two_mobile_noiseless Experiment Report

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This is a summary of the data from the two_mobile_noiseless experiment.

Shown below is the summary of the error of all robots combined 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.
## -16.26000  -2.03700   0.01165  -1.88300   0.01614   1.48600
```

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

```
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.516000 -0.318300  0.000001 -0.205900  0.168300  3.082000
```

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

```
##      Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14000 -1.53400 -0.07480 -0.01638  1.63900  3.14000
```

```
summary(continuous$horizontal_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000014  0.168600  0.951500  2.716000  2.938000 16.270000
```

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

```
##      Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -2.07300 -0.05100  0.01011  0.15840  0.36240  3.51800
```

```
summary(discrete$y_error)
```

```
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -1.9430000 -0.0002073  0.0760400  0.2734000  0.3470000  3.1240000
```

```
summary(discrete$yaw_error)
```

```
##     Min. 1st Qu.  Median     Mean 3rd Qu.    Max.
## -3.1360 -1.1630 -0.3763 -0.1076  1.1670  3.1400
```

```
summary(discrete$horizontal_error)
```

```
##      Min.  1st Qu.    Median      Mean  3rd Qu.     Max.
## 0.000003 0.080880 0.310200 0.629300 0.932100 3.592000
```
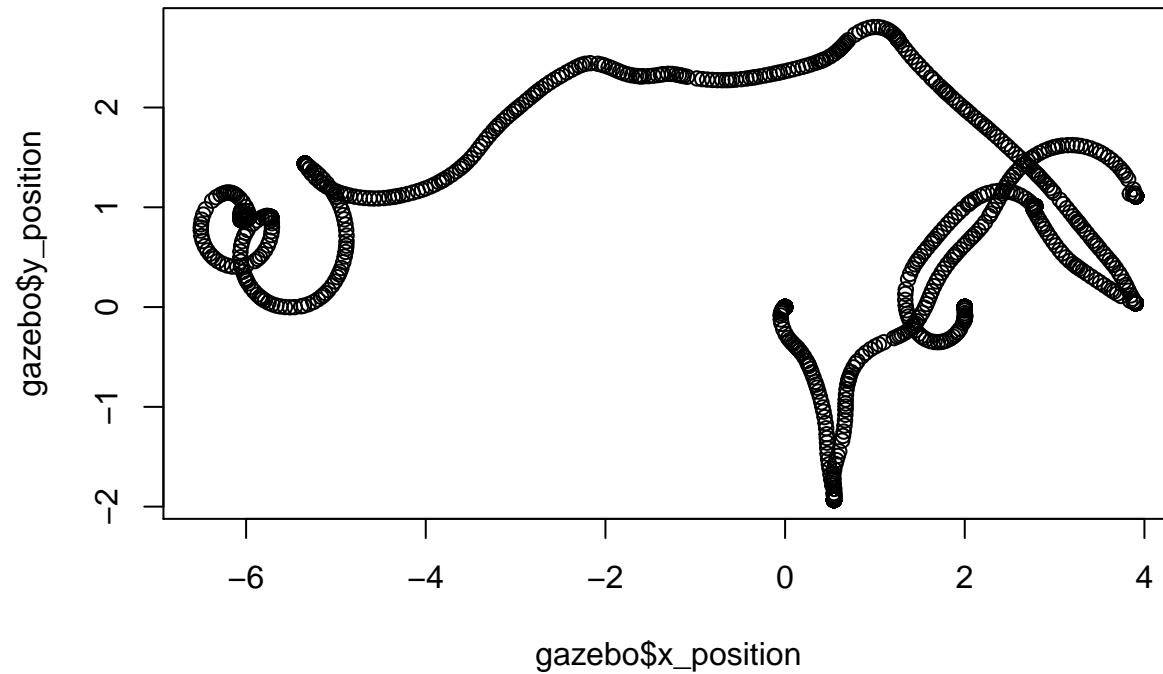
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

```
##       Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

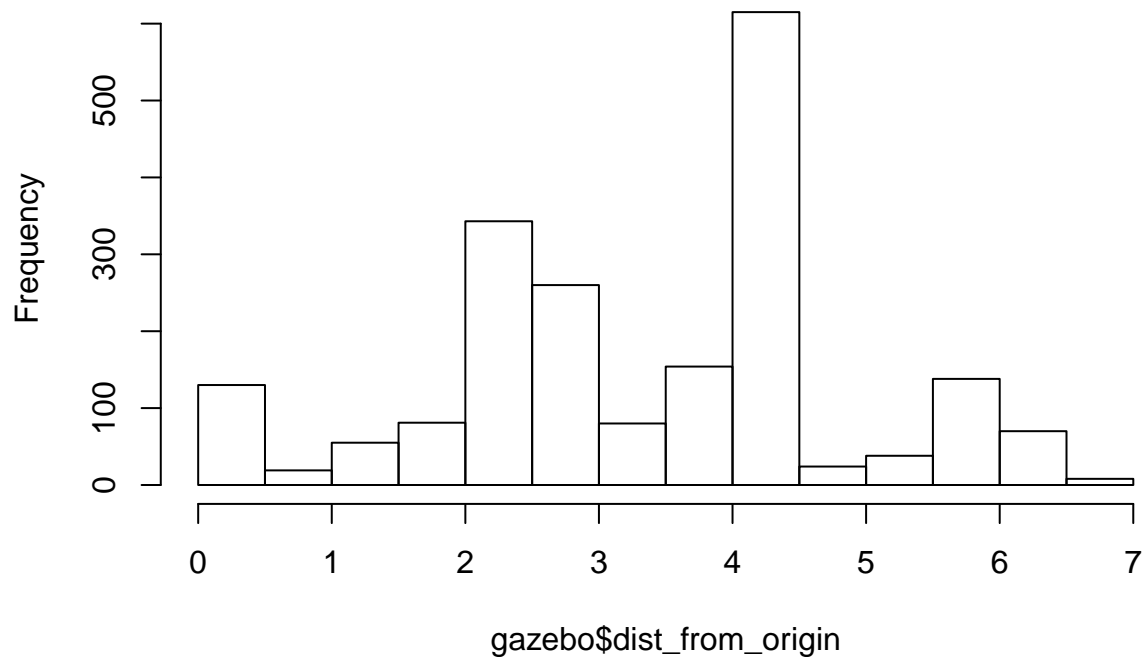Shown below are plots representing the robot's motion and error over time.

```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```

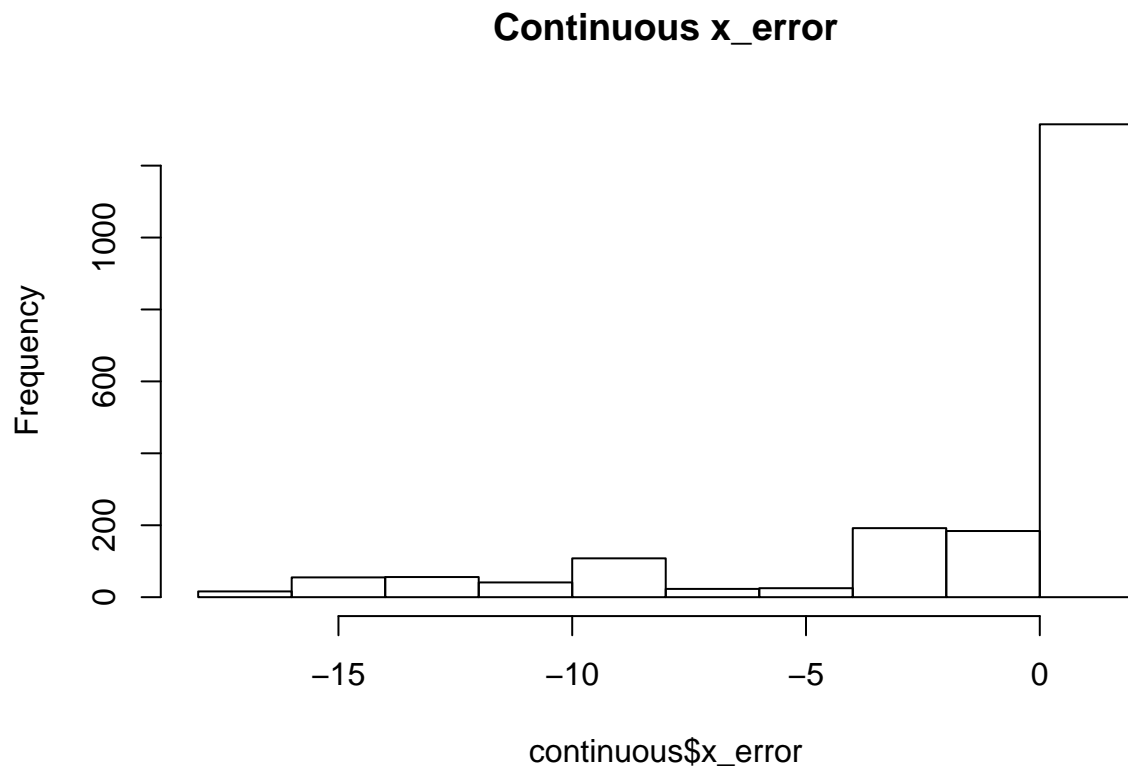## Ground truth visited locations of robots


```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```
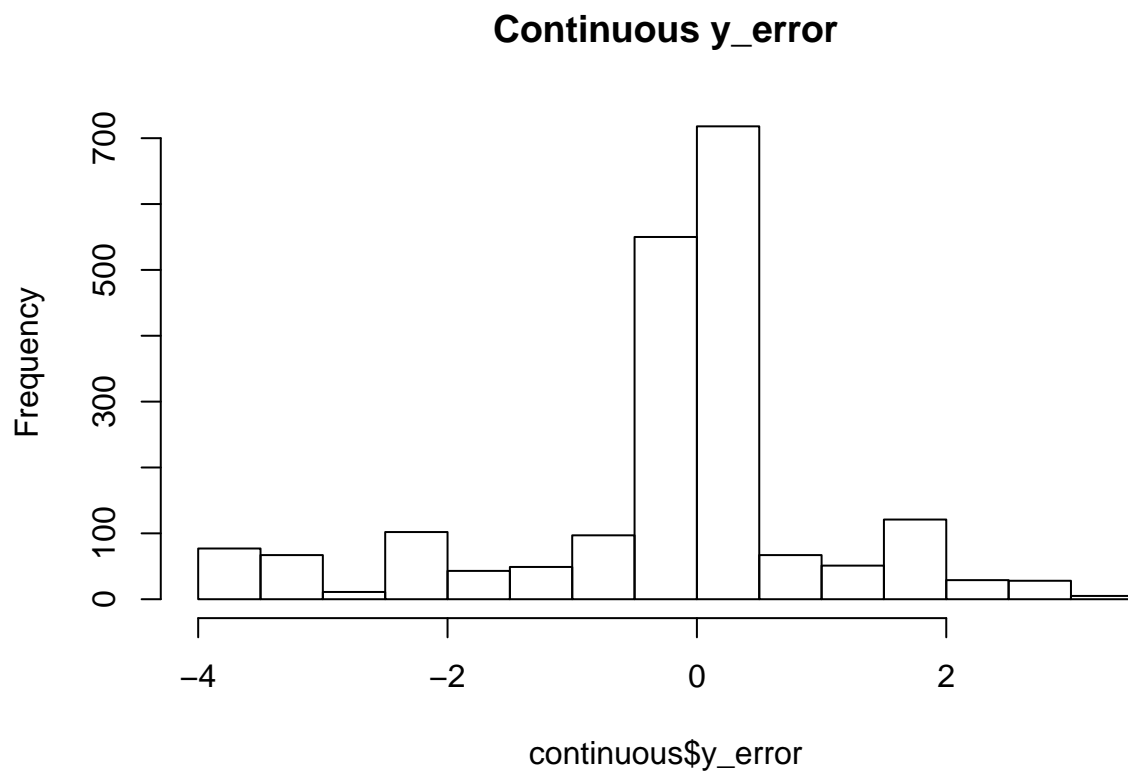
Distance from origin vs. time

```r
hist(continuous$x_error,
     main = "Continuous x_error")
```
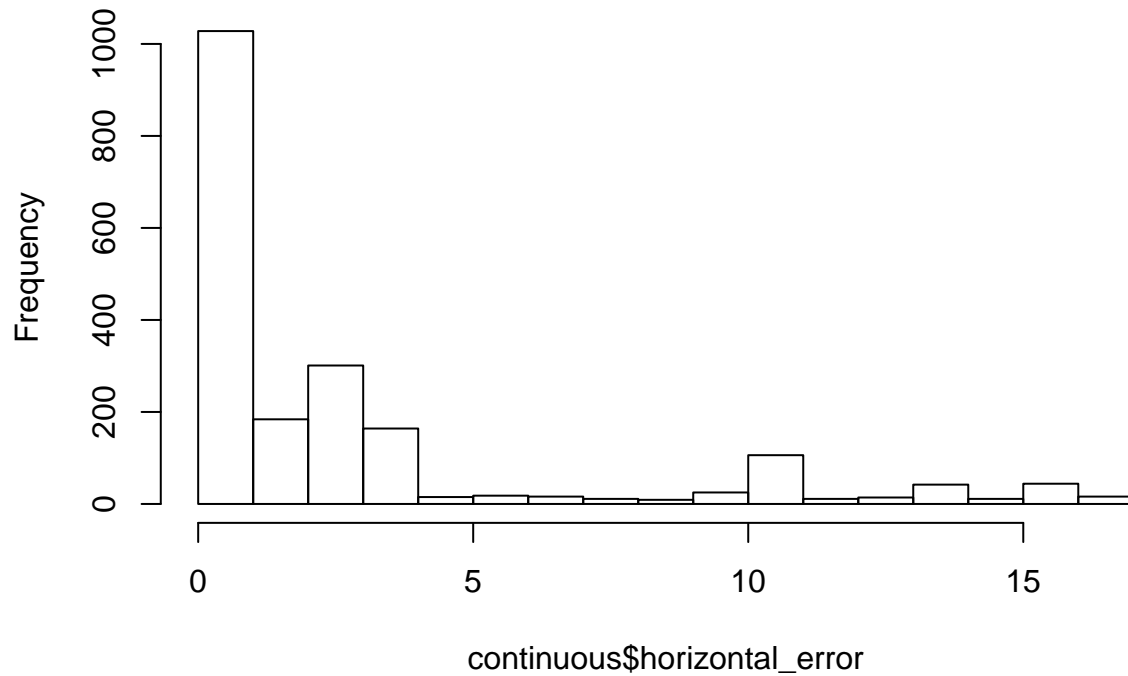
Continuous x_error

continuous$x_error

```r
hist(continuous$y_error,
     main = "Continuous y_error")
```
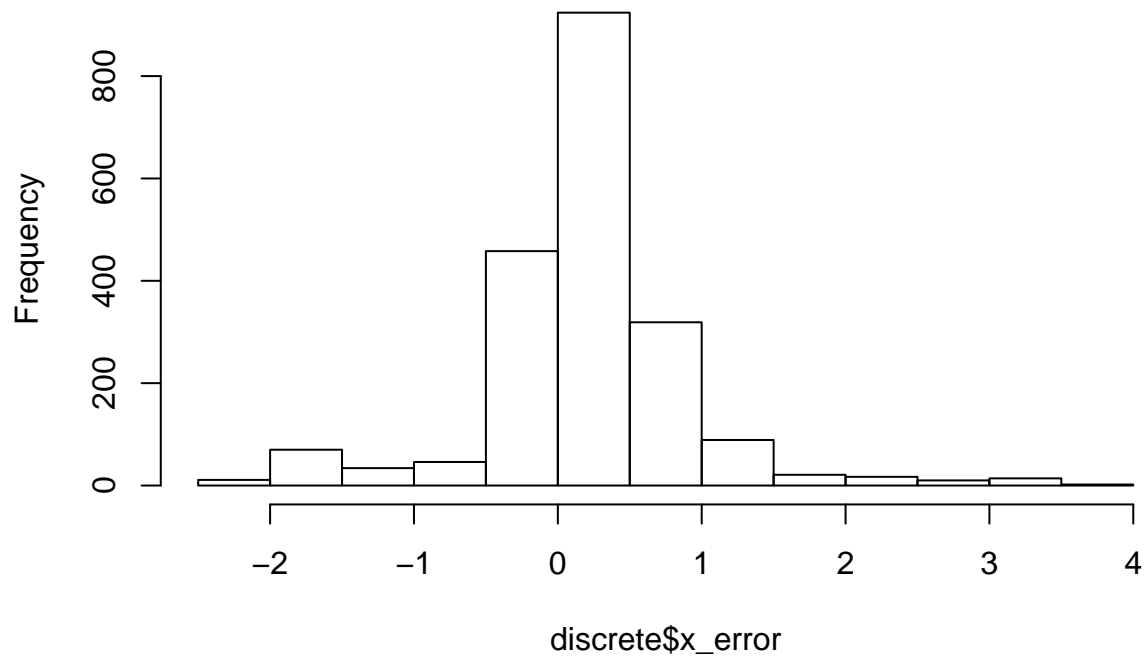
Continuous y_error

continuous$y_error

```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```

Continuous total distance error

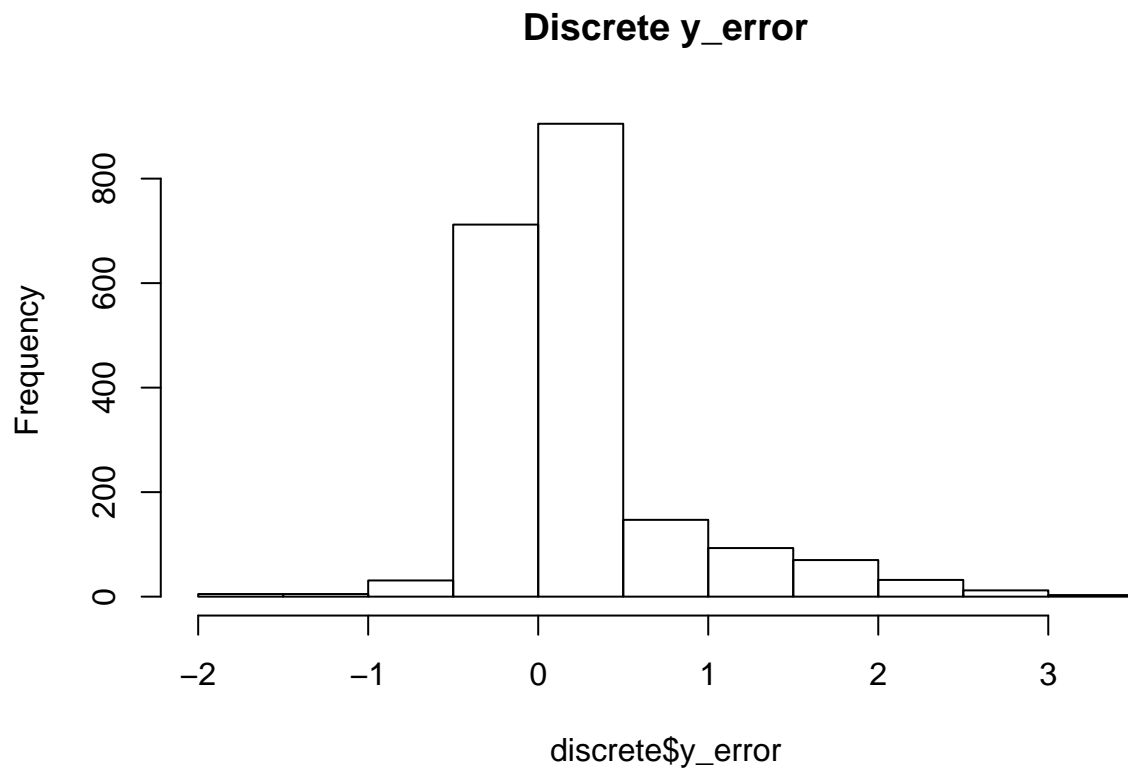continuous$horizontal_error

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```

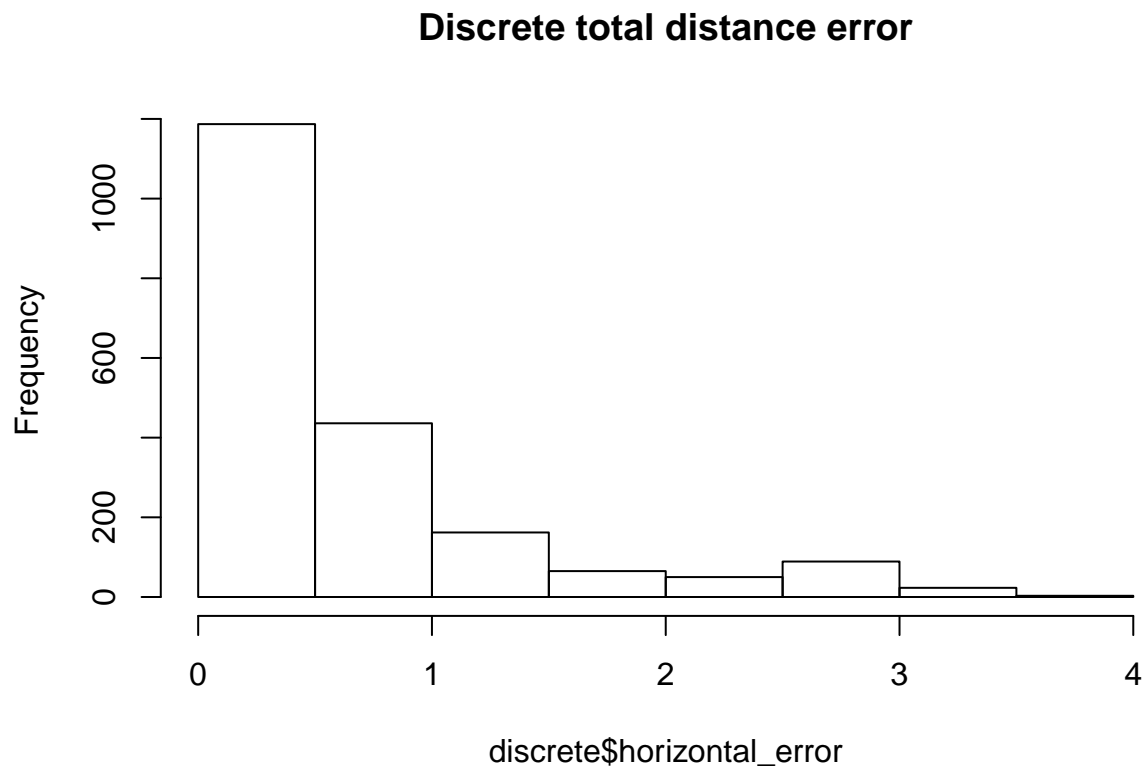## Discrete x_error

discrete$x_error

```
hist(discrete$y_error,
     main = "Discrete y_error")
```

Discrete y_error


```
hist (discrete$horizontal_error,
      main = "Discrete total distance error")
```

Discrete total distance error

```r
figure_dir <- "/home/matt/thesis/writing/r_figures/"
filename = paste0(figure_dir, params$experiment, "_continuous_error.pdf")
pdf(filename)
plot(continuous$horizontal_error, main="Continuous Filter Error", sub=paste0("For ", params$experiment,

dev.off()
```

```
## pdf
##   2
```

```r
filename = paste0(figure_dir, params$experiment, "_discrete_error.pdf")
pdf(filename)
plot(discrete$horizontal_error, main="Discrete Filter Error", sub=paste0("For ", params$experiment, " E
dev.off()
```

```
## pdf
##   2
```

```r
if (params$experiment == "one_stationary_noiseless") {
    gazebo$horizontal_error <- sqrt(gazebo$x_position ^ 2 + gazebo$y_position ^ 2)
    pdf(paste0(figure_dir, "gazebo_odom_drift.pdf"))

    plot(gazebo$horizontal_error, main="Gazebo Odometry Drift for Stationary Robot with Noiseless Odome
    dev.off()
}
```

```r
table_dir <- "/home/matt/thesis/writing/autogenerated_tables/"

out_file <- paste0(table_dir, params$experiment, "_continuous_summary.tex")
tex_label <- paste0("tab:", params$experiment, "_continuous_summary")
stargazer(continuous,
          out=out_file,
          table.placement="h",
          label=tex_label,
          title=gsub("_", "-", paste0("Continuous Filter Estimate for ", params$experiment, " Experiment
          digits.extra = 20)
```

```
##
## % Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard
## % Date and time: Mon, Aug 15, 2016 - 04:27:28 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-mobile-noiseless Experiment}
##   \label{tab:two_mobile_noiseless_continuous_summary}
## \begin{tabular}{@{\extracolsep{5pt}}lccccc}
## \\[-1.8ex]\hline
## \hline \\[-1.8ex]
## Statistic & \multicolumn{1}{c}{N} & \multicolumn{1}{c}{Mean} & \multicolumn{1}{c}{St. Dev.} & \multic
## \hline \\[-1.8ex]
## x\_position & 2,015 & 3.074 & 2.345 & $-$0.936 & 10.209 \\
## y\_position & 2,015 & 0.849 & 0.743 & $-$0.644 & 2.579 \\
## yaw & 2,015 & 0.617 & 1.060 & $-$3.140 & 3.137 \\
## x\_variance & 2,015 & 5.547 & 3.132 & 0.126 & 11.007 \\
## y\_variance & 2,015 & 5.547 & 3.132 & 0.126 & 11.007 \\
## yaw\_variance & 2,015 & 5.084 & 2.870 & 0.114 & 10.073 \\
## yaw\_error & 2,015 & $-$0.016 & 1.835 & $-$3.140 & 3.140 \\
## x\_error & 2,015 & $-$1.883 & 4.367 & $-$16.263 & 1.486 \\
```

```
## y\_error & 2,015 & $-$0.206 & 1.286 & $-$3.516 & 3.082 \\
## horizontal\_error & 2,015 & 2.716 & 4.115 & 0.00001 & 16.272 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```

```r
out_file <- paste0(table_dir, params$experiment, "_discrete_summary.tex")
tex_label <- paste0("tab:", params$experiment, "_discrete_summary")
stargazer(discrete,
          out=out_file,
          table.placement="h",
          label=tex_label,
          title=gsub("_", "-", paste0("Discrete Filter Estimate for ", params$experiment, " Experiment")
          digits.extra = 20)
```

```
##
## % Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard
## % Date and time: Mon, Aug 15, 2016 - 04:27:28 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-mobile-noiseless Experiment}
##   \label{tab:two_mobile_noiseless_discrete_summary}
## \begin{tabular}{@{\extracolsep{5pt}}lccccc}
## \\[-1.8ex]\hline
## \hline \\[-1.8ex]
## Statistic & \multicolumn{1}{c}{N} & \multicolumn{1}{c}{Mean} & \multicolumn{1}{c}{St. Dev.} & \multi
## \hline \\[-1.8ex]
## x\_position & 2,015 & 1.033 & 2.814 & $-$5.881 & 3.906 \\
## y\_position & 2,015 & 0.370 & 1.051 & $-$2.954 & 2.501 \\
## yaw & 2,015 & $-$0.262 & 1.556 & $-$3.139 & 3.136 \\
## x\_variance & 2,015 & 0.363 & 0.299 & 0.001 & 1.089 \\
## y\_variance & 2,015 & 0.363 & 0.299 & 0.001 & 1.089 \\
## yaw\_variance & 2,015 & 0.496 & 0.239 & 0.092 & 0.925 \\
## x\_error & 2,015 & 0.158 & 0.734 & $-$2.073 & 3.518 \\
## y\_error & 2,015 & 0.273 & 0.586 & $-$1.943 & 3.124 \\
## horizontal\_error & 2,015 & 0.629 & 0.766 & 0.000003 & 3.592 \\
## yaw\_error & 2,015 & $-$0.108 & 1.691 & $-$3.136 & 3.140 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```

```r
if (params$experiment == "one_stationary_noiseless") {
    stargazer(gazebo,
              out=paste0(table_dir, "gazebo_stationary_noiseless_summary.tex"),
              table.placement="h",
              label="tab:gazebo_stationary_noiseless_summary",
              title="Ground Truth Noiseless Odometry for Stationary Robot located at Origin",
              digits.extra = 20)
}
```