

two_mobile Turtlebot 1 Report

Matthew Swartwout

August 08, 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 67080
## items to be assigned to 720 items of column 'x_err' (66360 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 67080
## items to be assigned to 720 items of column 'y_err' (66360 unused)
```

This is a summary of the data from the two_mobile experiment, Turtlebot #1.

The runtime of this experiment was 1 hours, 51 minutes, and 48 seconds.

The total number of external pose measurements received by the robot during this time was 440 which means poses were received at an average of 0.0655933 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.
## -6.487  10.300 15.430 15.050 18.010 37.710
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -8.9970 -3.3620  0.9346 1.0180 5.6040 11.7300
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -6.24700 -1.98200  0.09777 0.01064 1.67900 6.25800
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
##  0.1512 11.2500 16.4000 16.2100 18.7700 37.7800
```

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

```
##      Min. 1st Qu. Median   Mean 3rd Qu.   Max.
## -5.38800 -0.77280 -0.03991 -0.06769  0.62970 6.21800
```

```

summary(discrete$y_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -6.22000 -0.68560 -0.01647 -0.02183 0.66810  5.63900

summary(discrete$yaw_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -6.249000 -1.752000 -0.004098 -0.080360 1.590000  6.257000

summary(discrete$dist_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.000014 0.644100 1.311000 1.565000 2.286000 7.408000

summary(noisy_odom$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -6.487 10.300 15.430 15.050 18.010 37.710

summary(noisy_odom$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -8.9970 -3.3640 0.9369 1.0180 5.6060 11.7200

summary(noisy_odom$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.1737 11.2500 16.4000 16.2100 18.7700 37.7800

summary(gps$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -34.970 -16.830 -14.540 -14.880 -11.980  4.866

summary(gps$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -11.6700 -3.3780  0.2764  0.6672  4.7290 13.5600

summary(gps$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 1.688 12.910 15.360 15.730 17.450 35.380

```

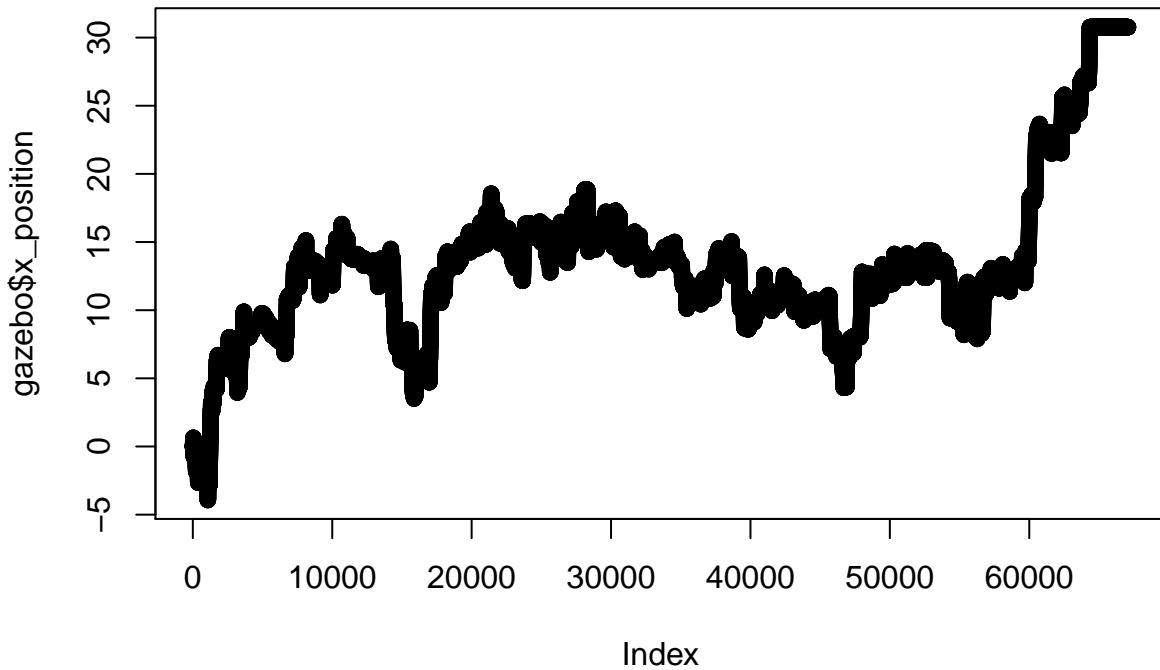
```

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

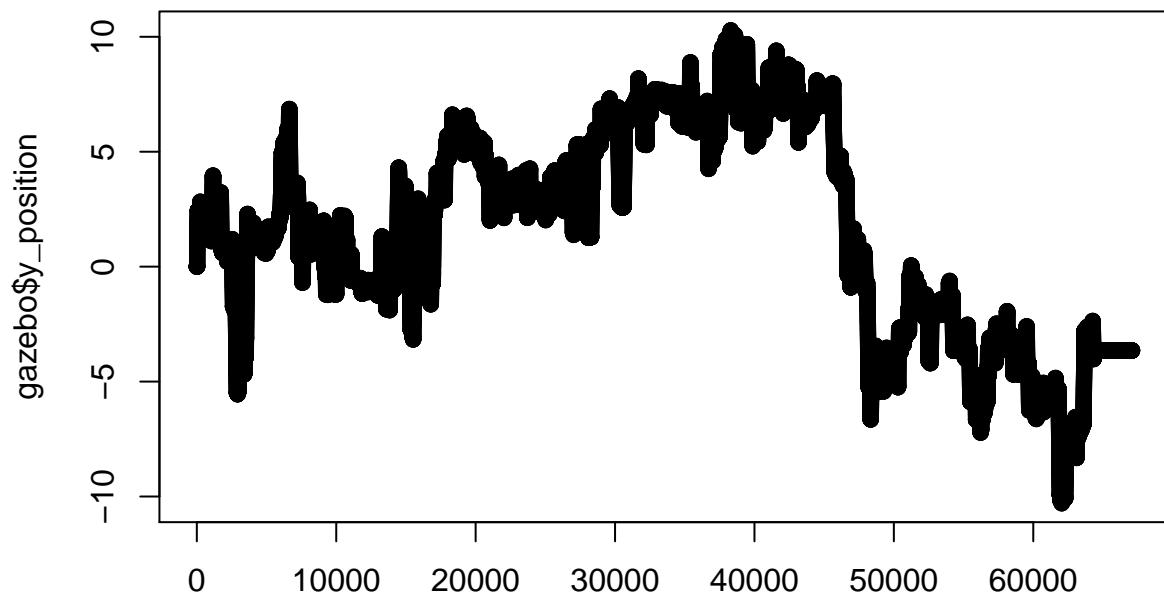
# shapiro.test(noisy_odom$x_err)
# shapiro.test(noisy_odom$y_err)
# shapiro.test(noisy_odom$dist_err)
#
# shapiro.test(gps$x_err)
# shapiro.test(gps$y_err)
# shapiro.test(gps$dist_err)
#
# noisy_odom_fit_x <- fitdist(noisy_odom$x_err, "norm")
# noisy_odom_fit_y <- fitdist(noisy_odom$y_err, "norm")
#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

```

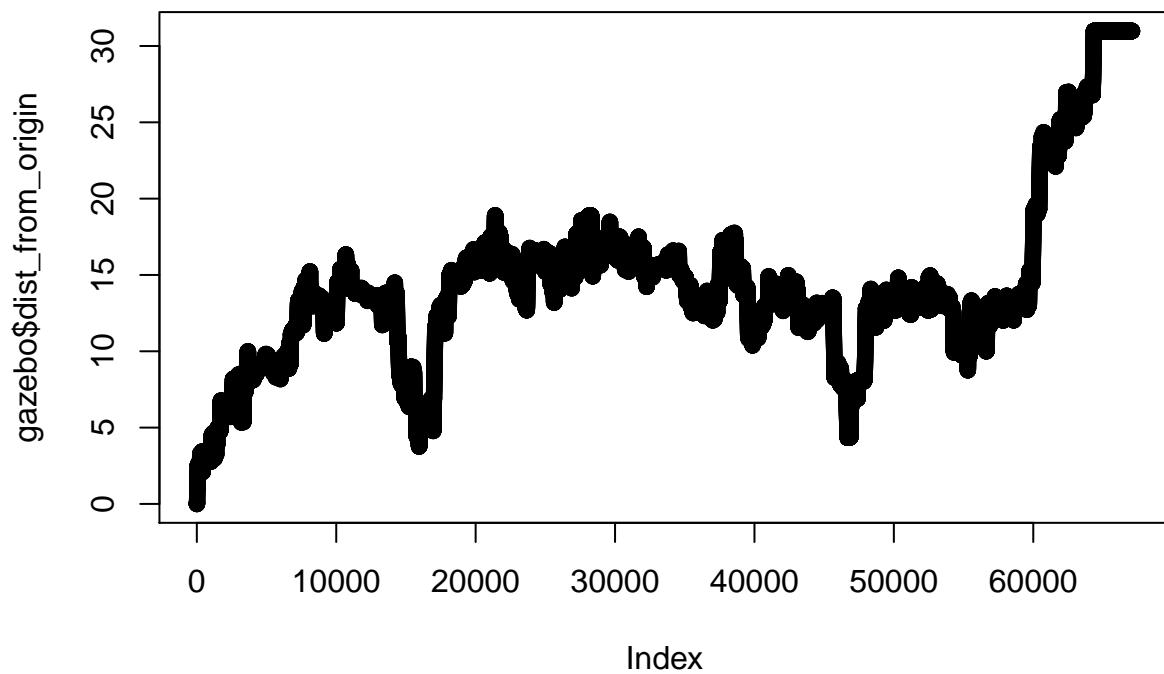
X coordinate of robot over time



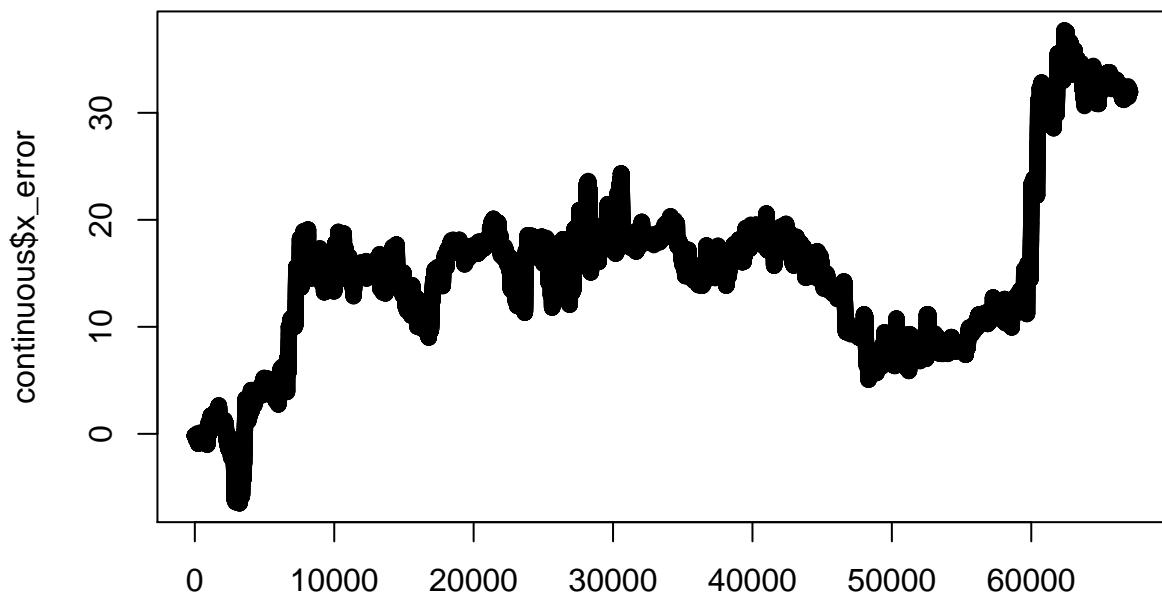
Y coordinate of robot over time



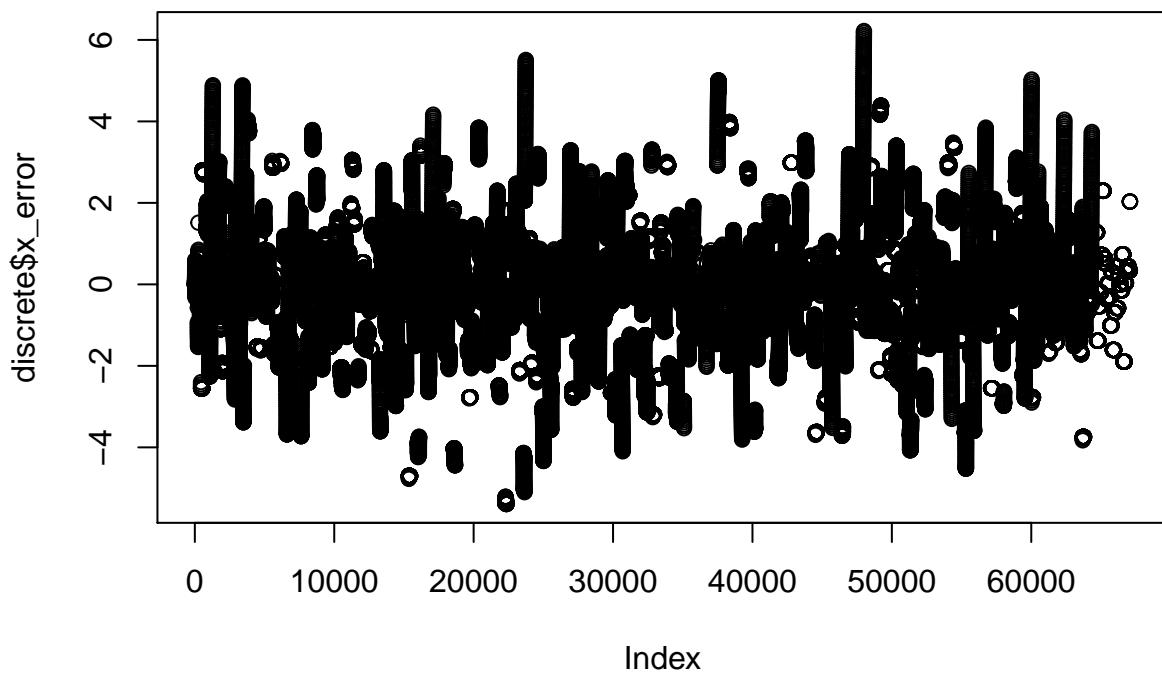
Distance from origin vs. time



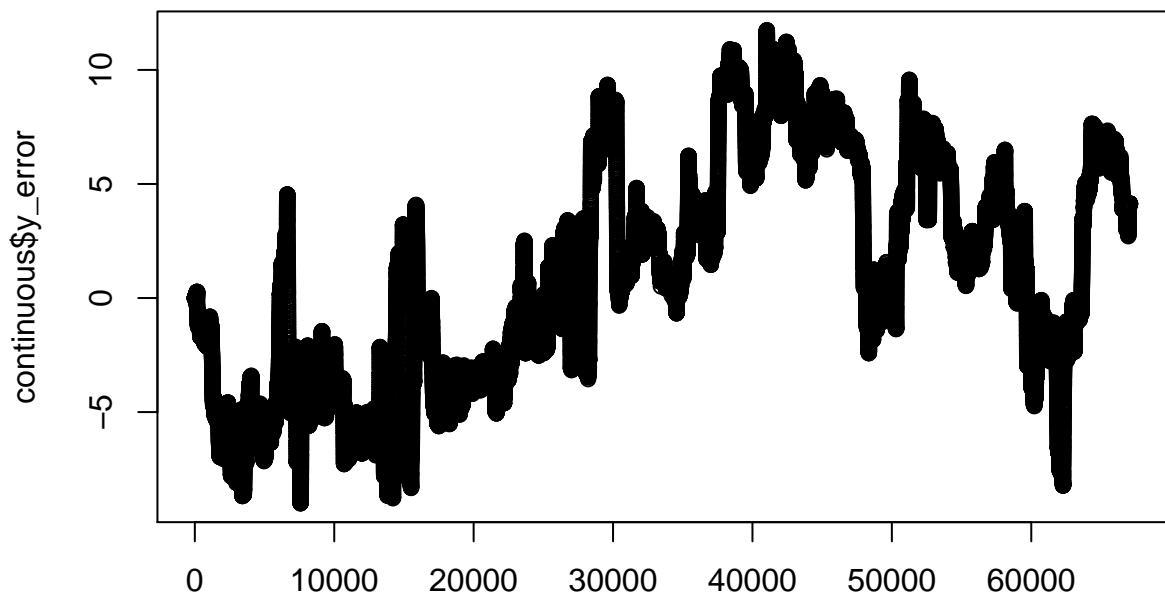
Continuous x_error over time



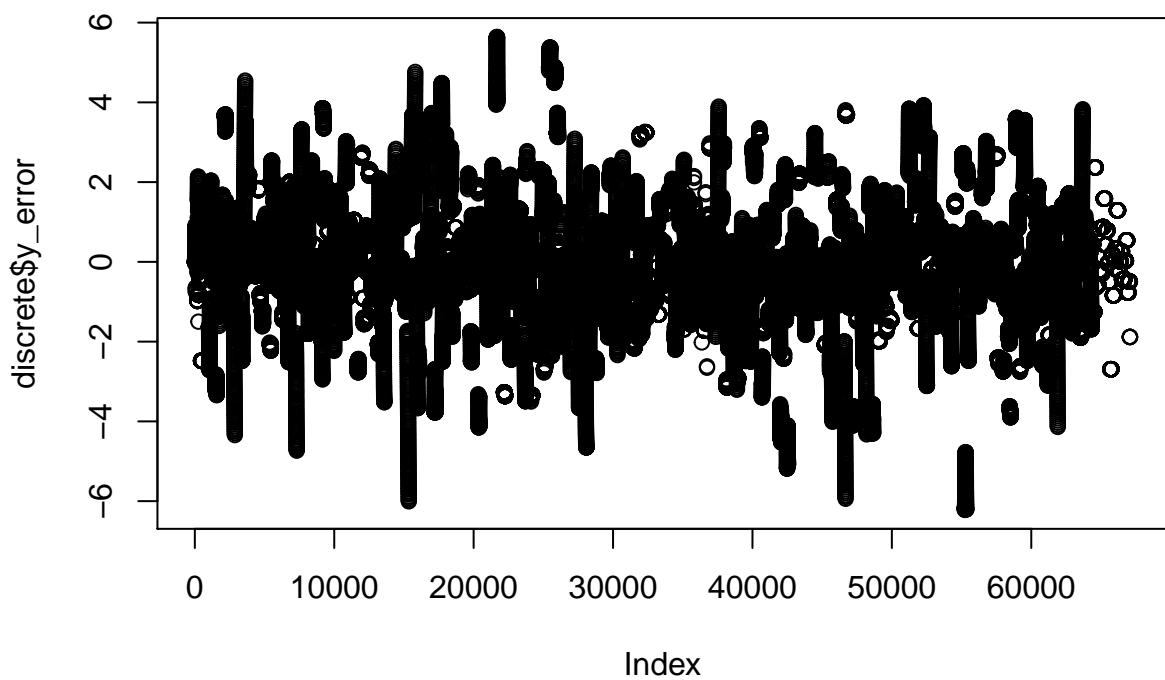
Discrete x_error over time



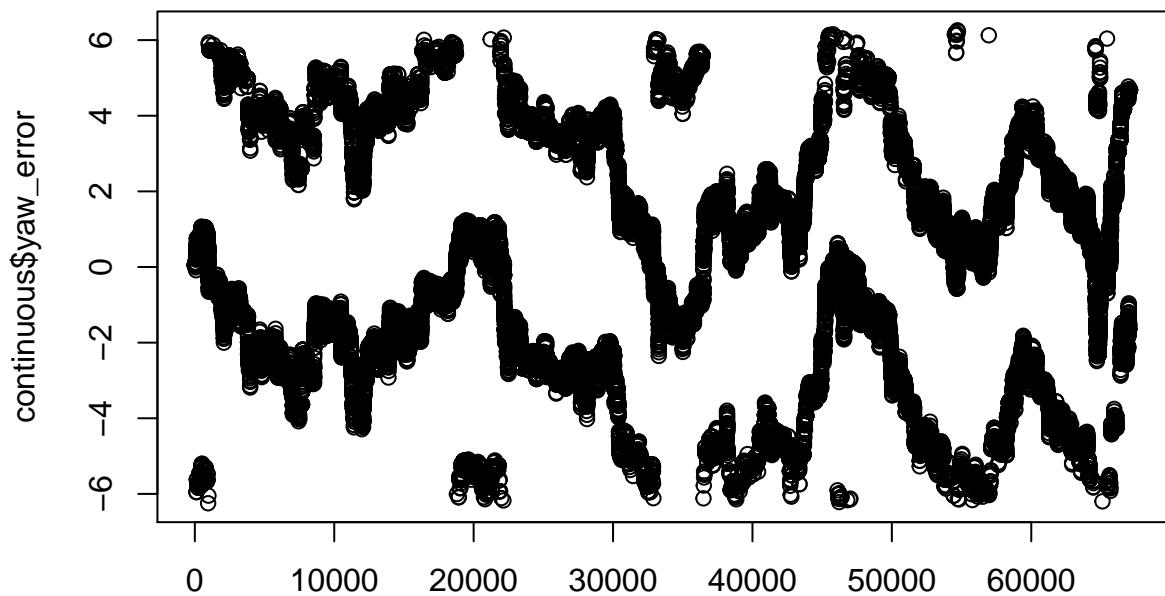
Continuous y_error over time



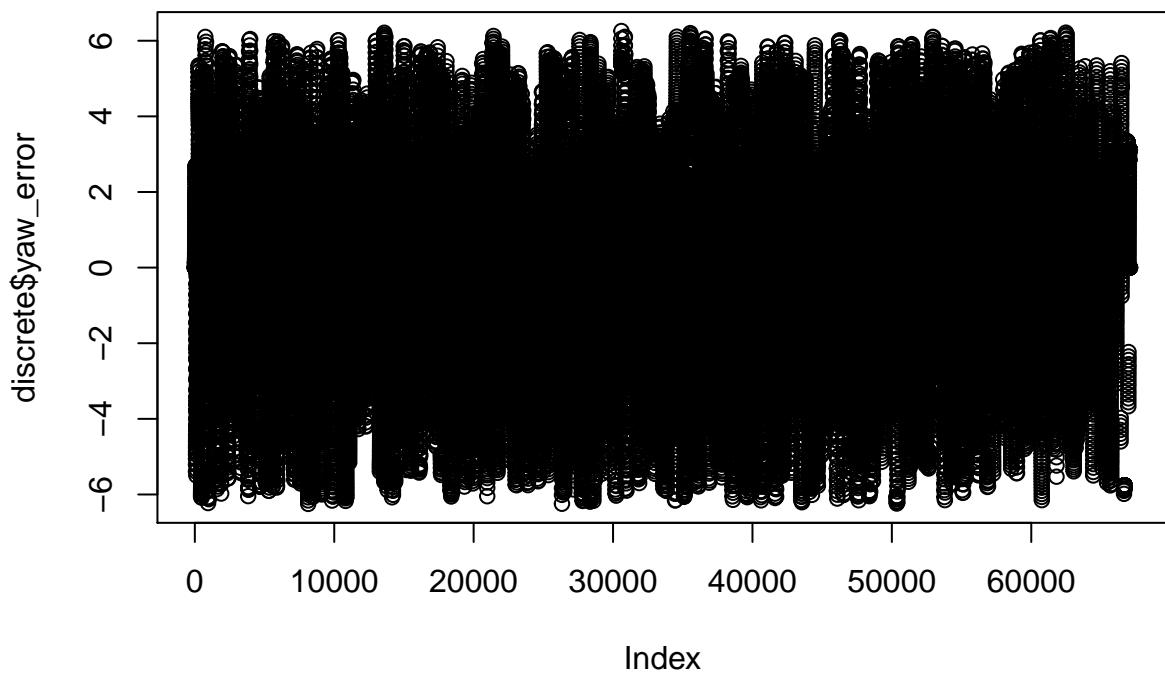
Discrete y_error over time



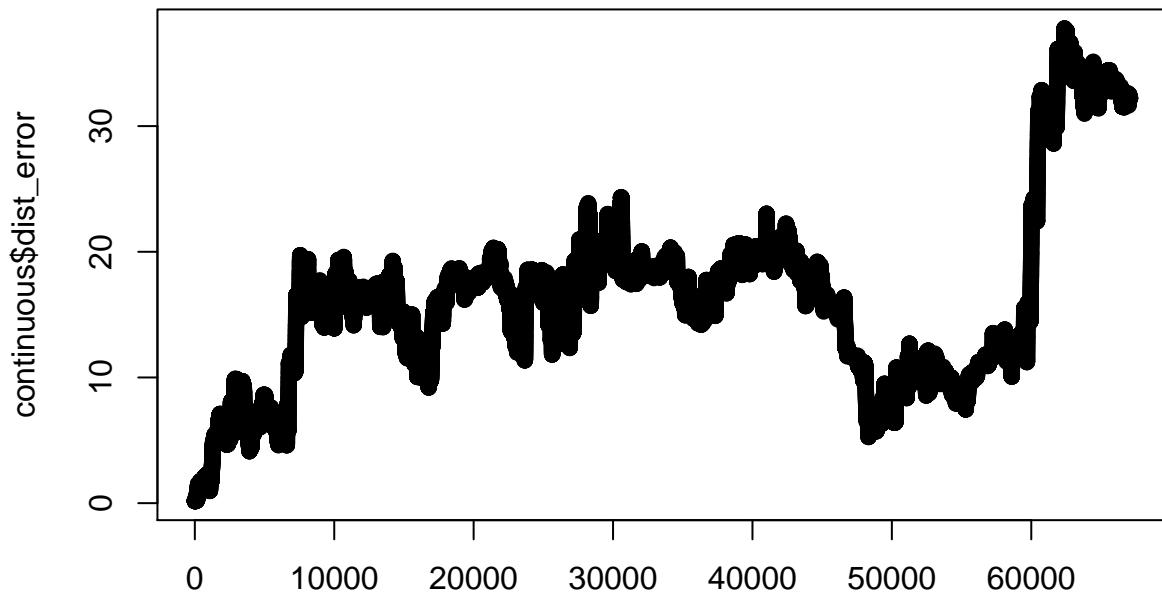
Continuous yaw error over time



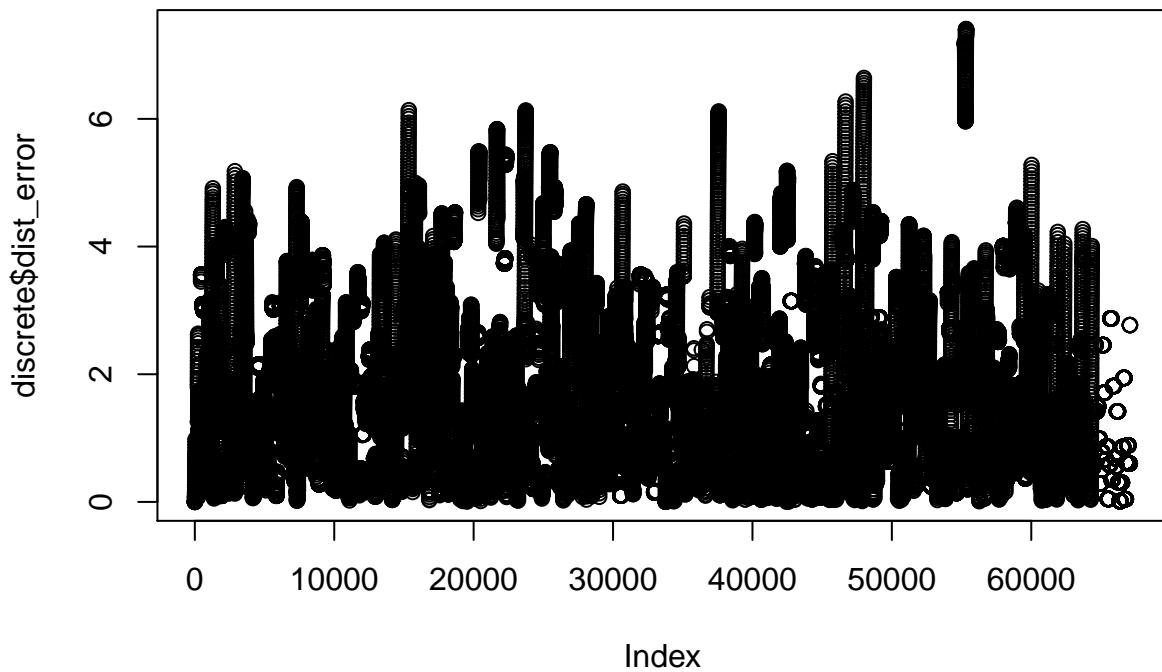
Discrete yaw error over time



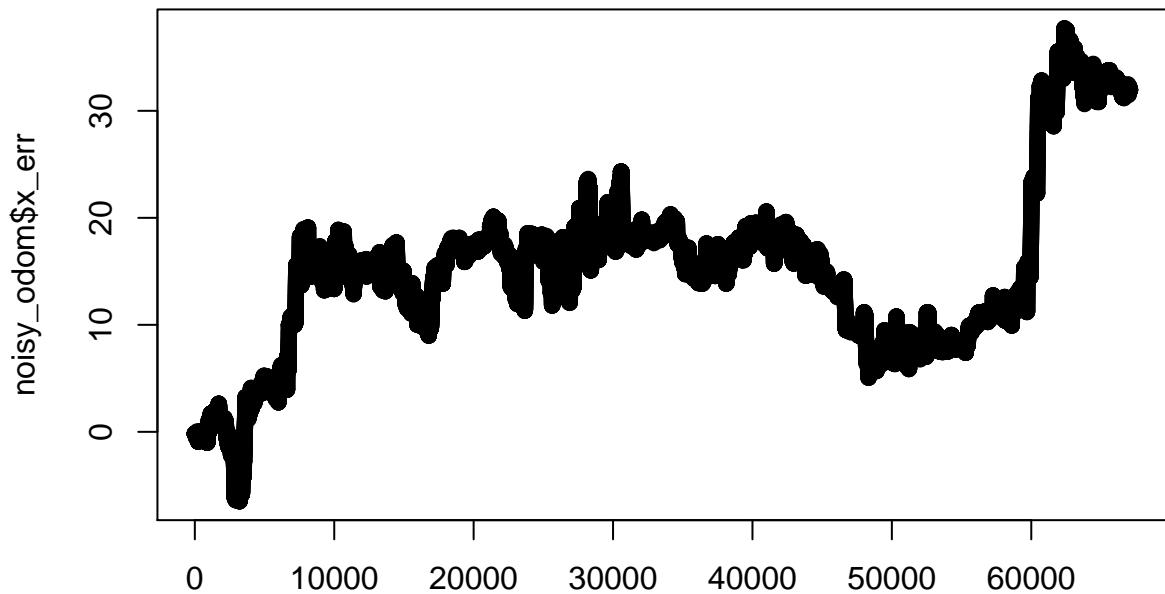
Continuous total distance error over time



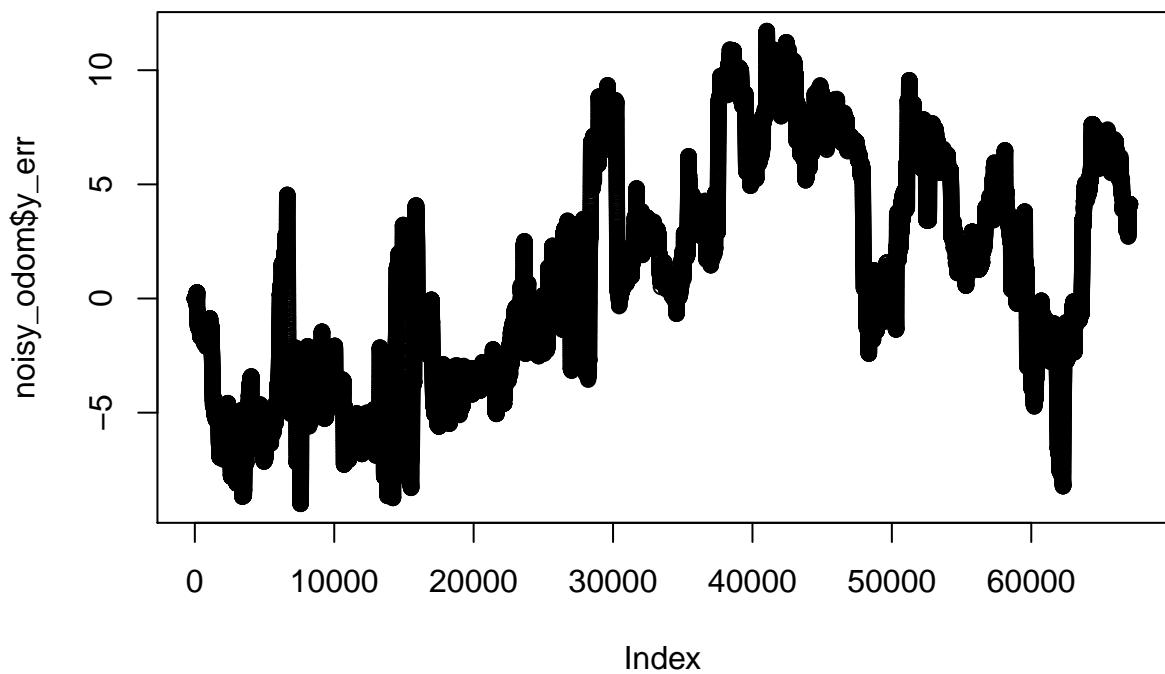
Discrete total distance error over time



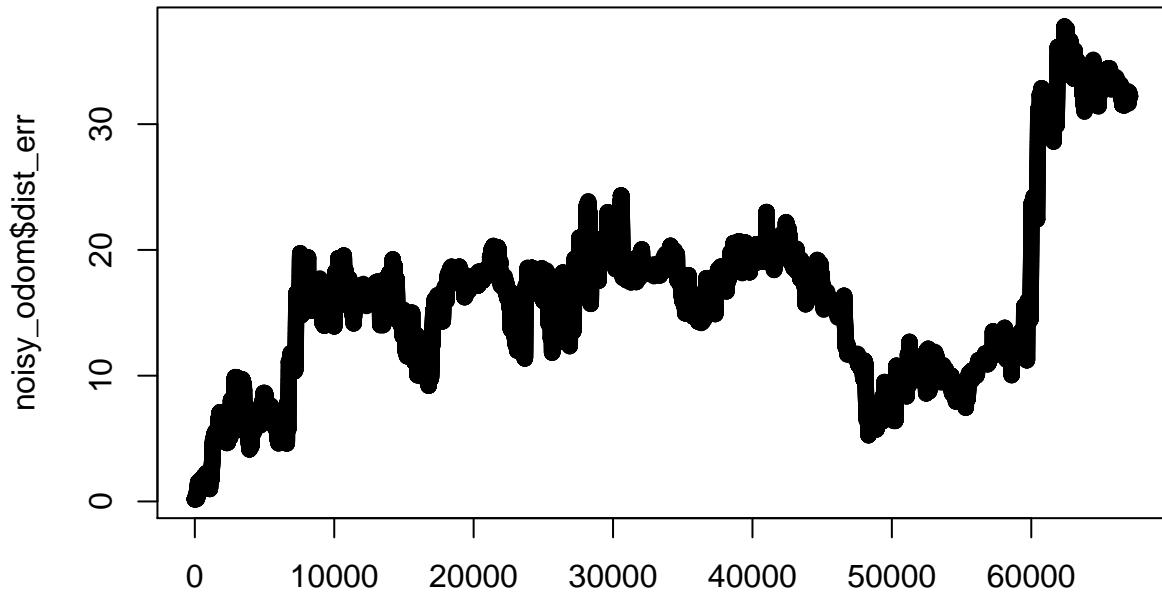
Noisy Odom X Error Over Time



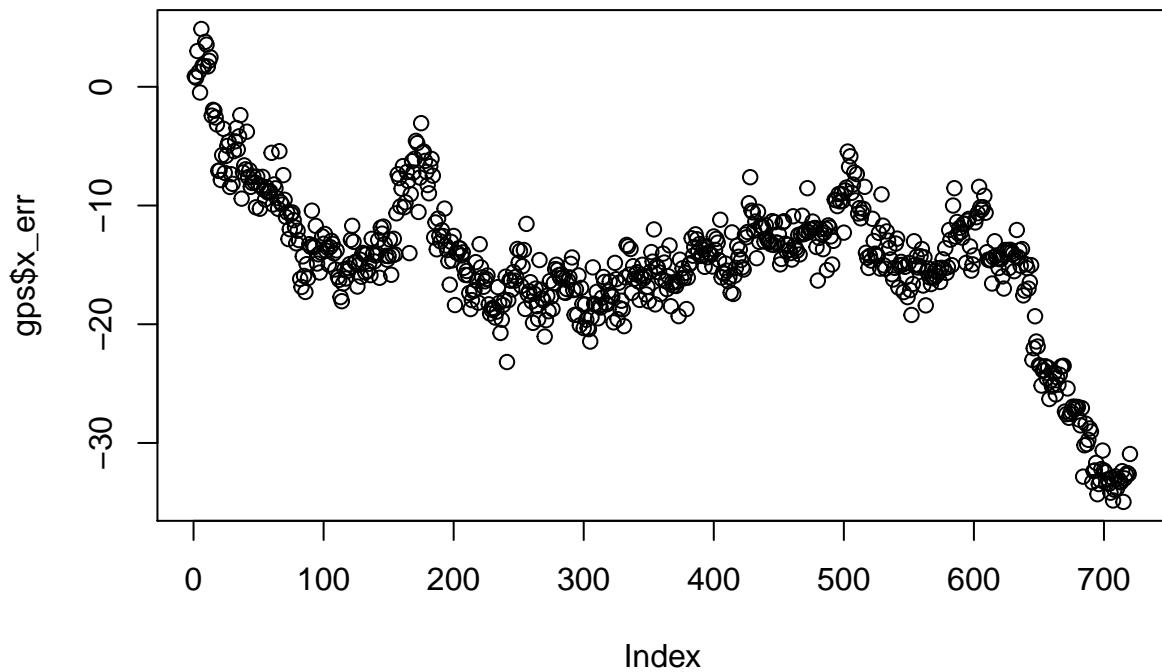
Noisy Odom Y Error Over Time



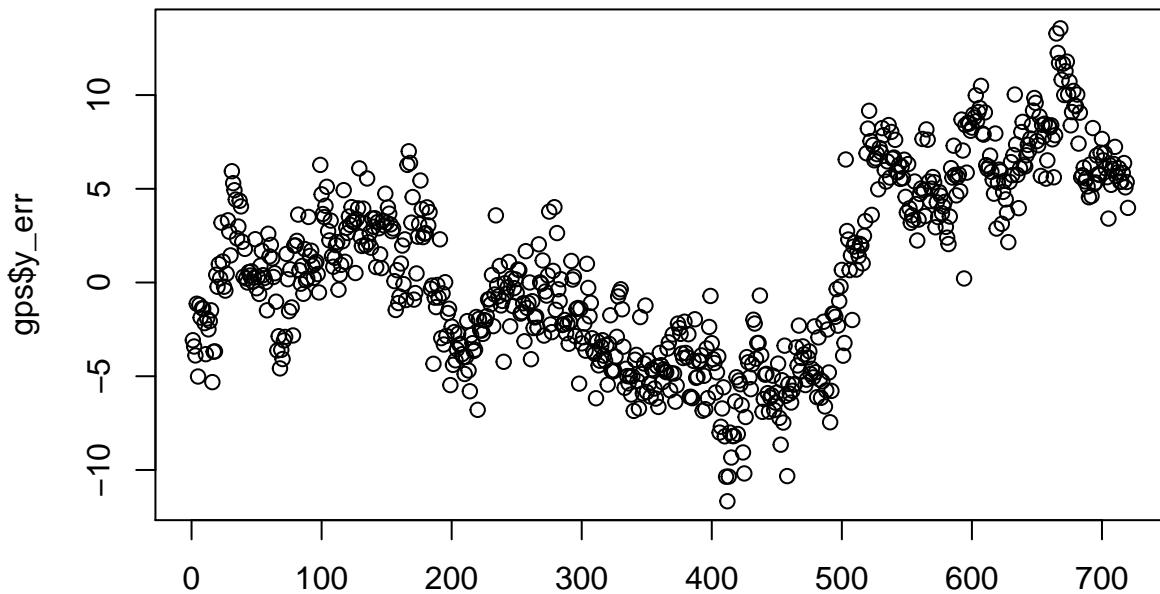
Noisy Odom Horizontal Distance Error Over Time



GPS X Error Over Time^{Index}



GPS Y Error Over Time



GPS Horizontal Distance Error Over Time

