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.
## -22.0600 -15.2900  -0.3418  -3.4050   6.7950  12.1100
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -11.6600   0.1566   2.1090   2.2180   4.5670  13.5400
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1420 -1.2510  0.2280  0.1932  1.7950  3.1410
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000014  6.154000 12.220000 11.280000 15.980000 25.860000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -77.08000 -11.69000  -3.26600  -7.70600  -0.07324  48.93000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -41.0200  -4.9800  -0.1164   0.6564   3.7090  65.8600
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.13900 -1.21800 -0.18850 -0.36120  0.03695  3.14000
```

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

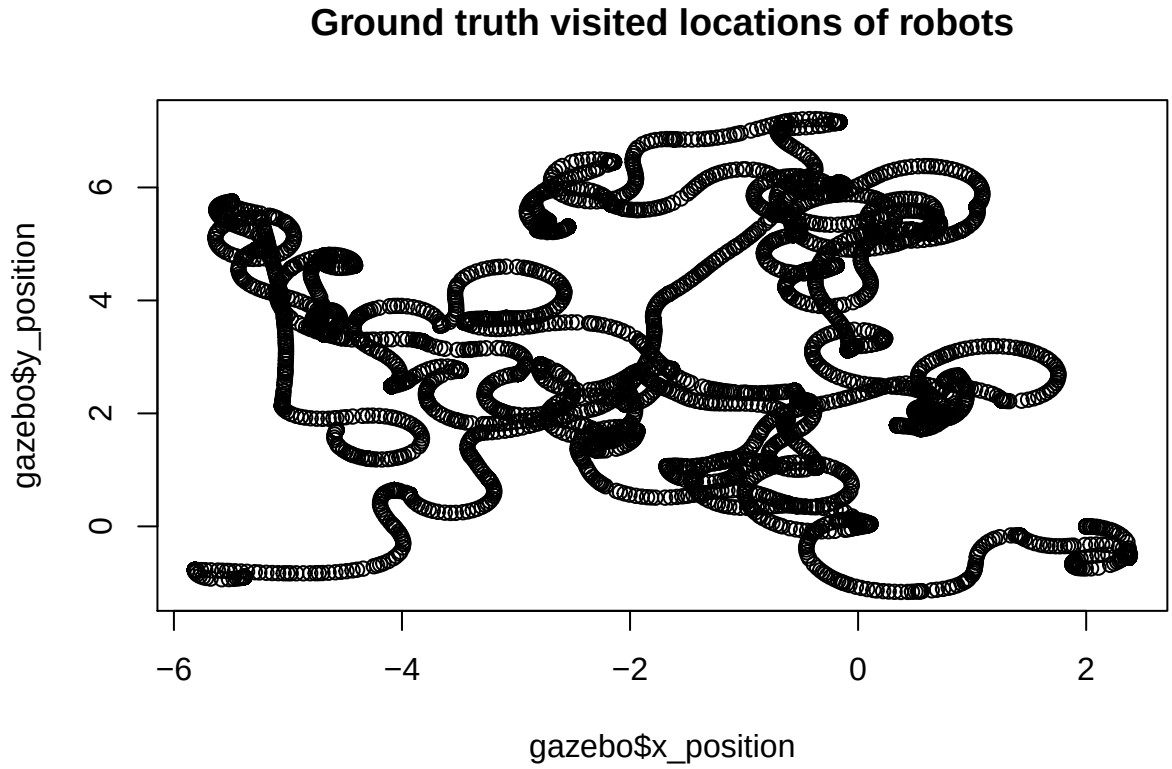
```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00001  2.93300  7.65000 15.27000 19.16000 81.55000
```

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

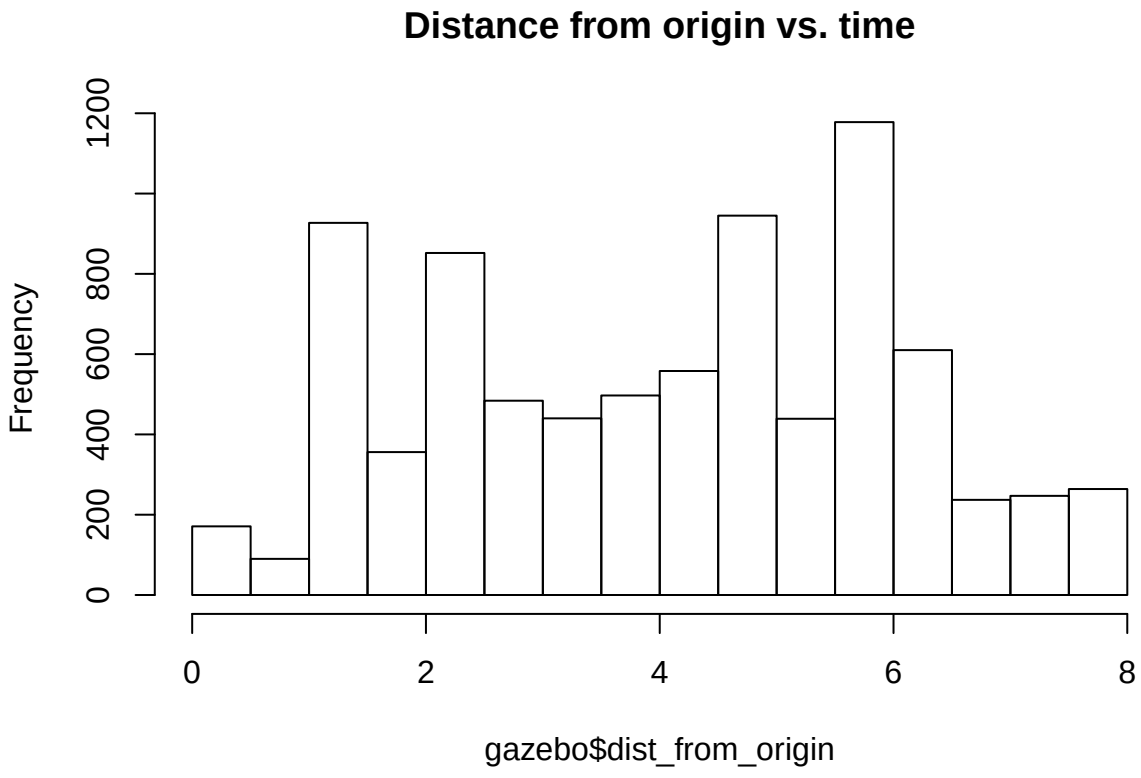
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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

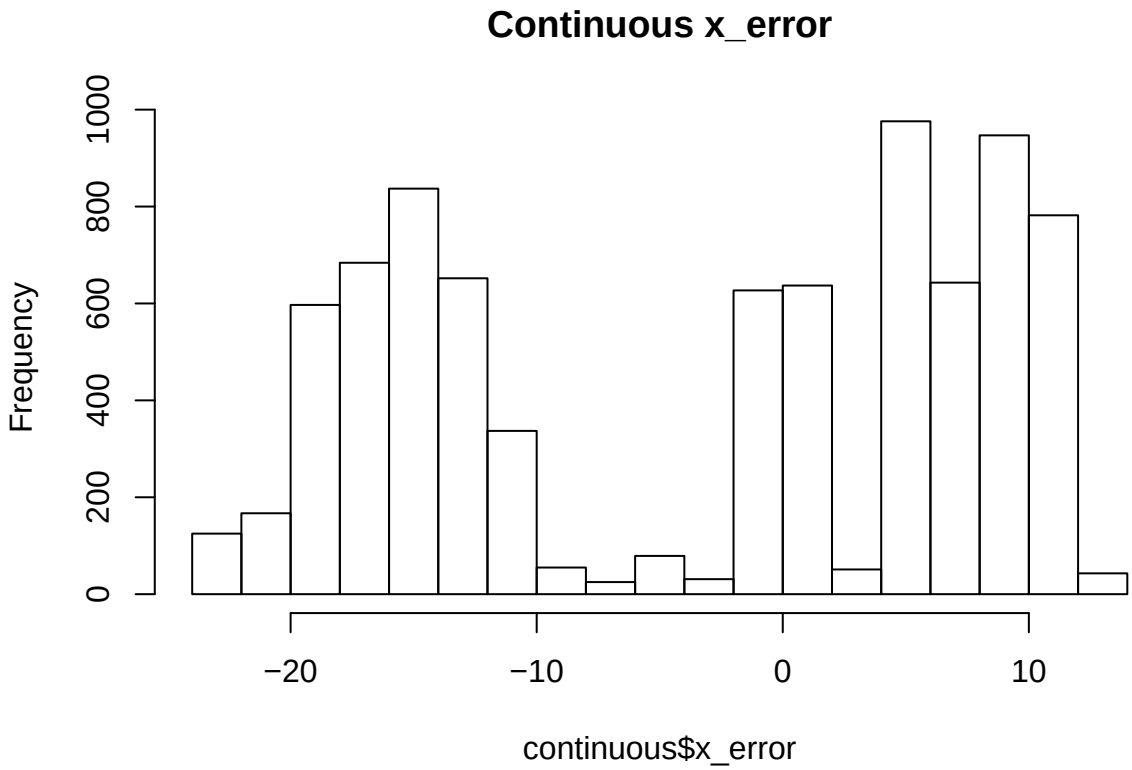
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



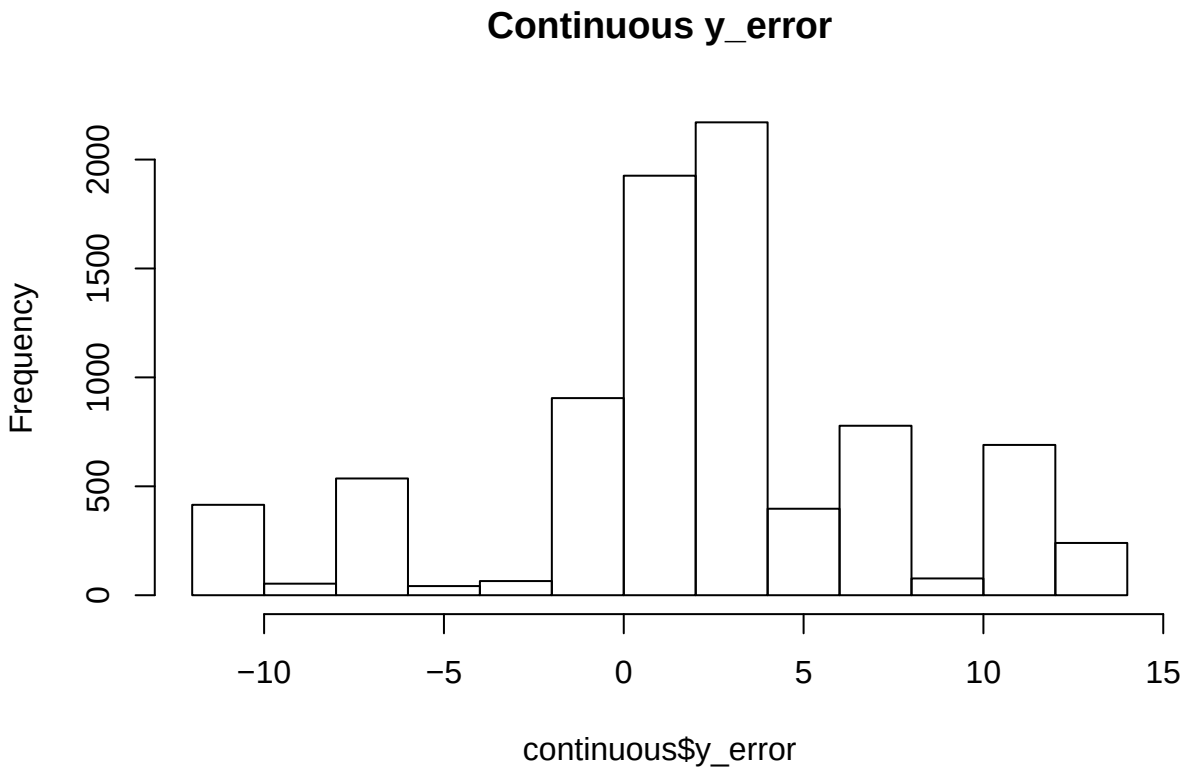

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



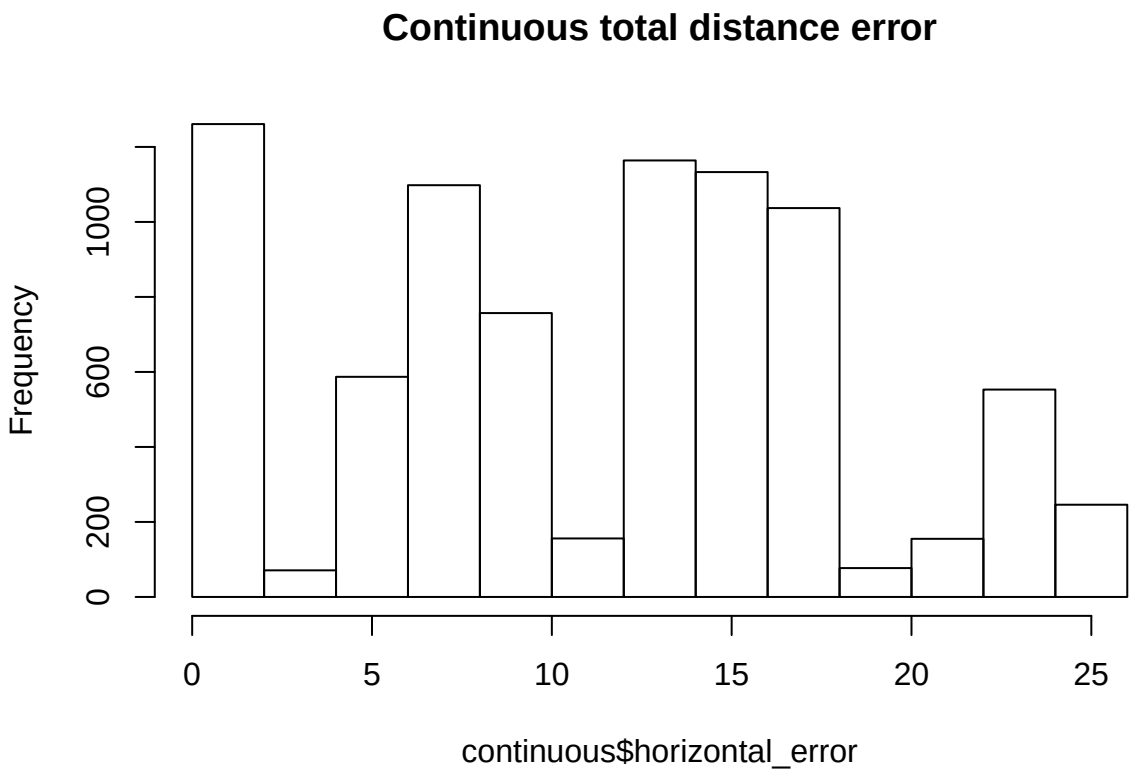
```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



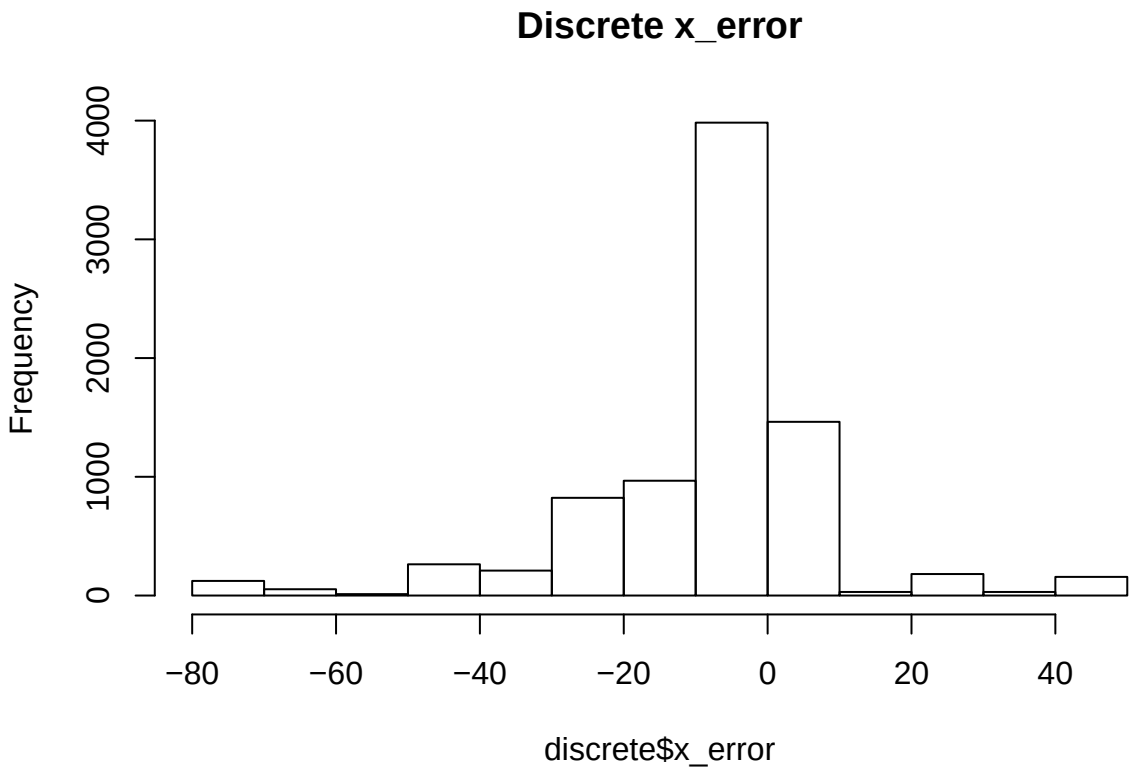

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



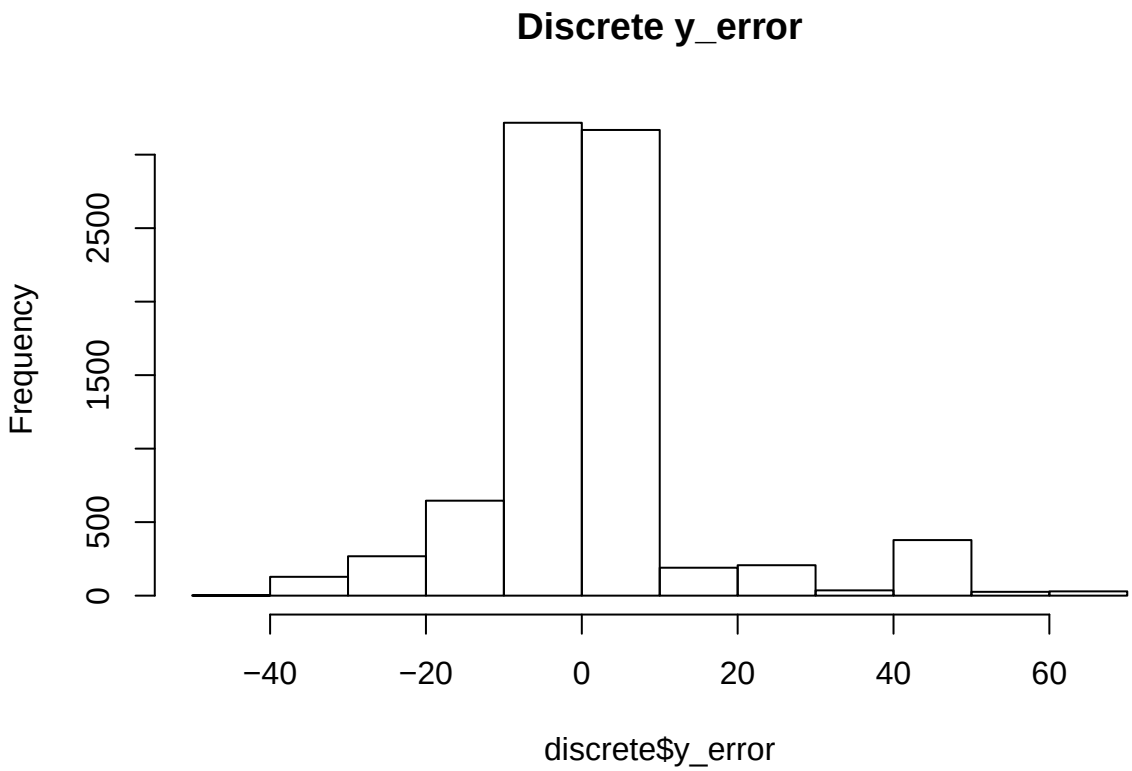
```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



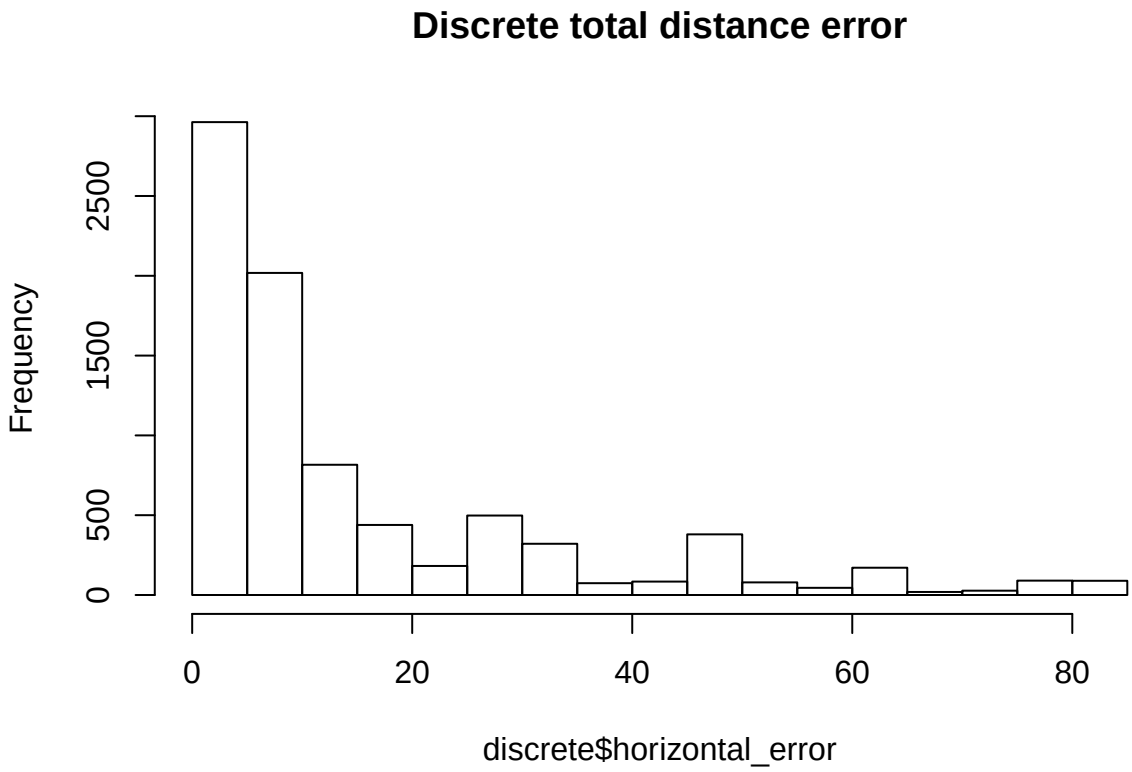

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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: Wed, Aug 10, 2016 - 04:39:33 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.} & \multi
## \hline \\[-1.8ex]
## x\_position & 8,295 & 1.732 & 10.033 & $-$16.467 & 16.553 \\
## y\_position & 8,295 & 0.775 & 5.354 & $-$7.848 & 13.841 \\
## yaw & 8,295 & 0.006 & 1.869 & $-$3.133 & 3.139 \\
## x\_variance & 8,295 & 12.058 & 6.915 & 0.070 & 24.044 \\
## y\_variance & 8,295 & 12.058 & 6.915 & 0.070 & 24.044 \\
## yaw\_variance & 8,295 & 14.454 & 8.289 & 0.084 & 28.823 \\
## yaw\_error & 8,295 & 0.193 & 1.821 & $-$3.142 & 3.141 \\
## x\_error & 8,295 & $-$3.405 & 11.202 & $-$22.057 & 12.110 \\
```

```
## y\_error & 8,295 & 2.218 & 5.445 & $-$11.657 & 13.541 \\
## horizontal\_error & 8,295 & 11.282 & 6.660 & 0.00001 & 25.858 \\
## \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: Wed, Aug 10, 2016 - 04:39:33 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 & 8,295 & 6.033 & 17.887 & $-$51.093 & 78.122 \\
## y\_position & 8,295 & 2.337 & 14.201 & $-$63.377 & 46.681 \\
## yaw & 8,295 & $-$0.231 & 1.646 & $-$3.141 & 3.141 \\
## x\_variance & 8,295 & 0.153 & 0.150 & 0.0001 & 0.657 \\
## y\_variance & 8,295 & 0.153 & 0.150 & 0.0001 & 0.657 \\
## yaw\_variance & 8,295 & 0.388 & 0.173 & 0.088 & 0.692 \\
## x\_error & 8,295 & $-$7.706 & 17.568 & $-$77.083 & 48.925 \\
## y\_error & 8,295 & 0.656 & 14.266 & $-$41.023 & 65.862 \\
## horizontal\_error & 8,295 & 15.271 & 18.405 & 0.00001 & 81.552 \\
## yaw\_error & 8,295 & $-$0.361 & 1.361 & $-$3.139 & 3.140 \\
## \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)
}
```