# five_mobile Experiment Report

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*August 09, 2016*

```
## Loading required package: data.table

## Loading required package: stargazer

##
## Please cite as:

##  Hlavac, Marek (2015). stargazer: Well-Formatted Regression and Summary Statistics Tables.

##  R package version 5.2. http://CRAN.R-project.org/package=stargazer
```

This is a summary of the data from the five_mobile 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.
## -11.9400  -0.3342   1.2830   0.9390   3.4400   8.4200
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -6.94700 -2.45200  0.02682  0.88450  2.87300 17.05000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14200 -1.36600 -0.14480 -0.06456  1.14200  3.14200
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.007337  1.986000  3.920000  4.838000  6.634000 17.080000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -211.2000  -17.3000   -0.4340   -0.1093   15.4100  213.9000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -174.600  -30.840   -5.302   -9.833    8.732  193.400
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1420000 -0.0561800  0.0001138  0.1121000  0.5771000  3.1410000
```

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

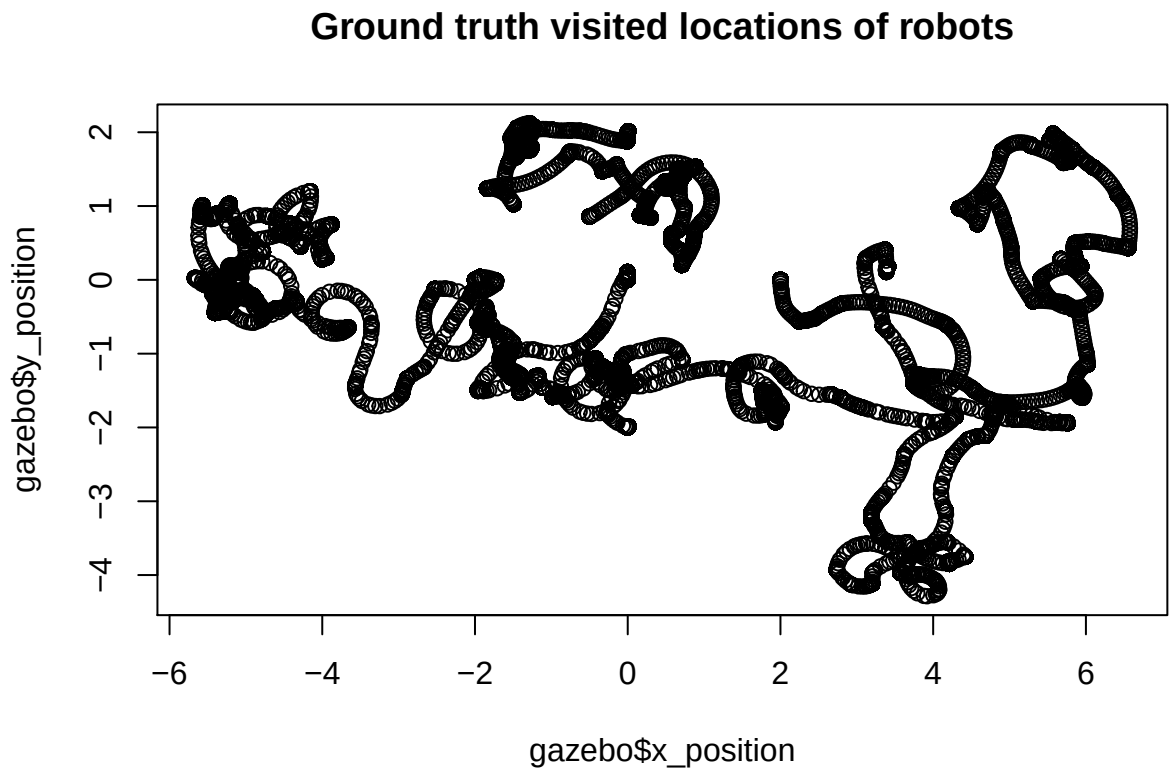
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##   0.00463  15.58000  35.91000  45.69000  66.89000 221.30000
```

```r
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

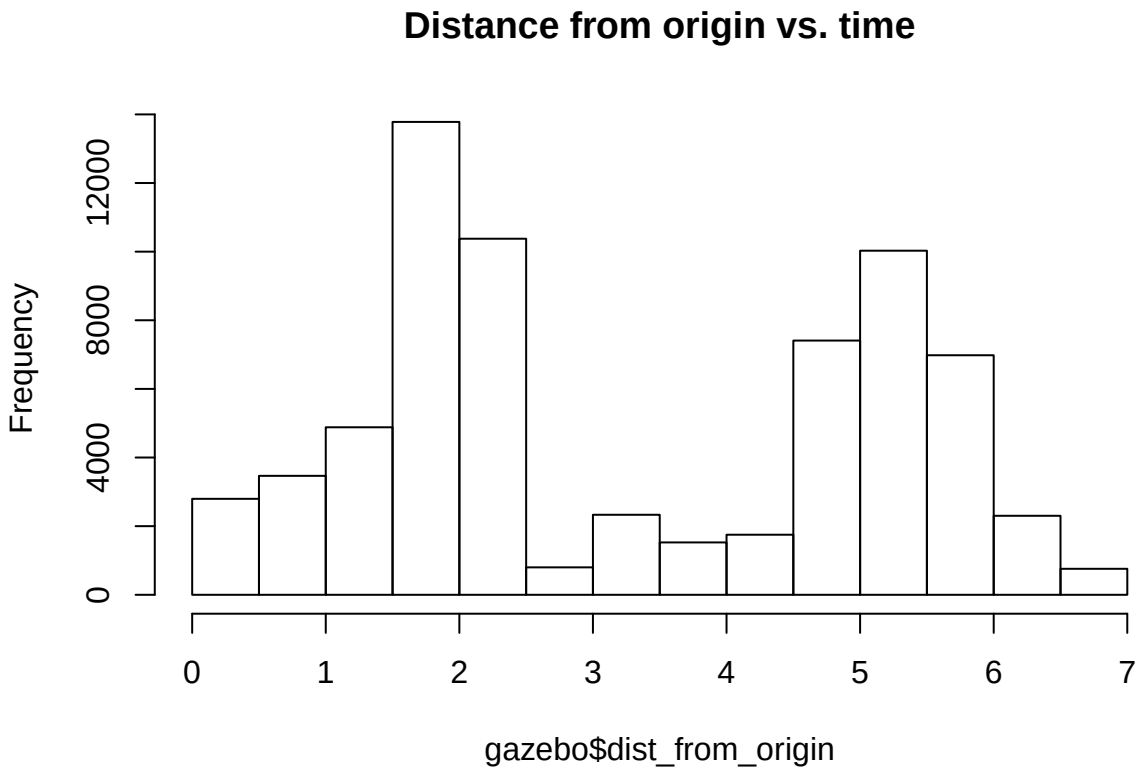
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
## [3,] 1      -none- numeric
## [4,] 1      -none- numeric
## [5,] 1      -none- numeric
```

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

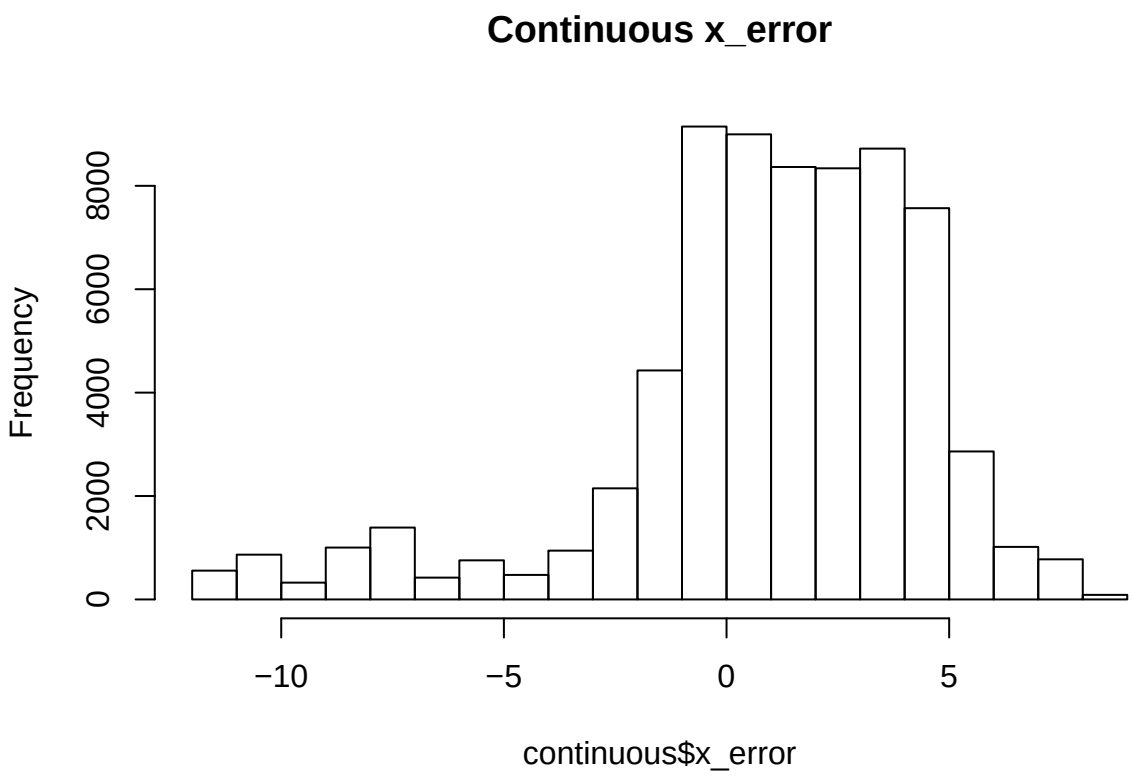
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



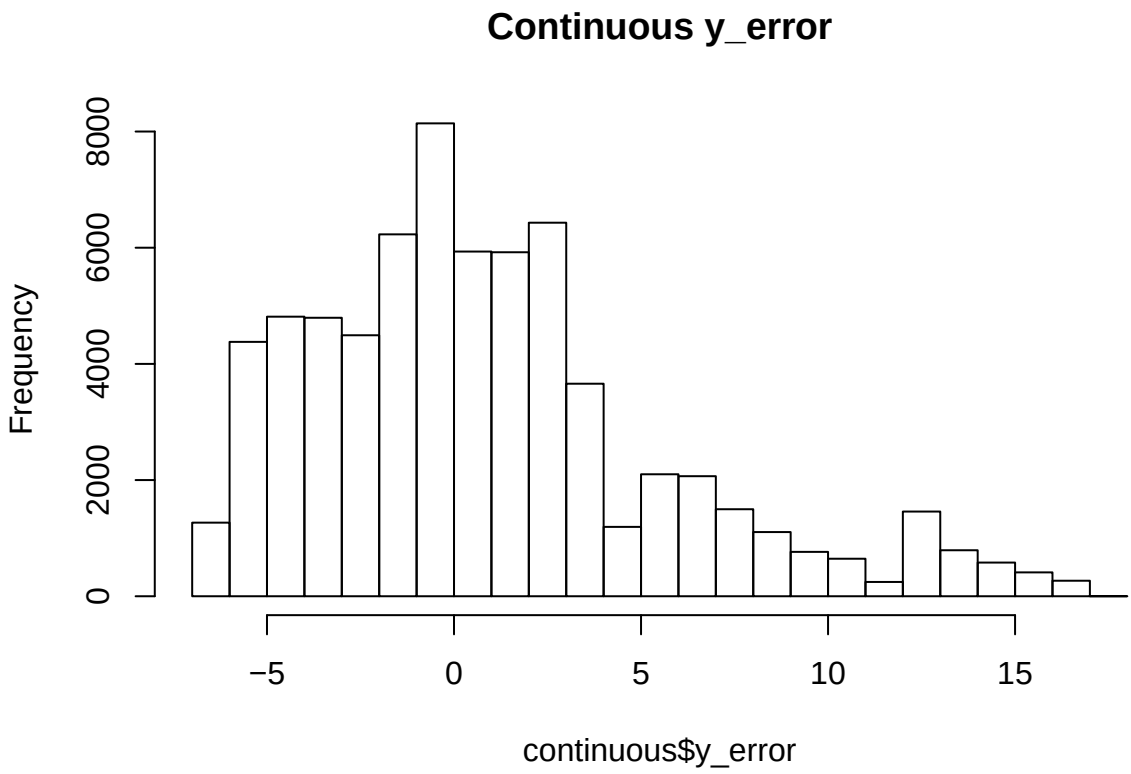

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



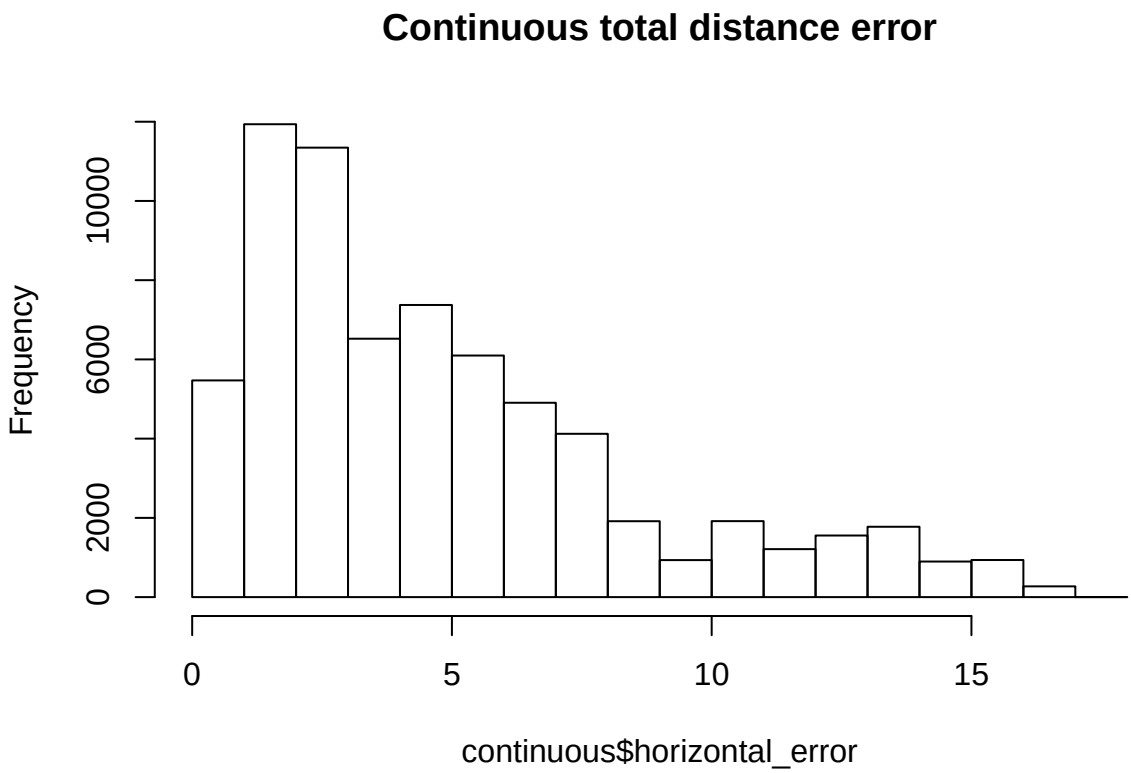
```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



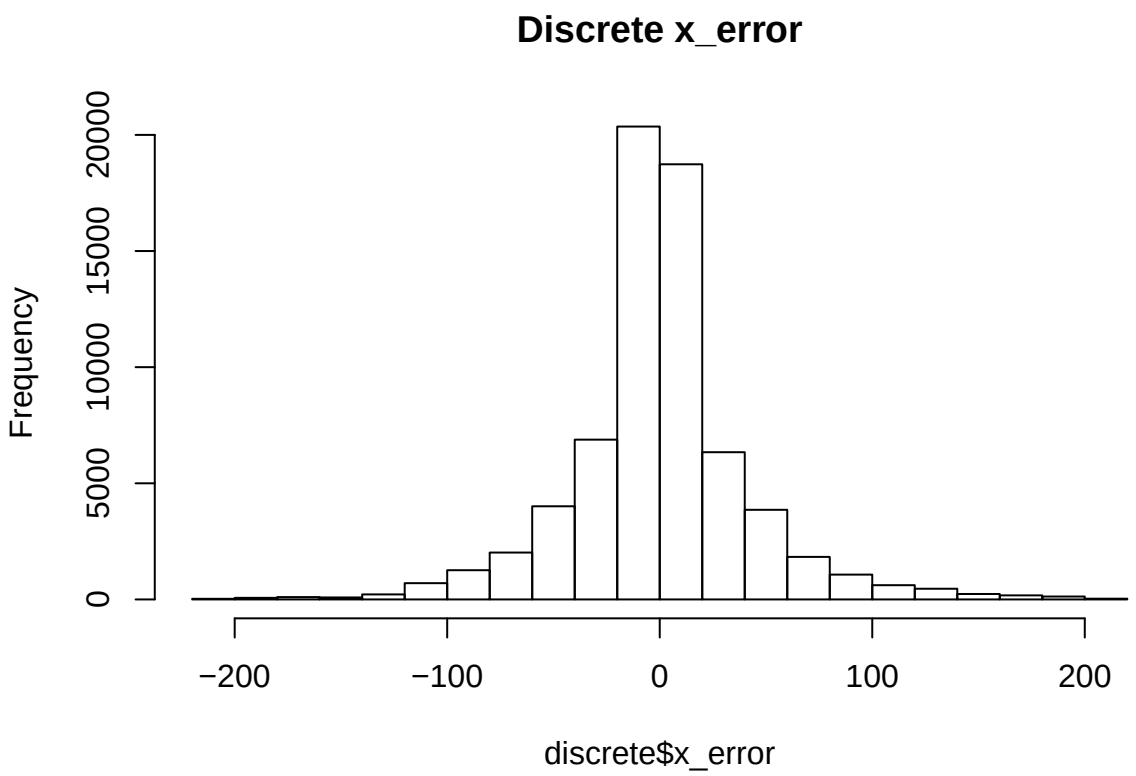

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



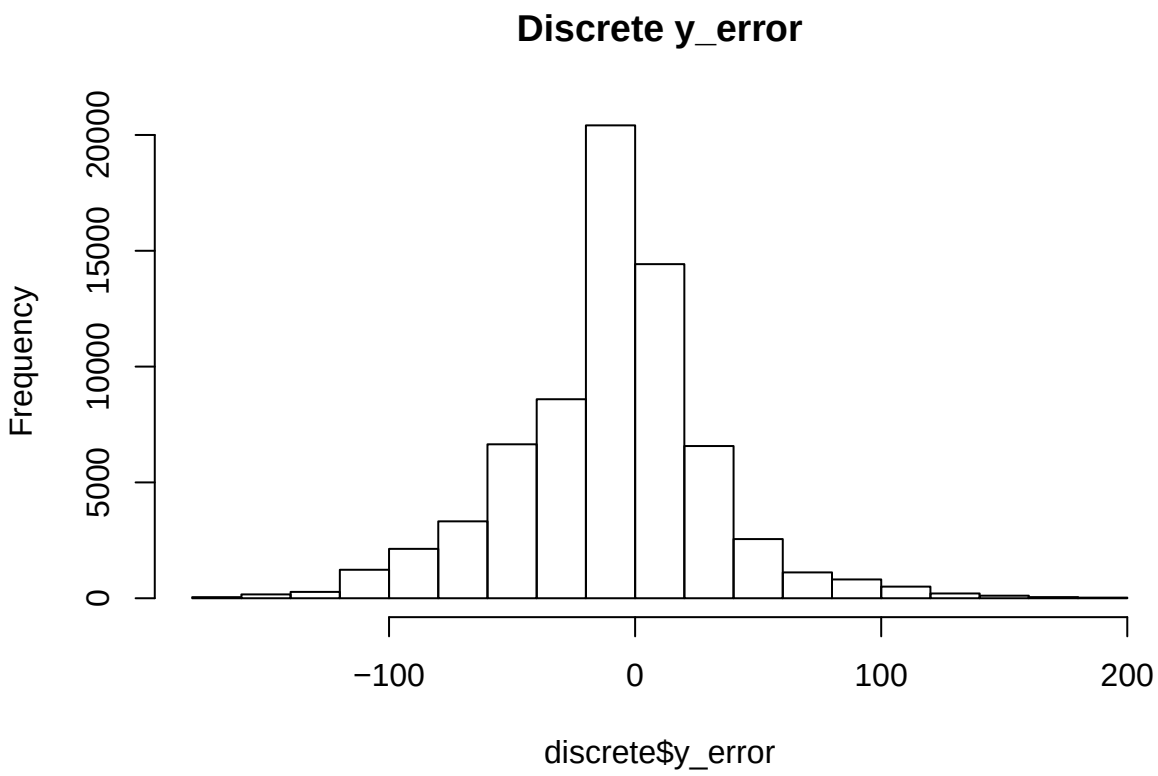

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



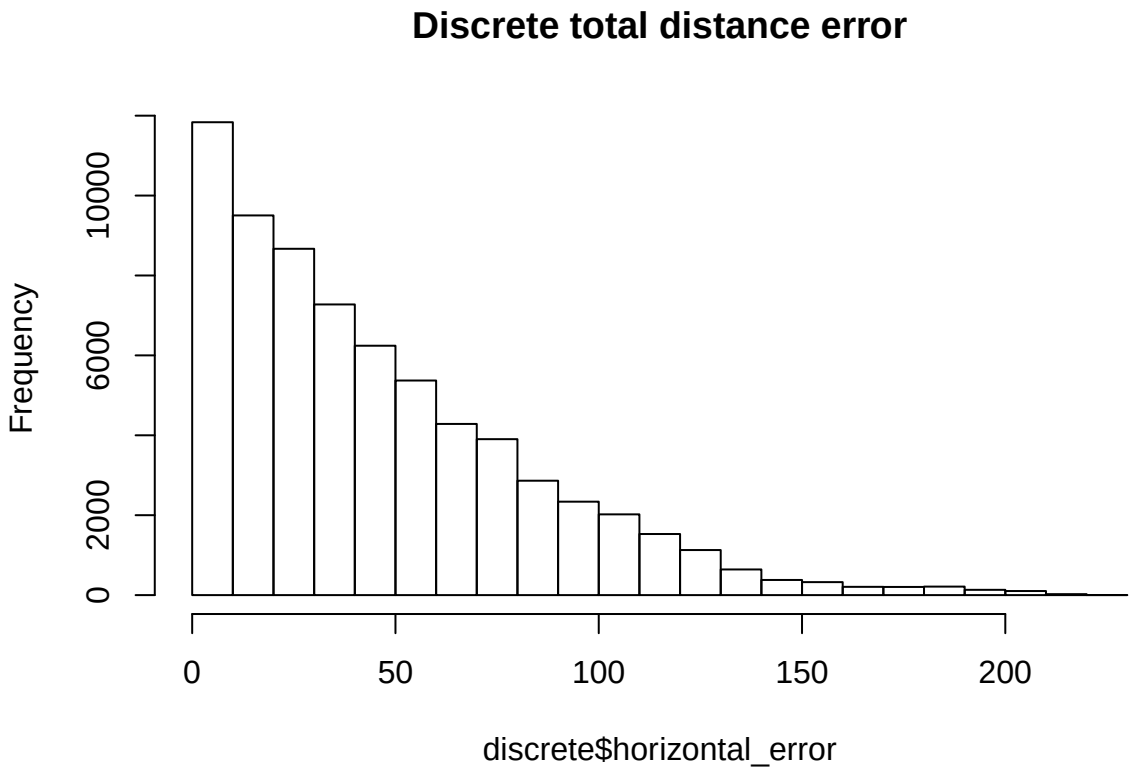
```r
hist(discrete$x_error,
     main = "Discrete x_error")
```




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




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



```
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
```

```
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
```

```
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()
}
```

```
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, " Experimen
          digits.extra = 20)
```

```
##
## % Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvar
## % Date and time: Tue, Aug 09, 2016 - 09:46:05 AM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for five-mobile Experiment}
##   \label{tab:five_mobile_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.} & \multi
## \hline \\[-1.8ex]
## x\_position & 69,192 & $-$0.235 & 3.406 & $-$7.471 & 8.570 \\
## y\_position & 69,192 & $-$1.083 & 5.540 & $-$17.690 & 7.978 \\
## yaw & 69,192 & 0.022 & 1.829 & $-$3.141 & 3.142 \\
```

```
## yaw\_error & 69,192 & $-$0.065 & 1.692 & $-$3.142 & 3.142 \\
## x\_error & 69,192 & 0.939 & 3.580 & $-$11.943 & 8.420 \\
## y\_error & 69,192 & 0.884 & 4.789 & $-$6.947 & 17.053 \\
## horizontal\_error & 69,192 & 4.838 & 3.743 & 0.007 & 17.083 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```

```
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.harvar
## % Date and time: Tue, Aug 09, 2016 - 09:46:05 AM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for five-mobile Experiment}
##   \label{tab:five_mobile_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 & 69,192 & 0.813 & 41.936 & $-$209.465 & 210.747 \\
## y\_position & 69,192 & 9.634 & 40.915 & $-$192.420 & 173.376 \\
## yaw & 69,192 & 0.066 & 1.758 & $-$3.141 & 3.141 \\
## x\_error & 69,192 & $-$0.109 & 41.989 & $-$211.164 & 213.926 \\
## y\_error & 69,192 & $-$9.833 & 40.885 & $-$174.640 & 193.392 \\
## horizontal\_error & 69,192 & 45.689 & 37.998 & 0.005 & 221.287 \\
## yaw\_error & 69,192 & 0.112 & 1.251 & $-$3.142 & 3.141 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```

```
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)
}
```