

one_stationary_noiseless Turtlebot 1 Report

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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 15713
## items to be assigned to 180 items of column 'x_err' (15533 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 15713
## items to be assigned to 180 items of column 'y_err' (15533 unused)
```

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

The runtime of this experiment was 0 hours, 26 minutes, and 11.3 seconds.

The total number of external pose measurements received by the robot during this time was 0 which means poses were received at an average of 0 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.
## -1.761e-07 -2.481e-09  1.910e-09  1.995e-07  9.844e-08  2.186e-06
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -1.531e-10 -8.890e-12  7.027e-12  1.049e-09  1.795e-10  1.136e-08
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.055e-05 -2.860e-06  1.977e-07  1.363e-07  3.145e-06  3.624e-05
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 2.800e-12  2.205e-09  5.193e-09  2.032e-07  1.020e-07  2.186e-06
```

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

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -3.20000 -0.53450 -0.01748 -0.02757  0.63170  3.45800
```

```

summary(discrete$y_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -4.43400 -0.33000 0.06292  0.18060  0.78430  4.14200

summary(discrete$yaw_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -9.684e-04 -9.145e-05 1.291e-05 1.118e-05 1.246e-04 7.550e-04

summary(discrete$dist_error)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.0000  0.3949  1.0320  1.3160  2.0380  4.4980

summary(noisy_odom$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -1.452e-05 -6.196e-06 -1.798e-06 -1.718e-06 1.916e-06 1.703e-05

summary(noisy_odom$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -1.872e-08  9.269e-09  2.610e-08 4.411e-08 4.918e-08 2.587e-07

summary(noisy_odom$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 1.053e-08 1.834e-06 3.979e-06 4.916e-06 7.376e-06 1.703e-05

summary(gps$x_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -3.20100 -0.53390 -0.02376 -0.03546 0.62270  3.44900

summary(gps$y_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## -4.43400 -0.31400 0.05978  0.17960  0.74120  4.14200

summary(gps$dist_err)

##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
## 0.005633 0.388000 1.025000 1.316000 2.031000 4.499000

```

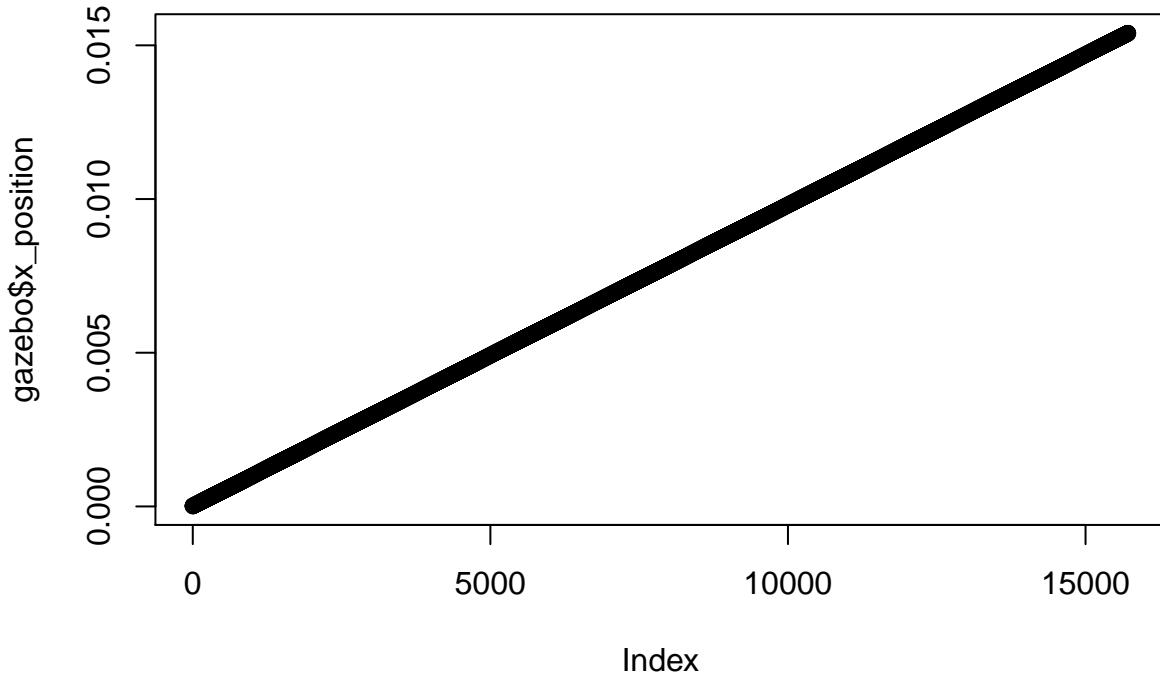
```

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

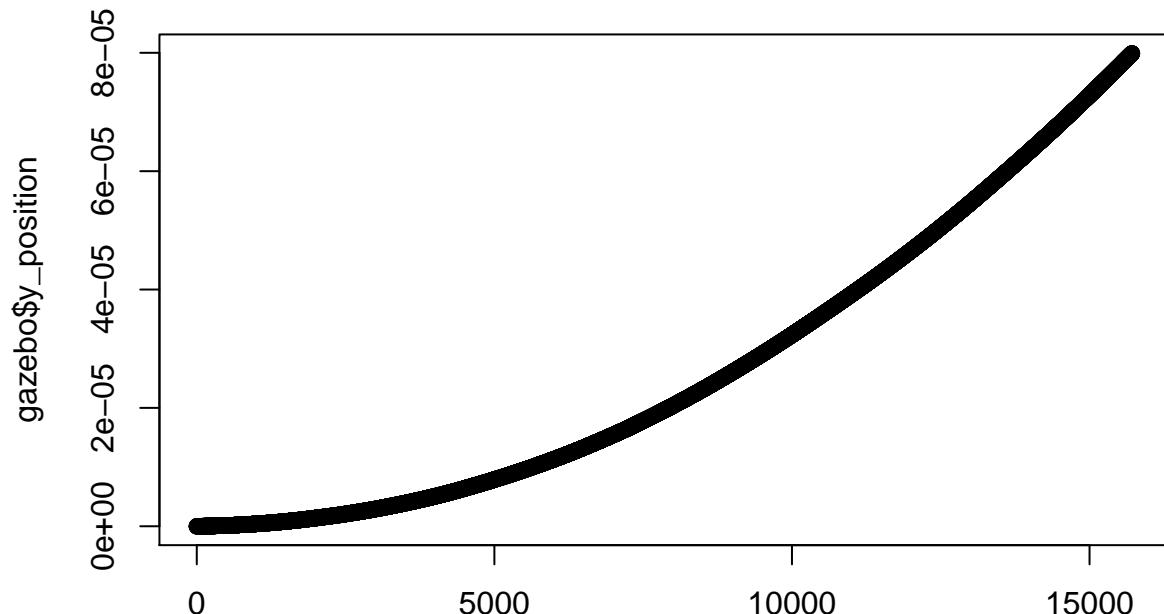
# shapiro.test(noisy_odom$x_err)
# shapiro.test(noisy_odom$y_err)
# shapiro.test(noisy_odom$dist_err)
#
# shapiro.test(gps$x_err)
# shapiro.test(gps$y_err)
# shapiro.test(gps$dist_err)
#
# noisy_odom_fit_x <- fitdist(noisy_odom$x_err, "norm")
# noisy_odom_fit_y <- fitdist(noisy_odom$y_err, "norm")
#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

```

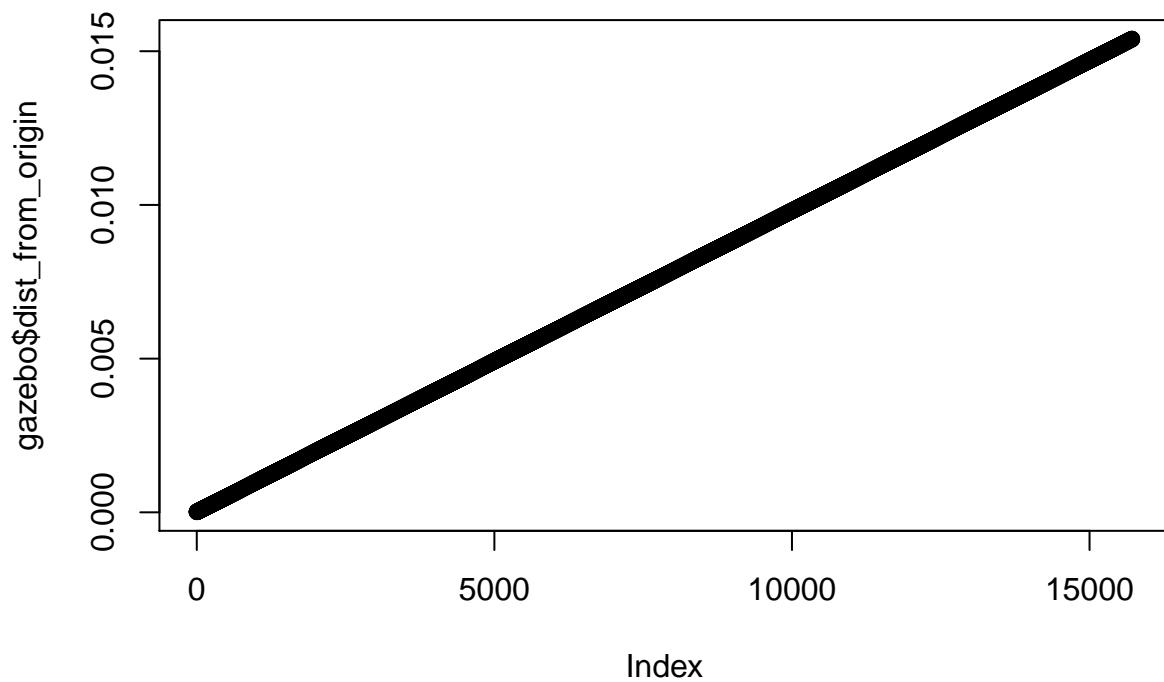
X coordinate of robot over time



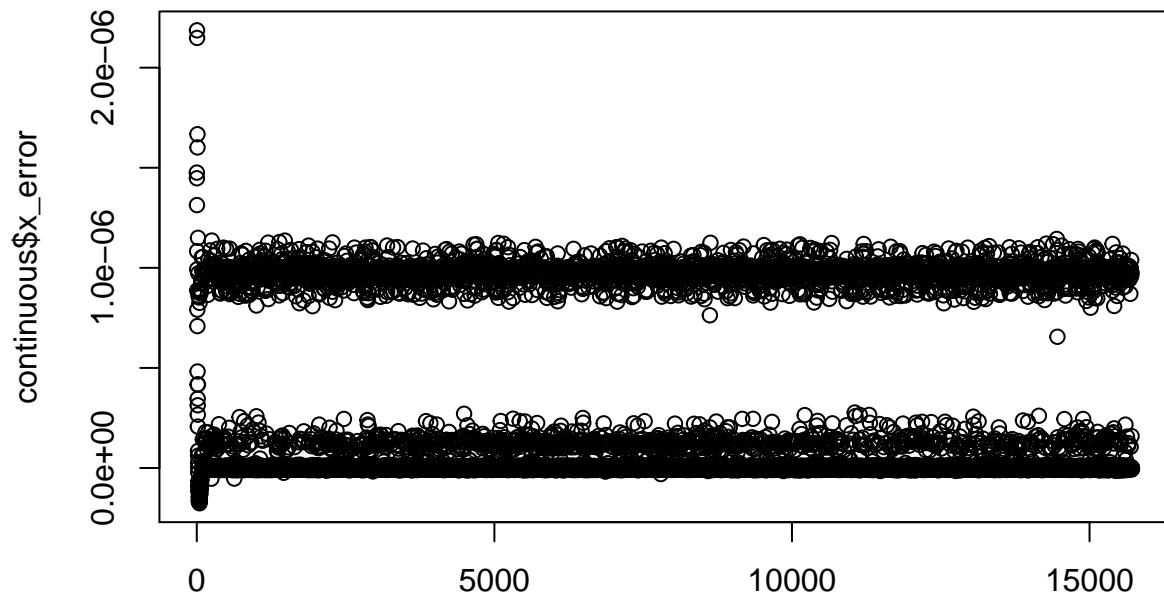
Y coordinate of robot over time



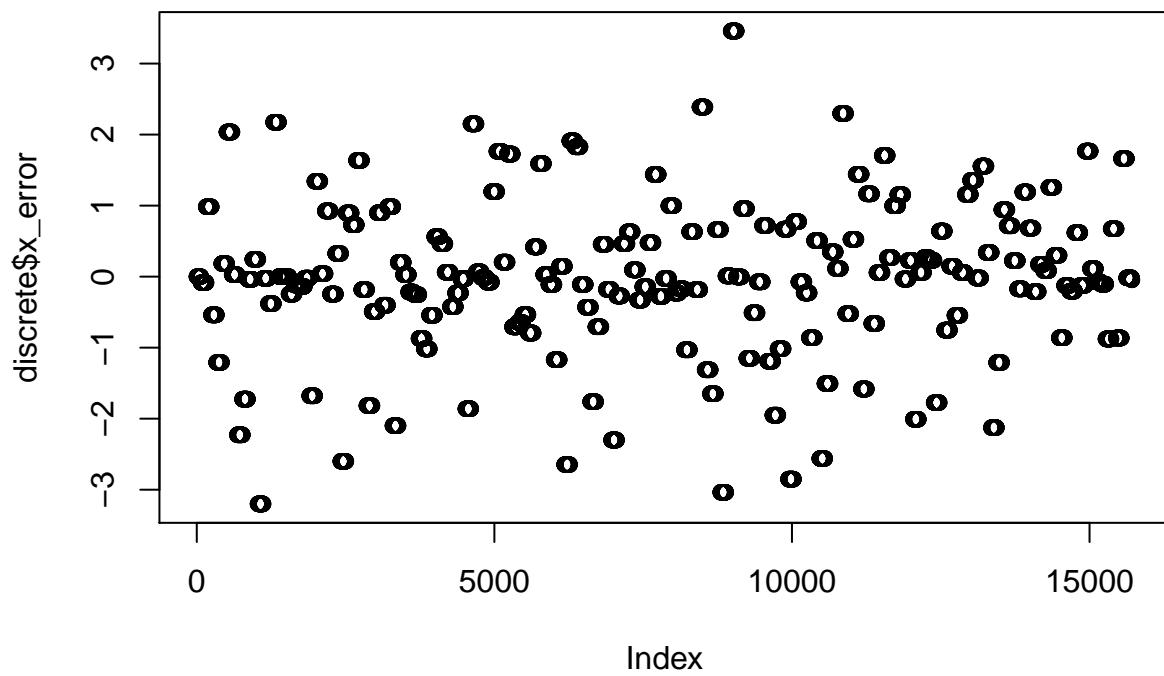
Distance from origin vs. time^{Index}



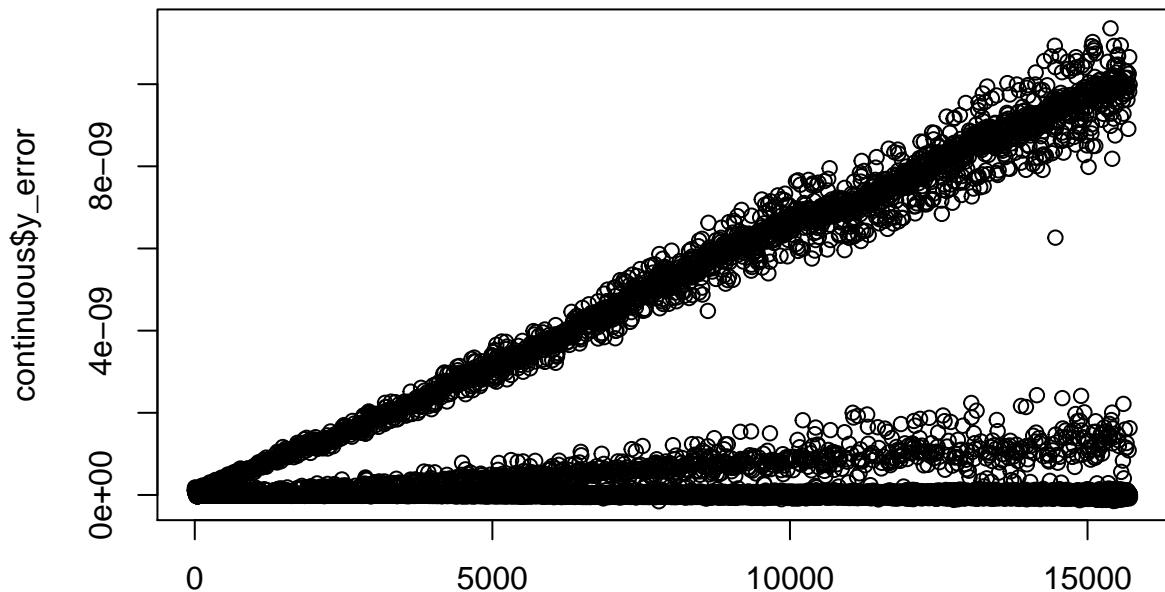
Continuous x_error over time



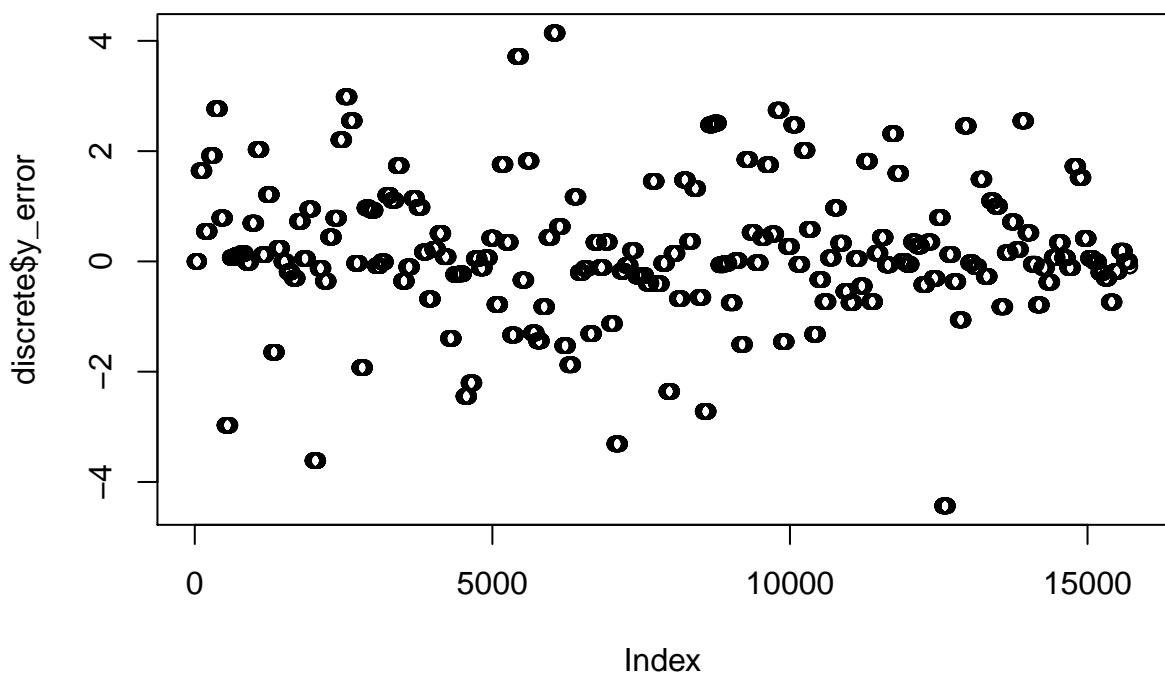
Discrete x_error over time



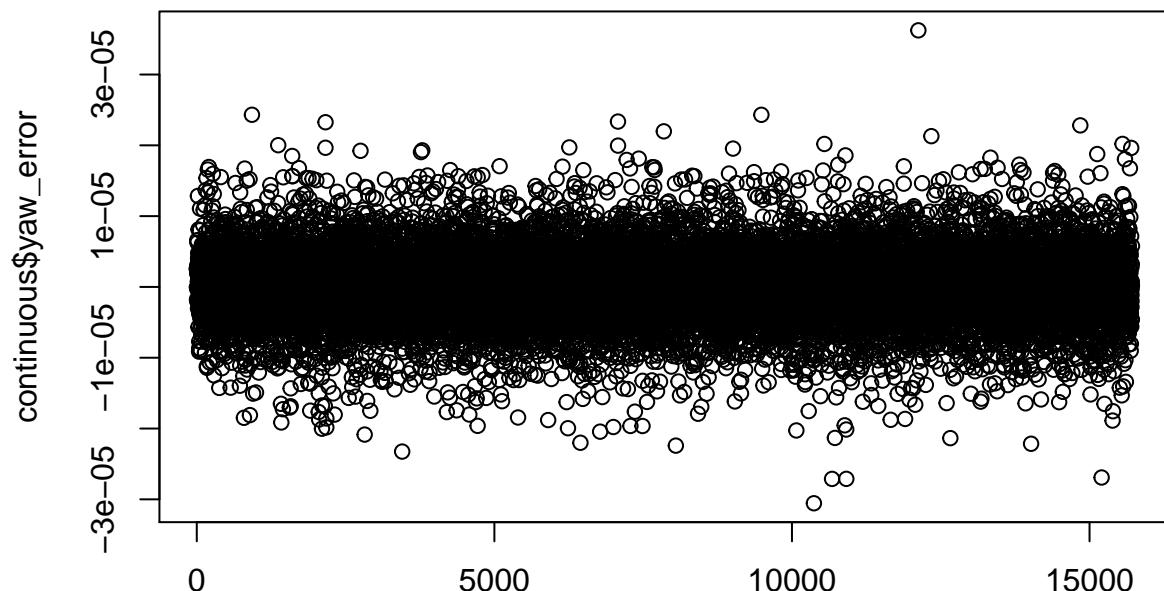
Continuous y_error over time



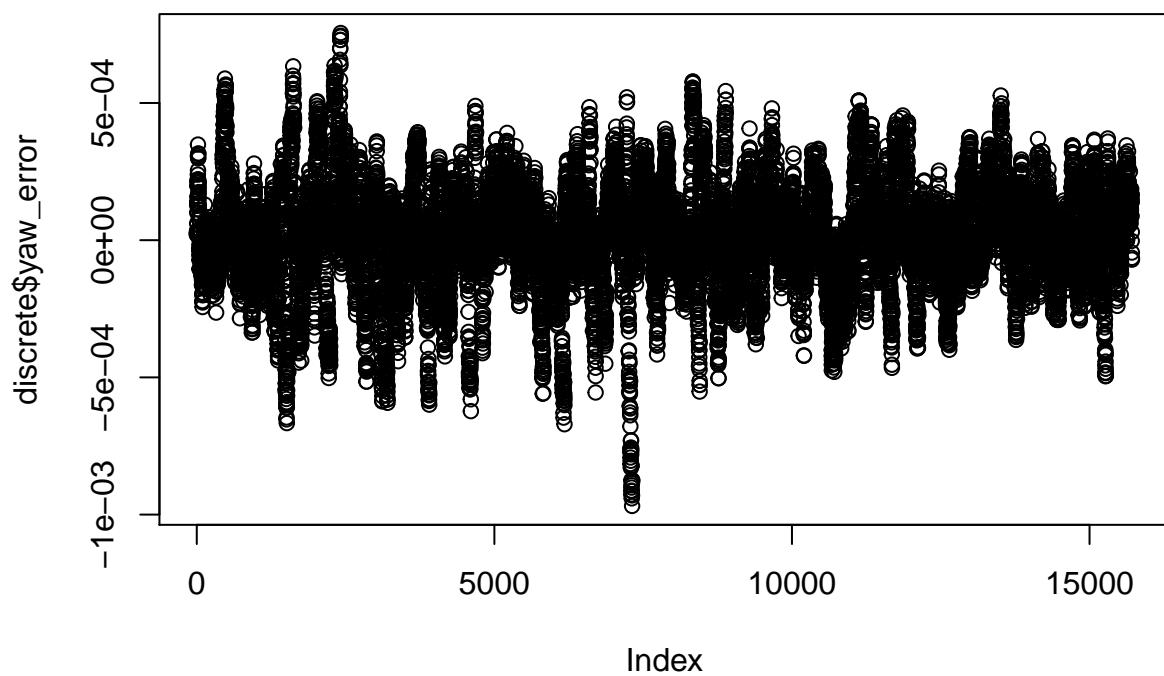
Discrete y_error over time



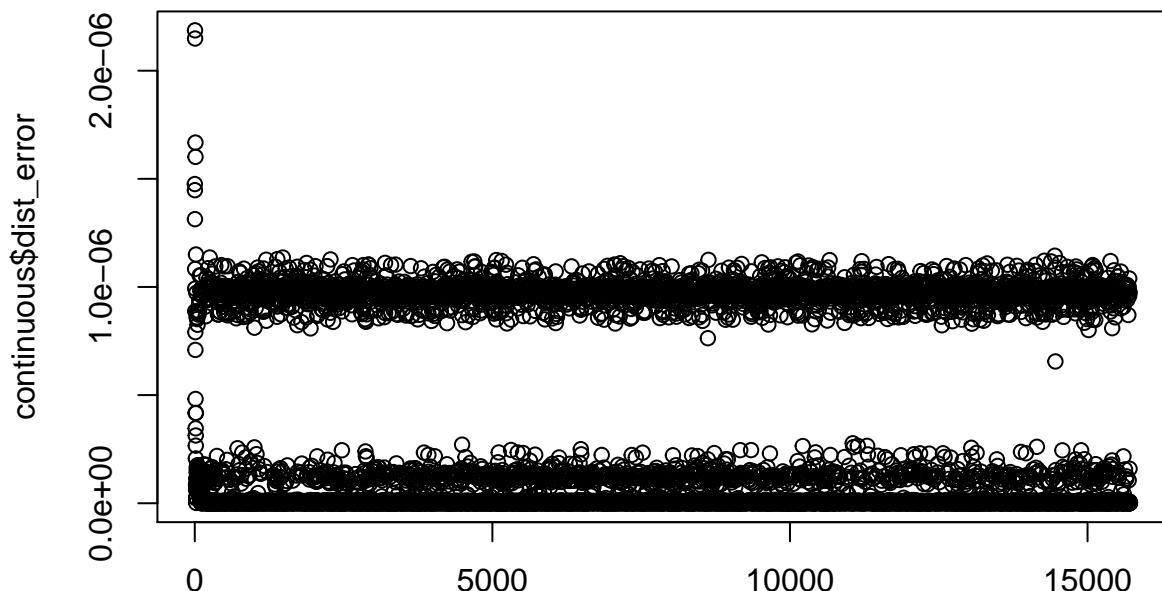
Continuous yaw error over time



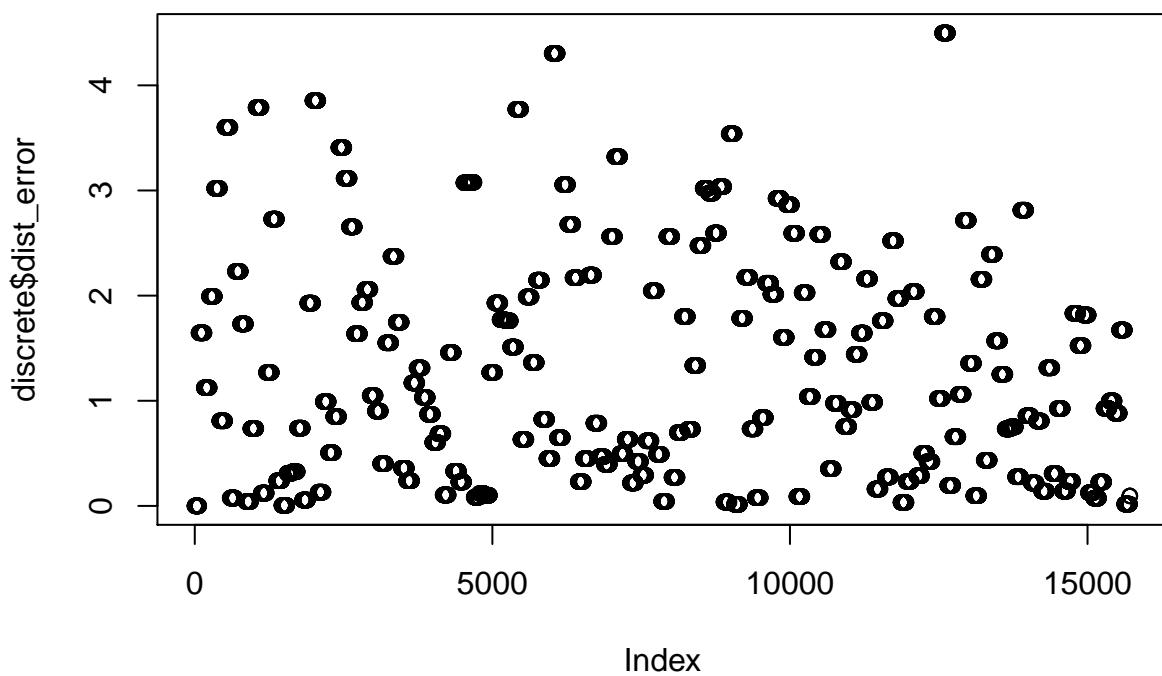
Discrete yaw error over time



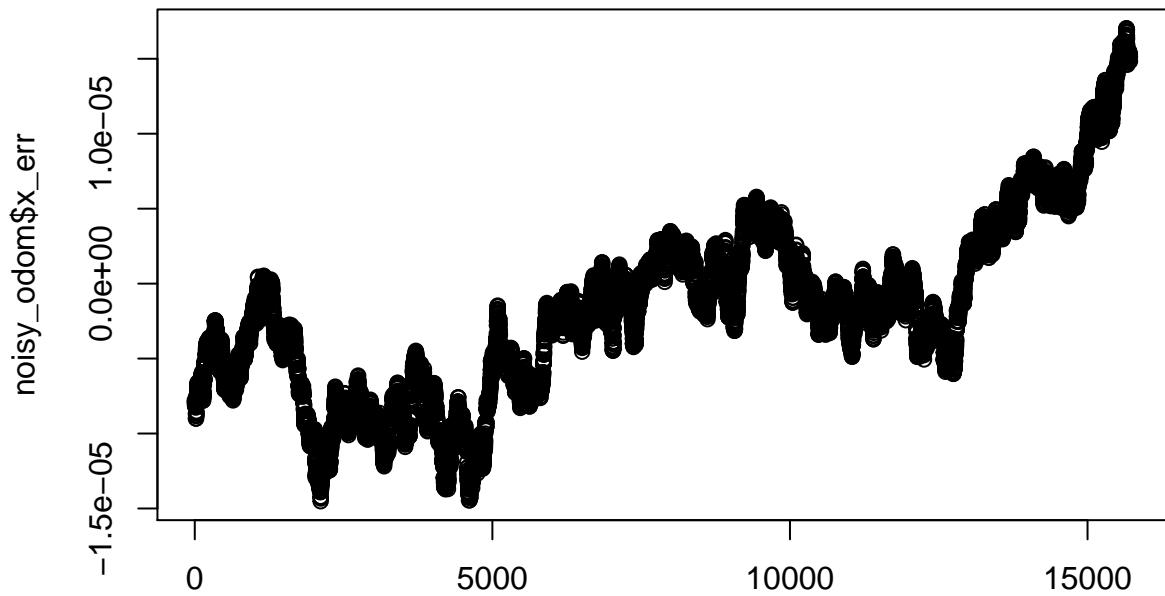
Continuous total distance error over time



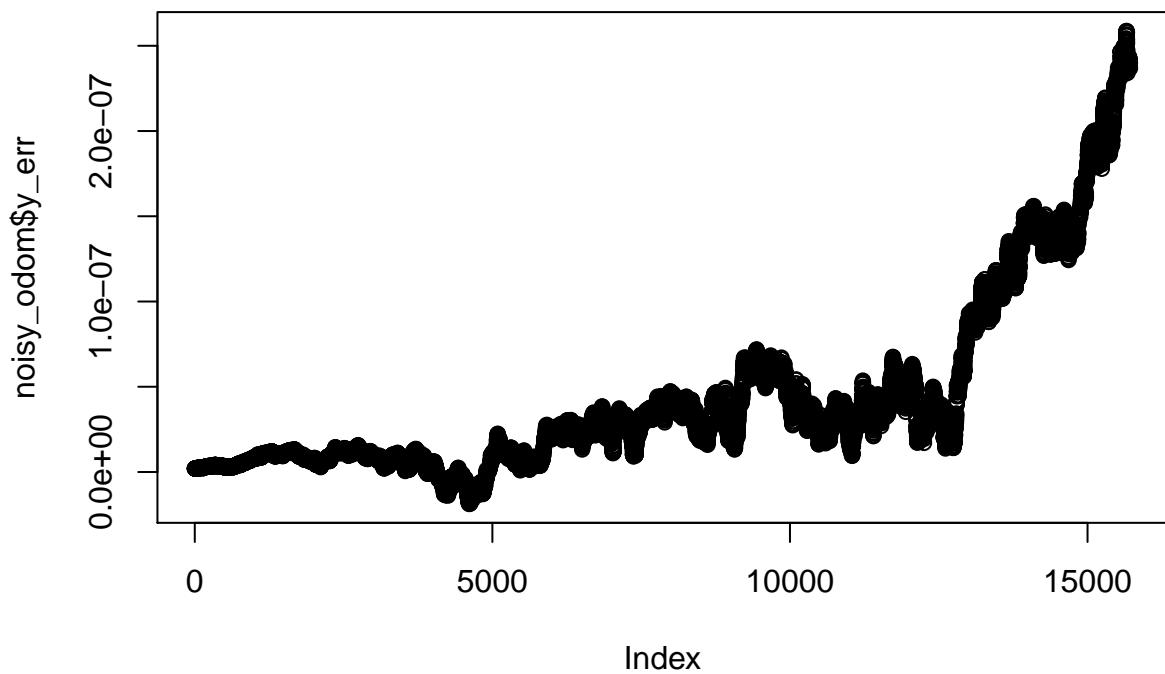
Discrete total distance error over time



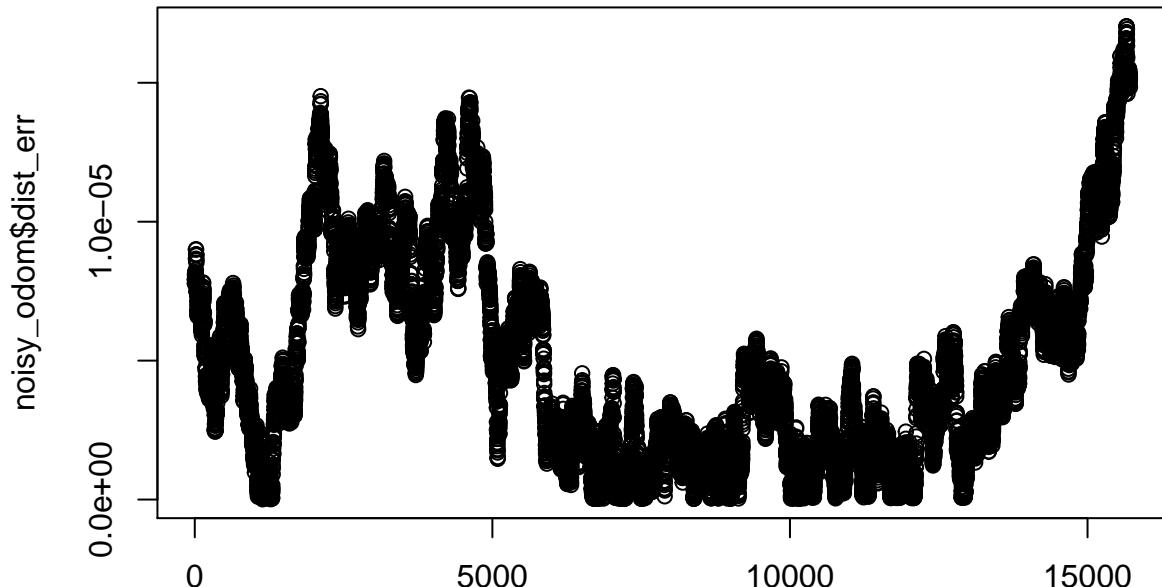
Noisy Odom X Error Over Time



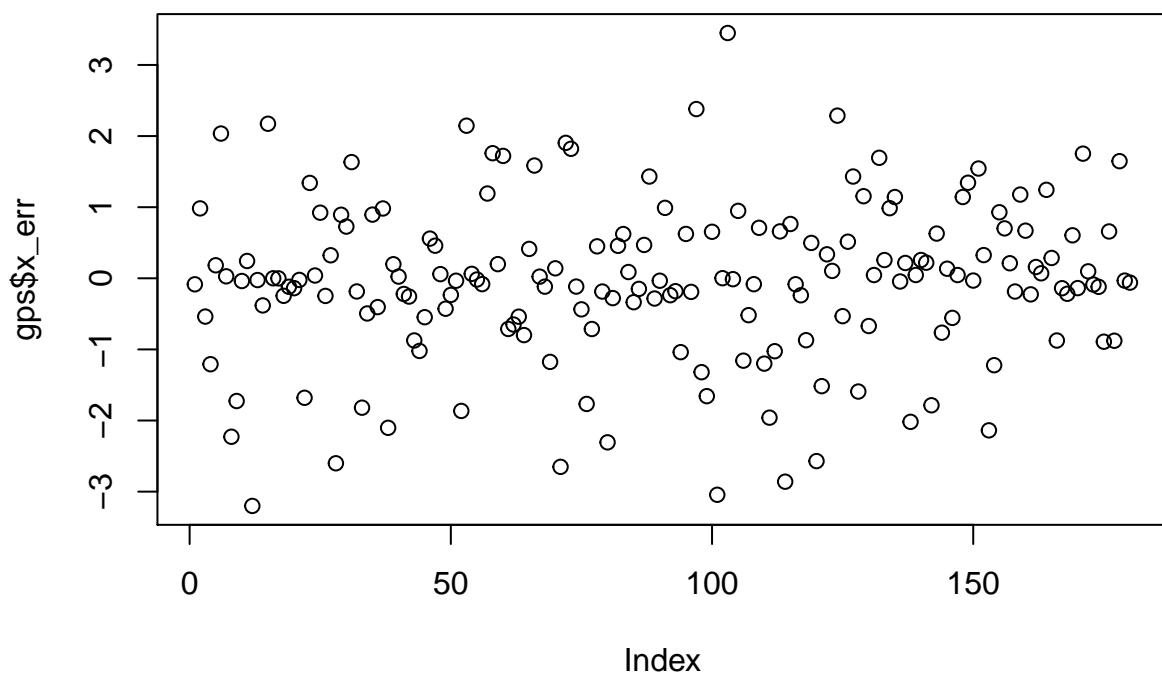
Noisy Odom Y Error Over Time



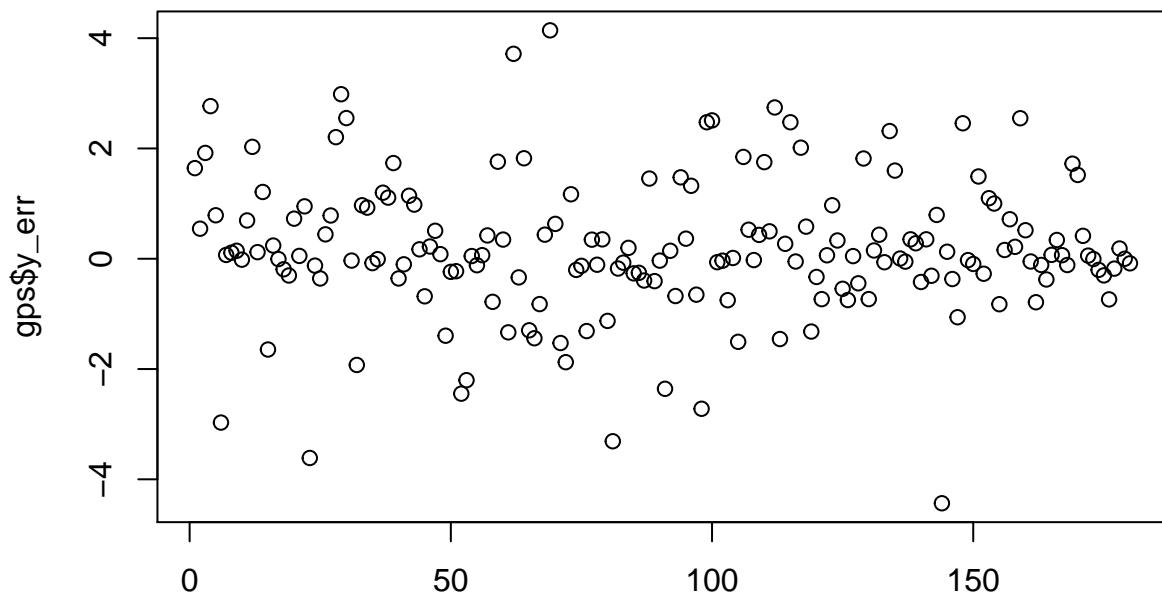
Noisy Odom Horizontal Distance Error Over Time



GPS X Error Over Time



GPS Y Error Over Time



GPS Horizontal Distance Error Over Time

