two_mobile_no_gps Experiment Report

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This is a summary of the data from the two_mobile_no_gps 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.
## -171.600  -68.240   -6.431  -24.120   13.770   97.450
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -98.4100 -50.3800  -0.6115  -9.9340  25.0900  66.0400
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1410000 -1.5720000  0.0000993  0.0310900  1.5890000  3.1410000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##   0.00001  20.90000  62.10000  66.20000 105.30000 183.90000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -302.800 -294.900 -261.100 -217.500 -170.100    8.054
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -59.3500 -51.4100 -44.8400 -41.4500 -37.5900   0.3647
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1410000 -1.5670000  0.0000453  0.0314100  1.5820000  3.1390000
```

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

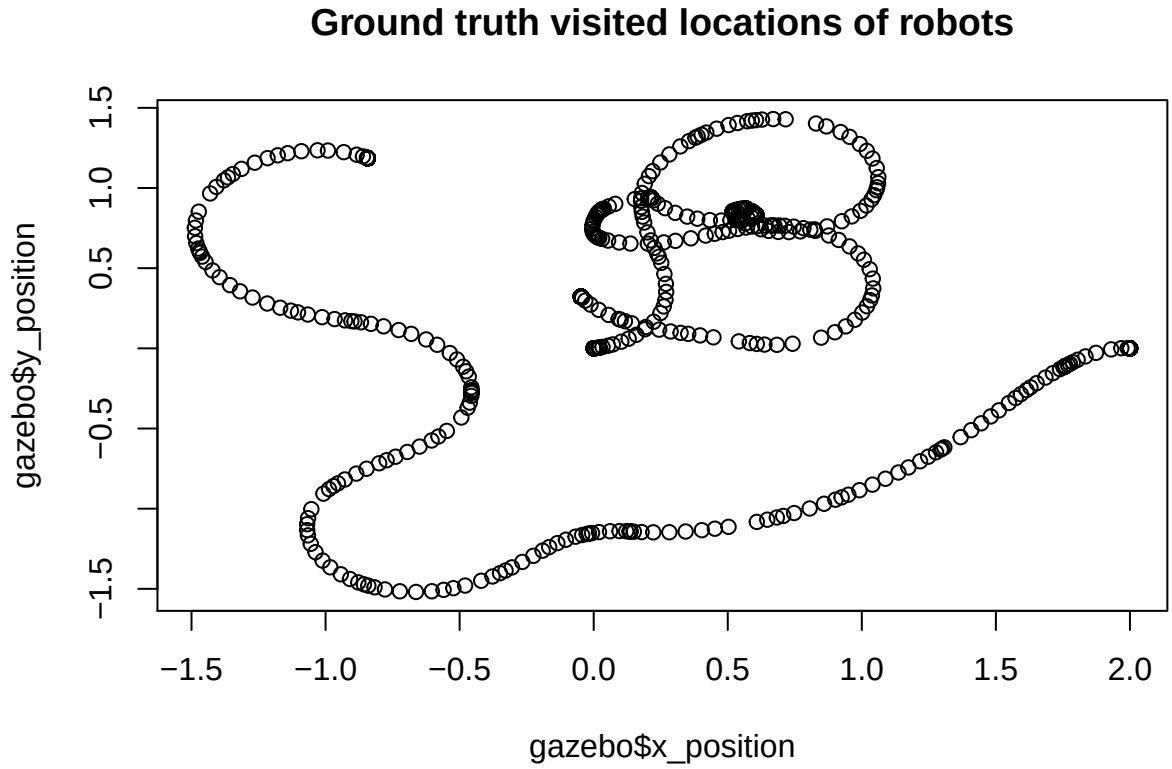
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##   0.00002 174.40000 266.20000 222.40000 299.10000 305.90000
```

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

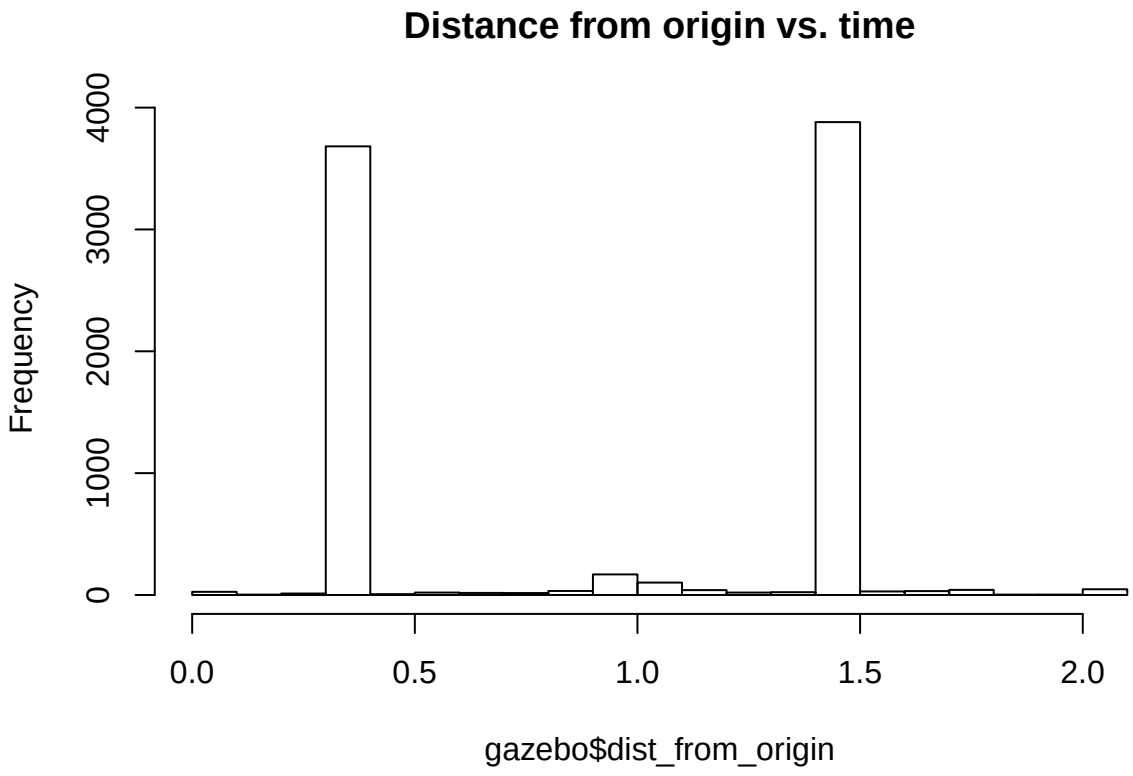
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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

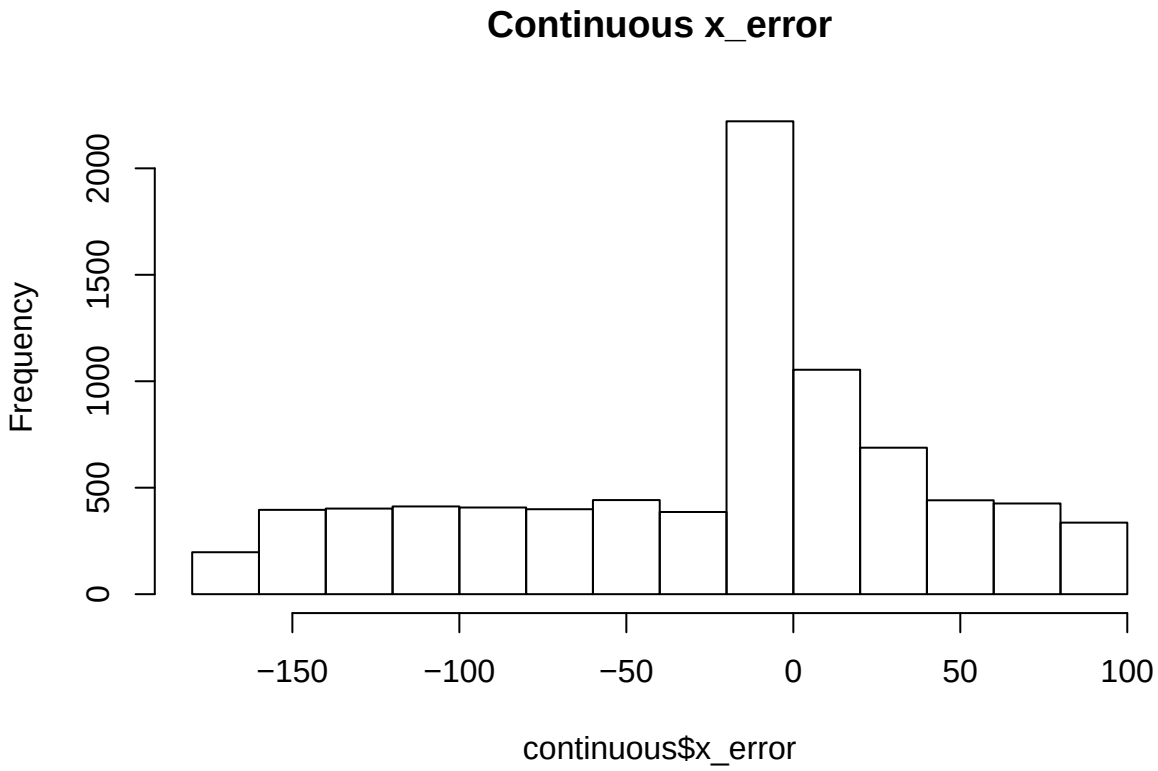
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



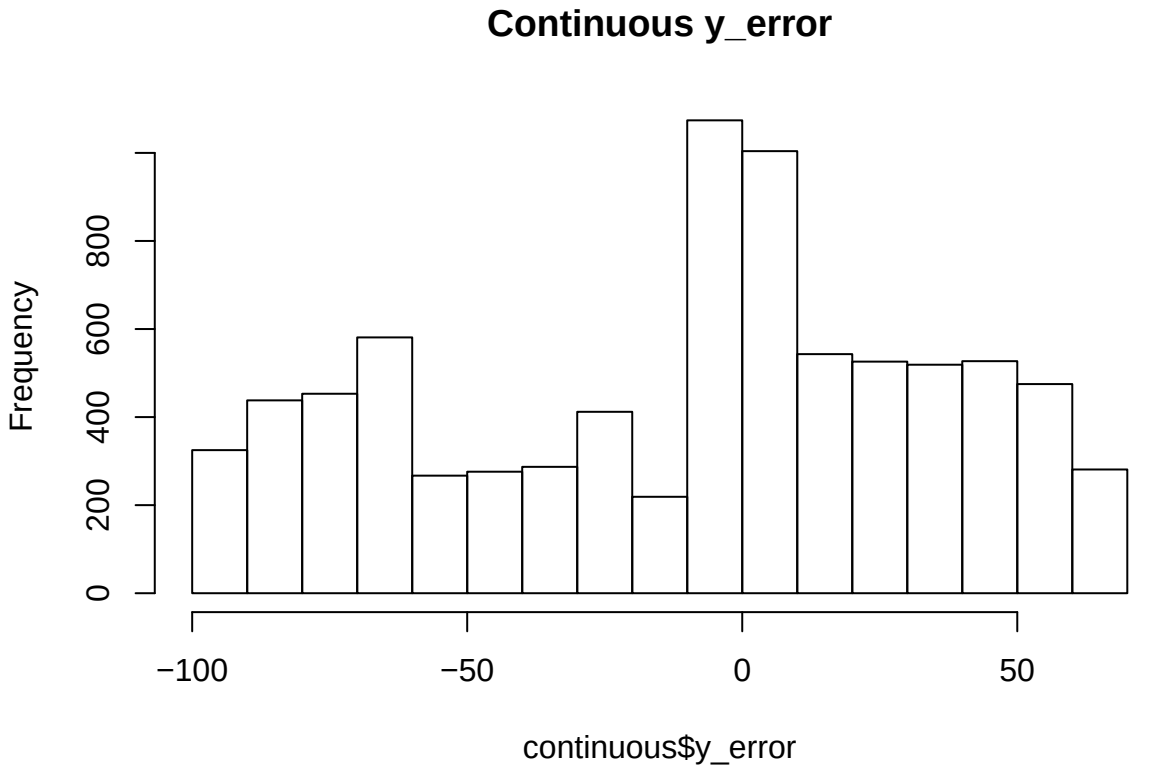

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



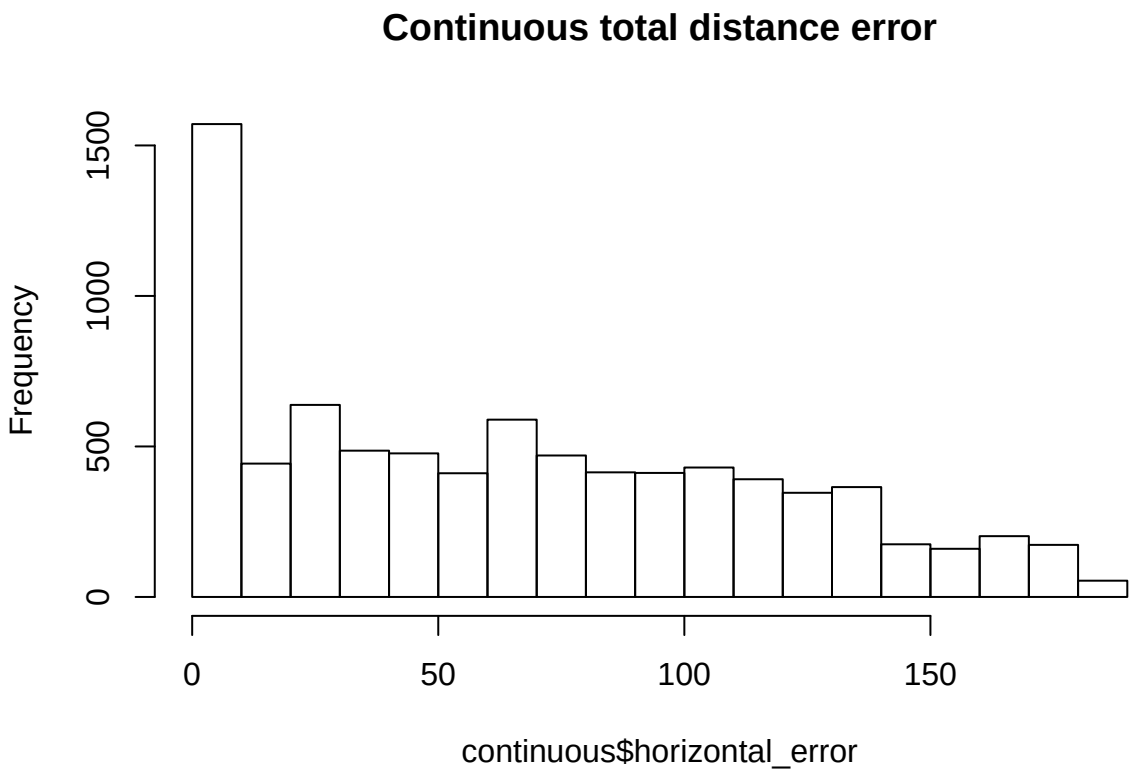
```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



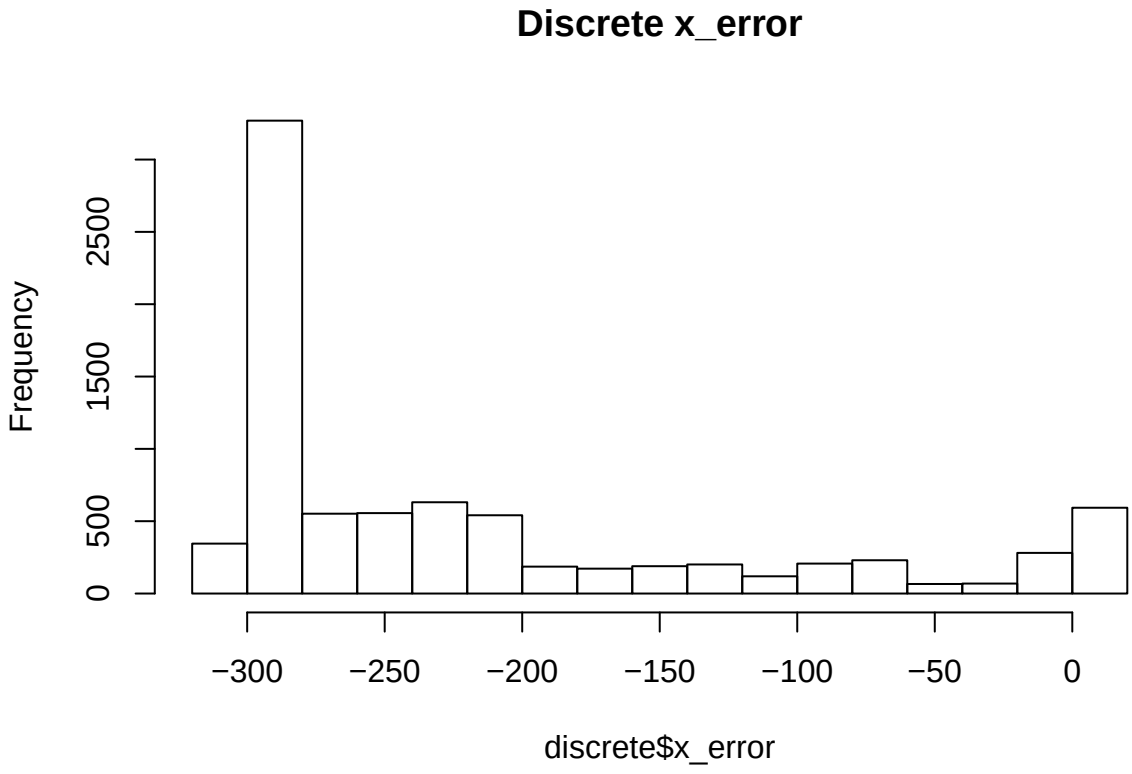

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



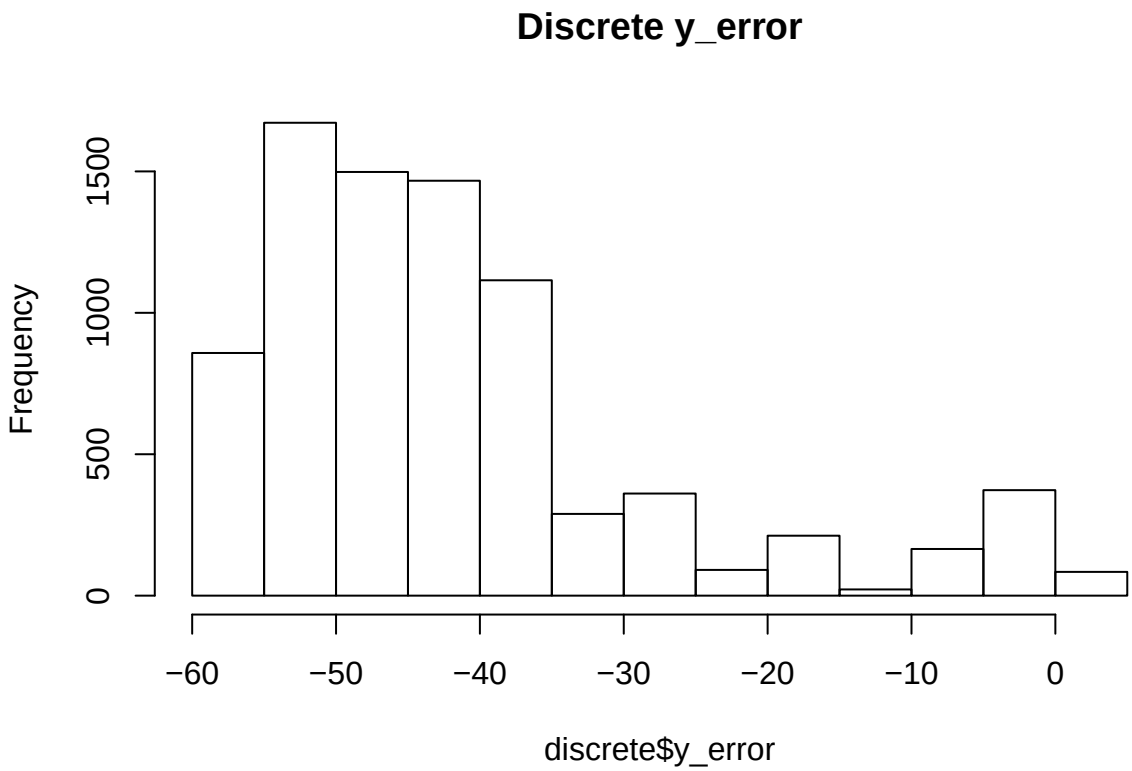
```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



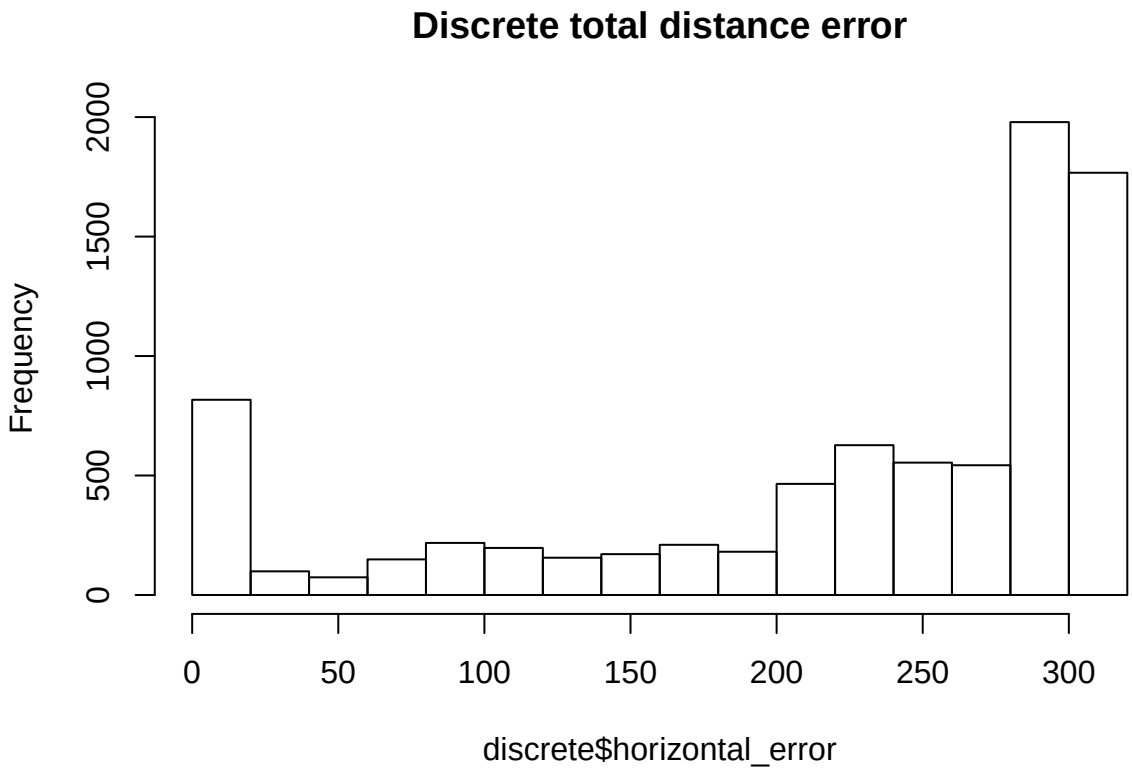

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



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




```r
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: Mon, Aug 15, 2016 - 04:03:02 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-mobile-no-gps Experiment}
##   \label{tab:two_mobile_no_gps_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 & 8,207 & 23.732 & 65.324 & $-$98.293 & 171.561 \\
## y\_position & 8,207 & 10.665 & 45.828 & $-$65.718 & 99.594 \\
## yaw & 8,207 & 0.862 & 1.410 & $-$3.140 & 3.107 \\
## x\_variance & 8,207 & 89.104 & 76.645 & 0.074 & 270.268 \\
## y\_variance & 8,207 & 50.756 & 40.312 & 0.074 & 133.072 \\
## yaw\_variance & 8,207 & 98.675 & 72.145 & 0.089 & 240.901 \\
## yaw\_error & 8,207 & 0.031 & 1.823 & $-$3.141 & 3.141 \\
## x\_error & 8,207 & $-$24.118 & 65.057 & $-$171.608 & 97.450 \\
```

```
## y\_error & 8,207 & $-$9.934 & 45.476 & $-$98.407 & 66.041 \\
## horizontal\_error & 8,207 & 66.196 & 50.975 & 0.00001 & 183.877 \\
## \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.harvard
## % Date and time: Mon, Aug 15, 2016 - 04:03:02 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-mobile-no-gps Experiment}
##   \label{tab:two_mobile_no_gps_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.} & \multic
## \hline \\[-1.8ex]
## x\_position & 8,207 & 217.107 & 100.063 & $-$8.491 & 301.927 \\
## y\_position & 8,207 & 42.178 & 14.369 & $-$0.365 & 59.790 \\
## yaw & 8,207 & 0.871 & 1.468 & $-$3.119 & 3.124 \\
## x\_variance & 8,207 & 0.700 & 1.198 & 0.0001 & 10.202 \\
## y\_variance & 8,207 & 0.288 & 0.415 & 0.0001 & 2.517 \\
## yaw\_variance & 8,207 & 98.789 & 72.213 & 0.100 & 240.549 \\
## x\_error & 8,207 & $-$217.492 & 100.195 & $-$302.769 & 8.054 \\
## y\_error & 8,207 & $-$41.447 & 14.308 & $-$59.346 & 0.365 \\
## horizontal\_error & 8,207 & 222.441 & 98.915 & 0.00002 & 305.875 \\
## yaw\_error & 8,207 & 0.031 & 1.825 & $-$3.141 & 3.139 \\
## \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)
}
```