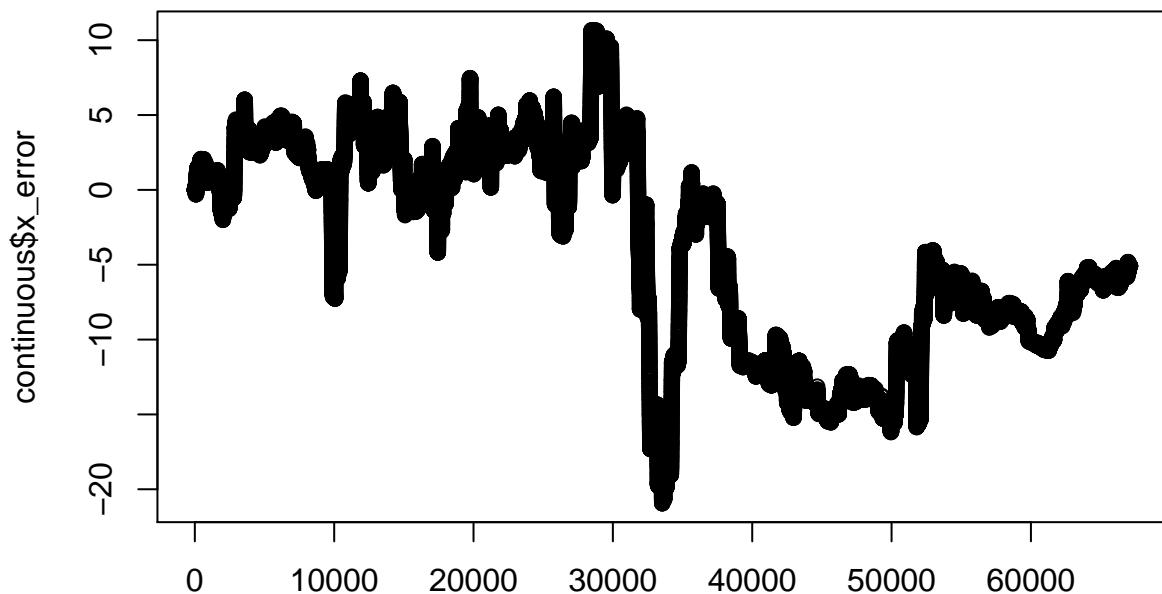
Y coordinate of robot over time



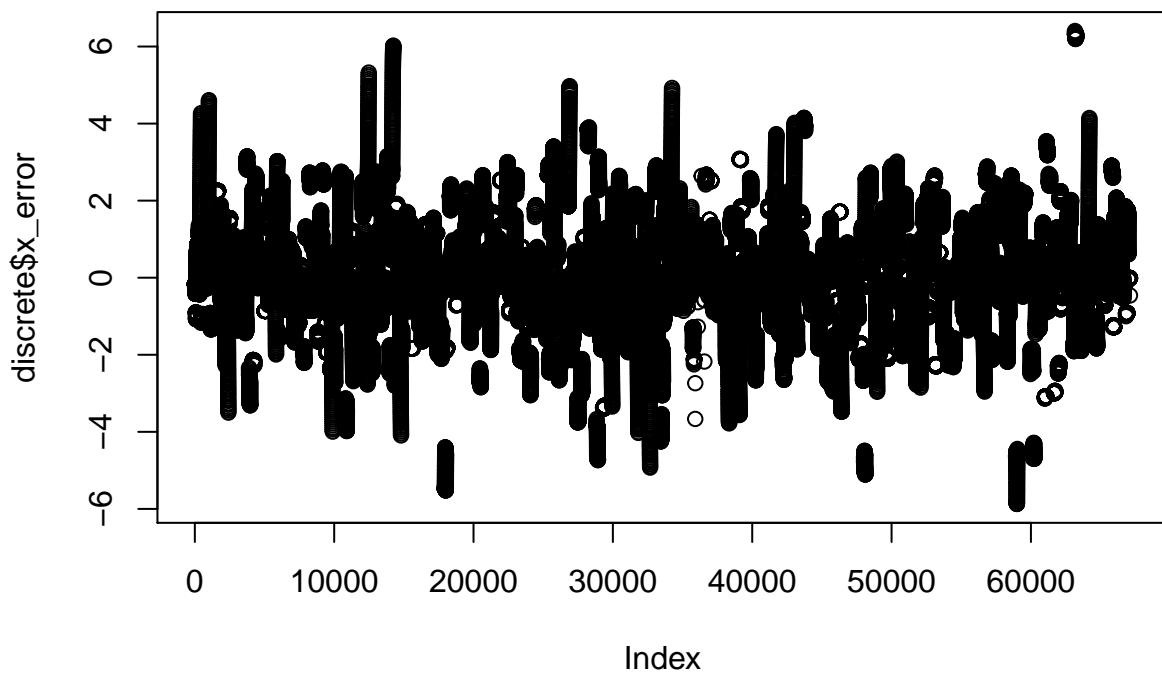
Distance from origin vs. time



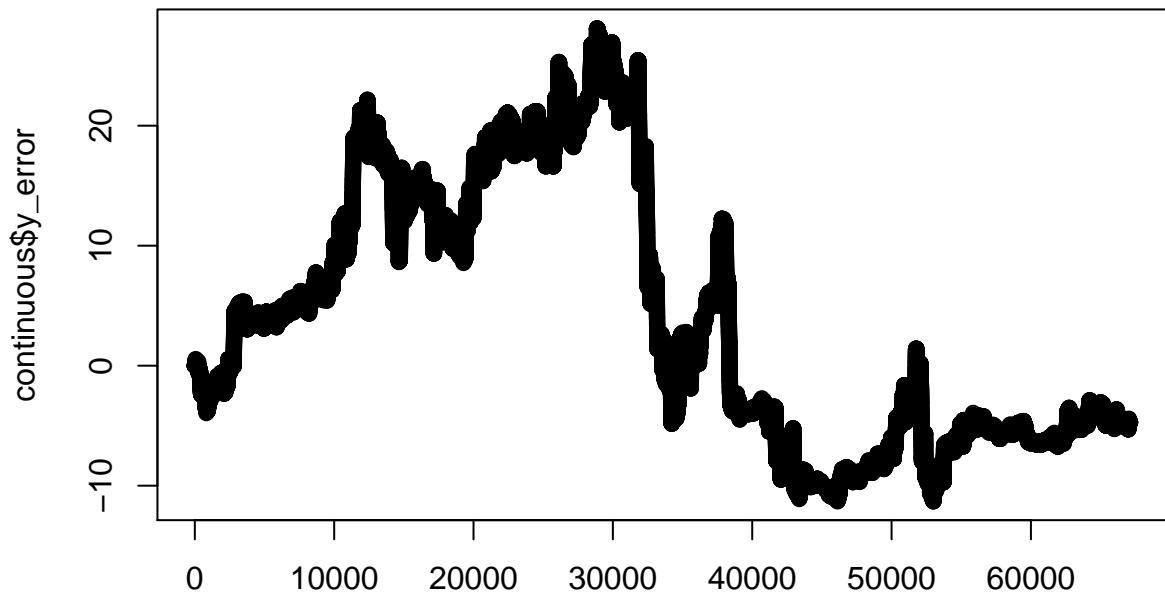
Continuous x_error over time



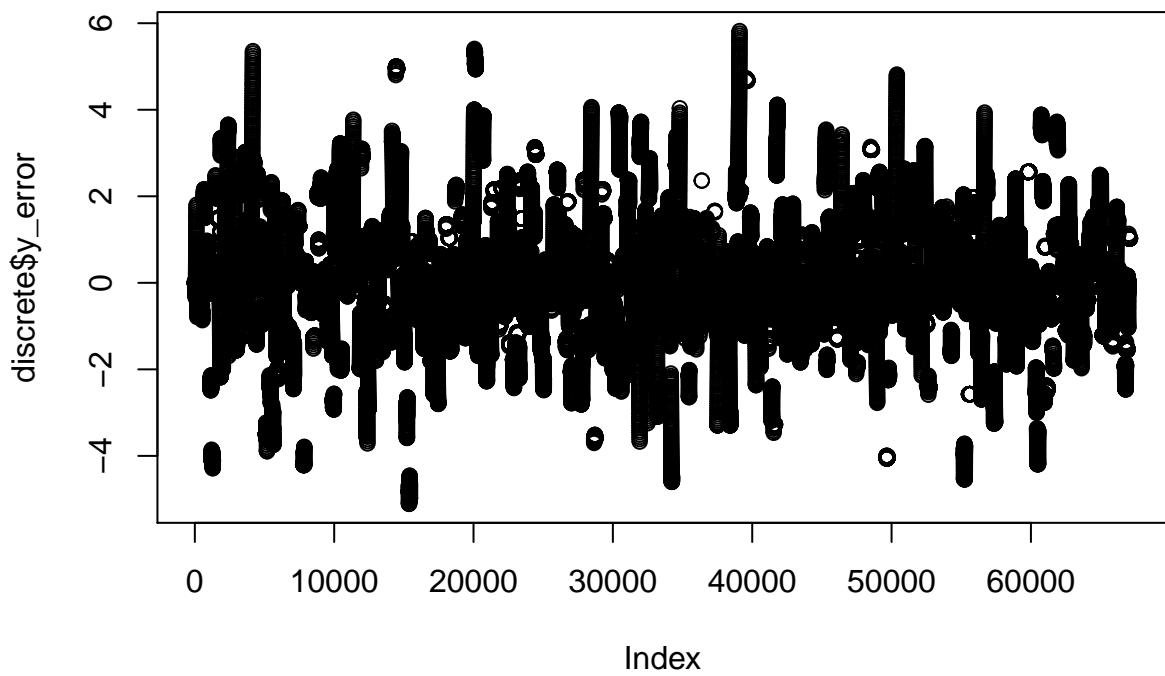
Discrete x_error over time



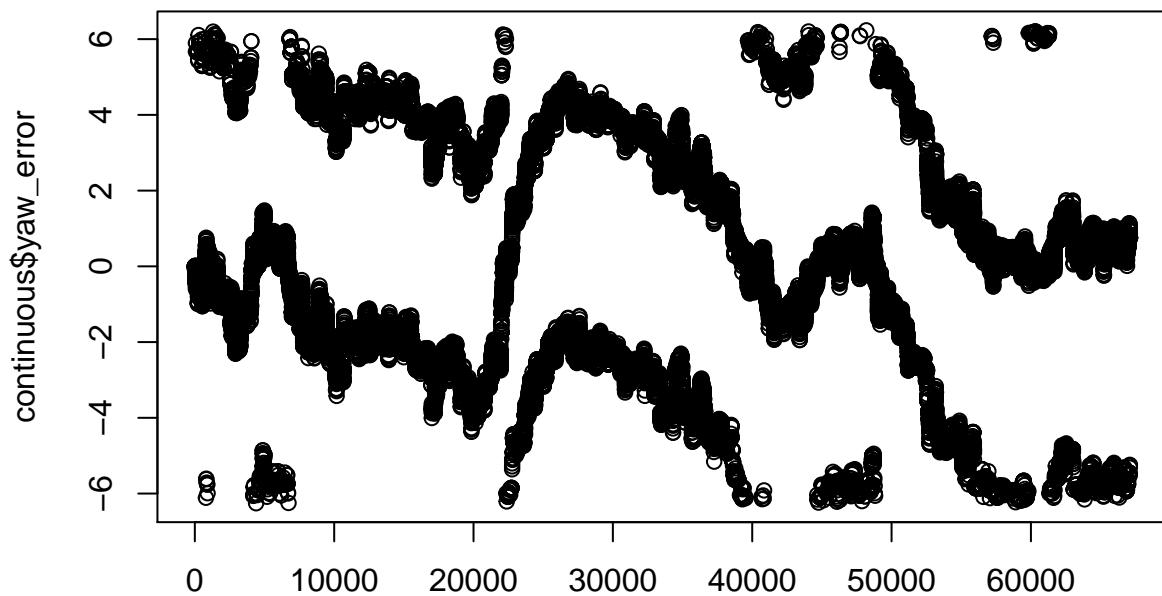
Continuous y_error over time



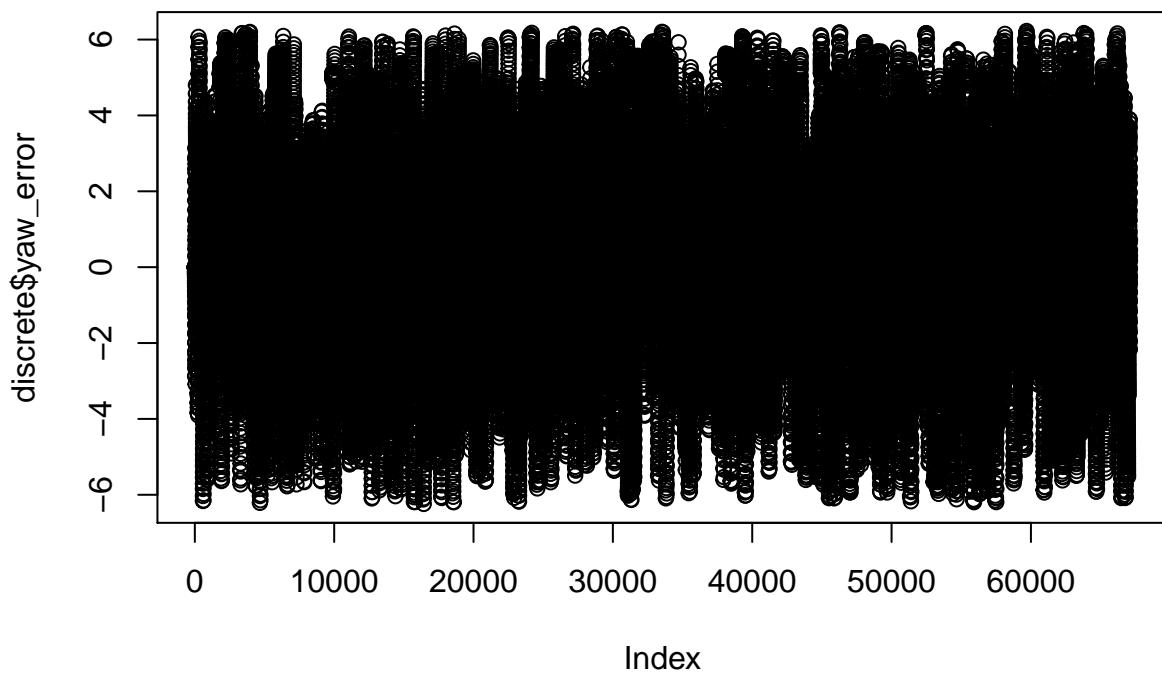
Discrete y_error over time



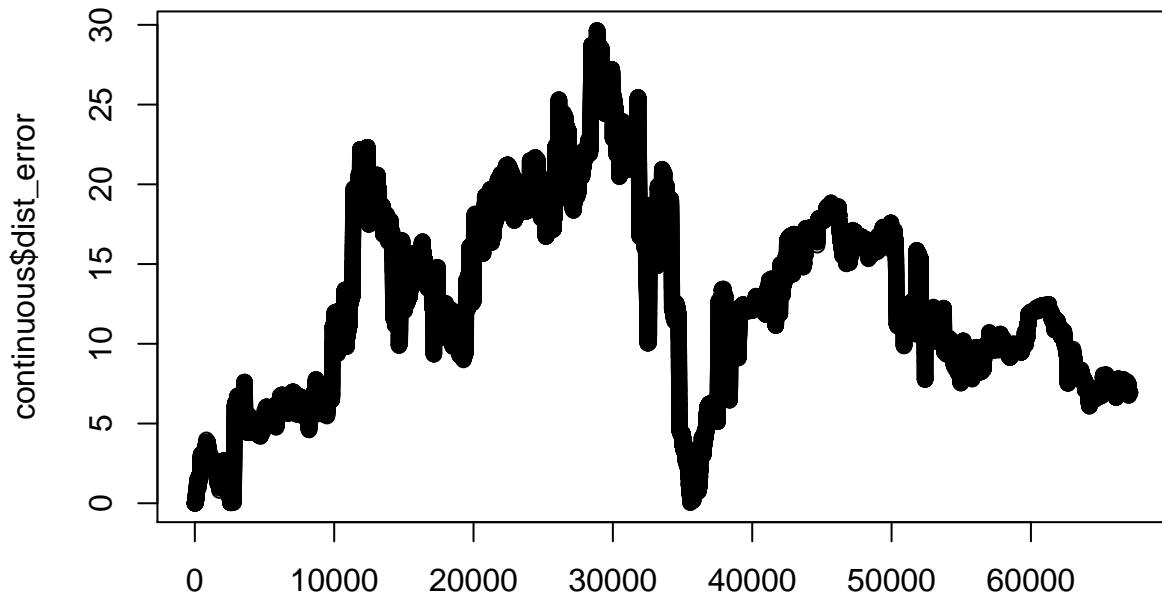
Continuous yaw error over time



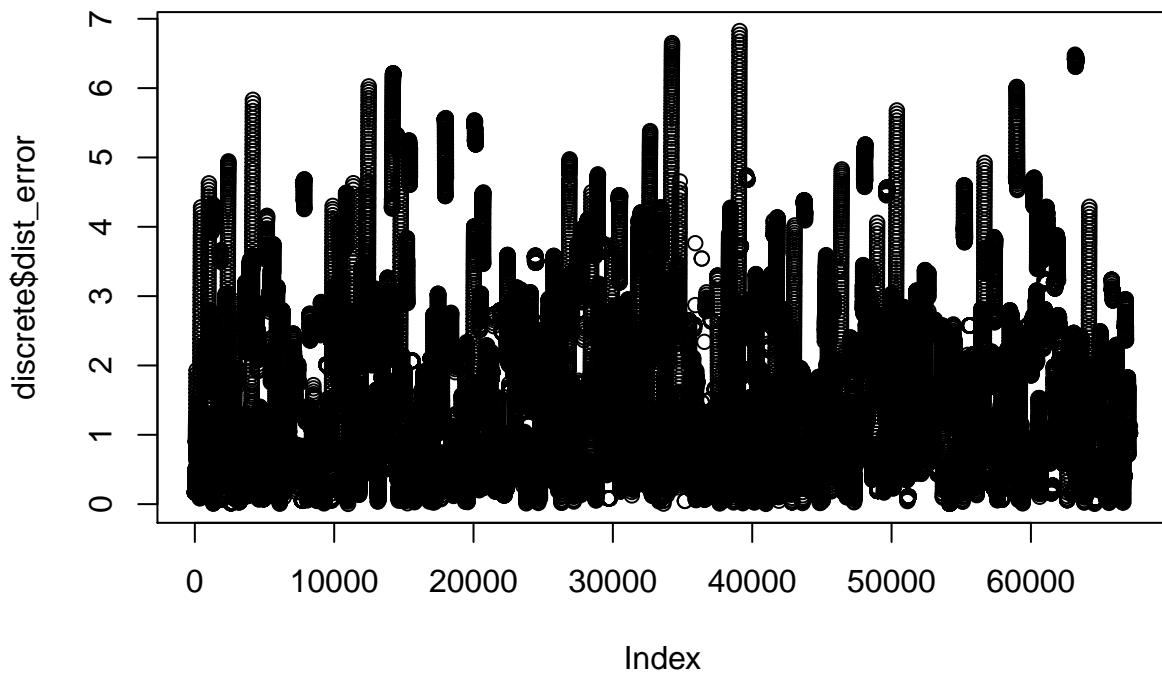
Discrete yaw error over time



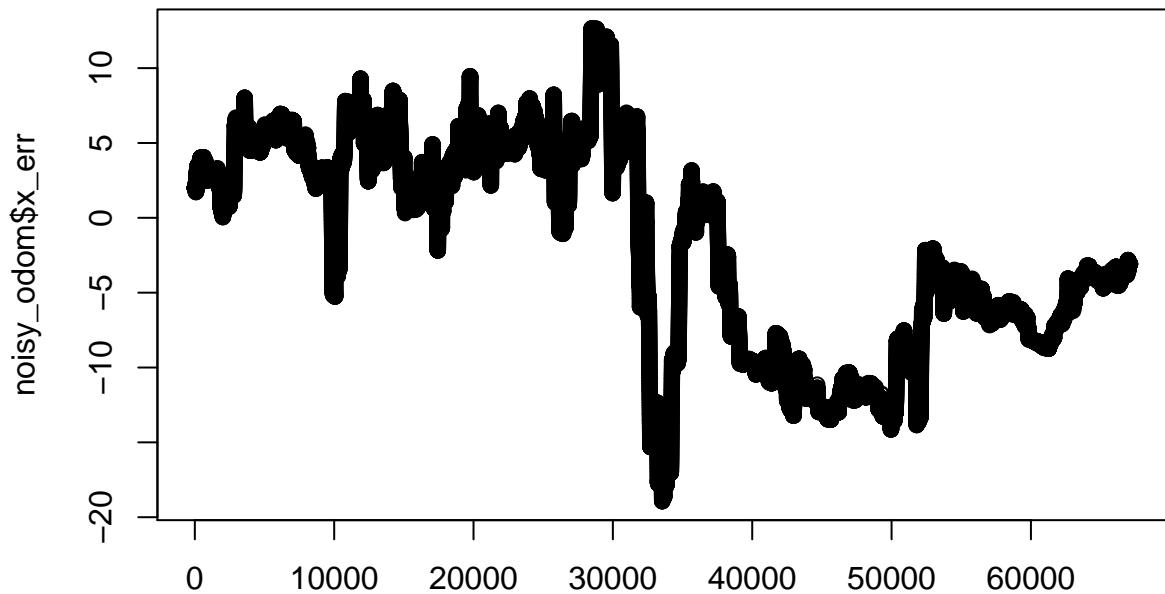
Continuous total distance error over time



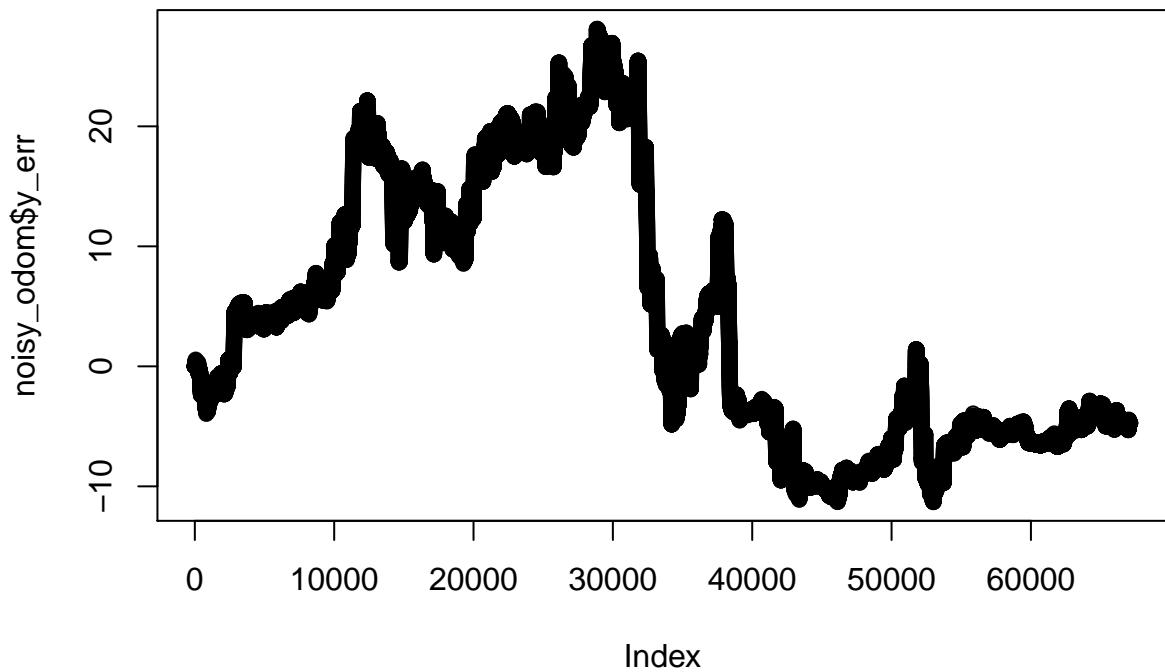
Discrete total distance error over time



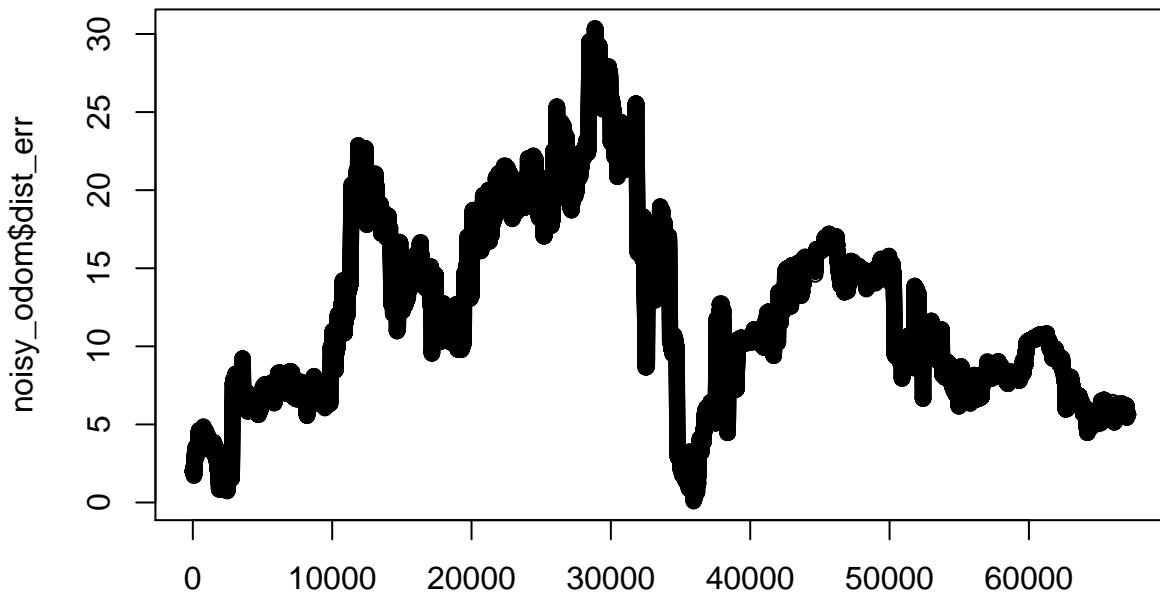
Noisy Odom X Error Over Time



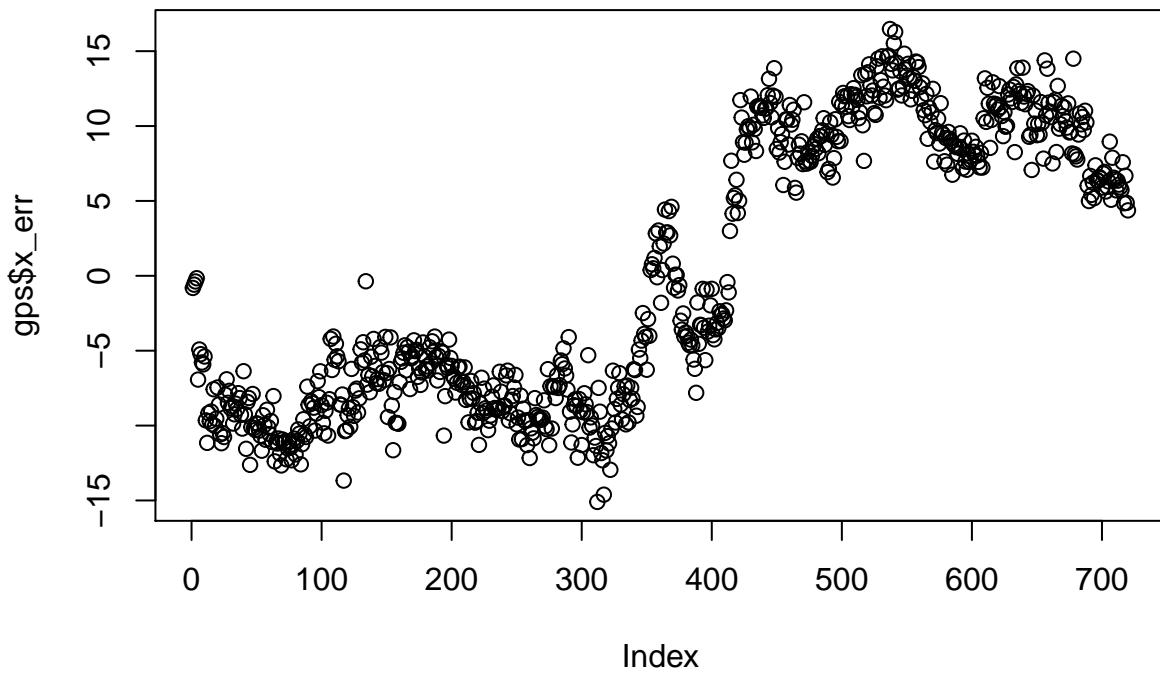
Noisy Odom Y Error Over Time



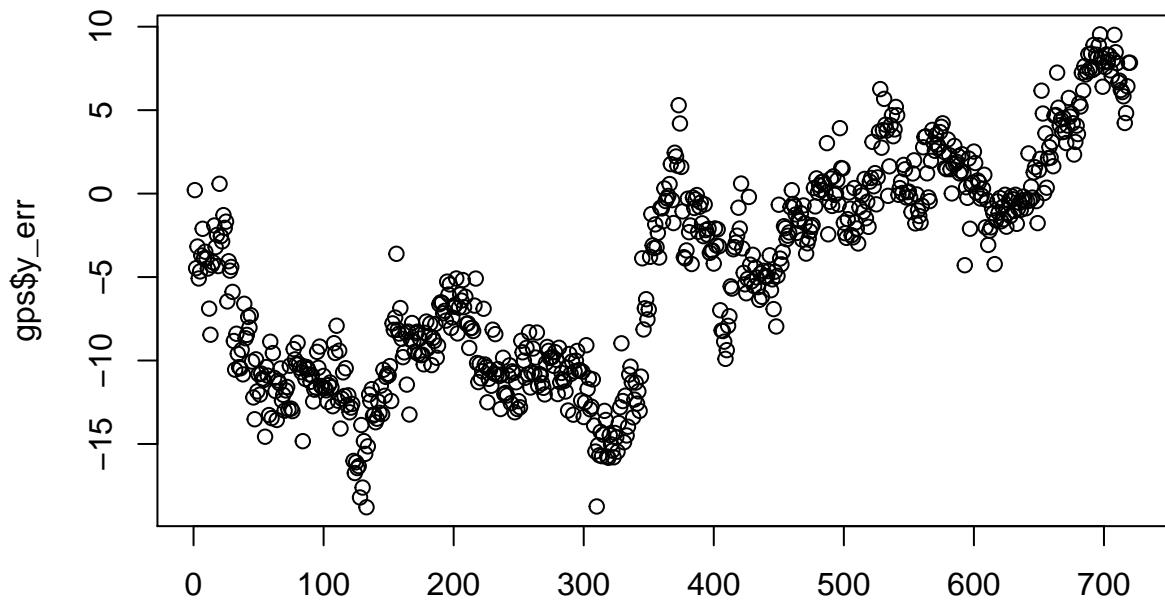
Noisy Odom Horizontal Distance Error Over Time



GPS X Error Over Time



GPS Y Error Over Time



GPS Horizontal Distance Error Over Time

