two_mobile_noiseless_no_gps Experiment Report

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This is a summary of the data from the two_mobile_noiseless_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.
## -8.0960 -2.4450 -1.5640 -0.1833  6.5540  6.5540
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -14.330 -14.320   3.337  -2.189   4.176   6.971
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.141000 -1.585000  0.010090  0.008157  1.593000  3.141000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000001  7.058000  7.355000  8.578000 14.530000 14.540000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -12.730  -5.869  -4.872  -2.515   5.034   5.034
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -9.8680 -3.7040 -2.9730 -2.0780  0.6549  1.5580
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.141000 -1.561000 -0.007078  0.009967  1.592000  3.142000
```

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

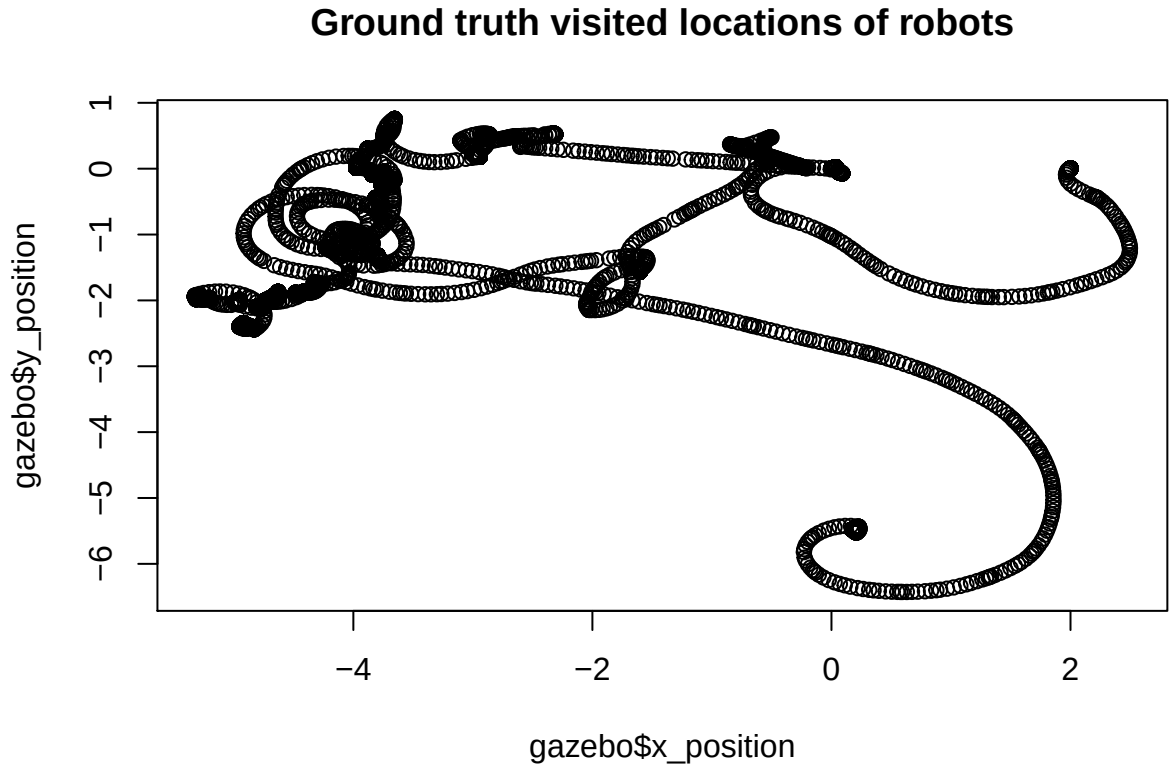
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000016  4.916000  6.250000  6.262000  6.323000 13.470000
```

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

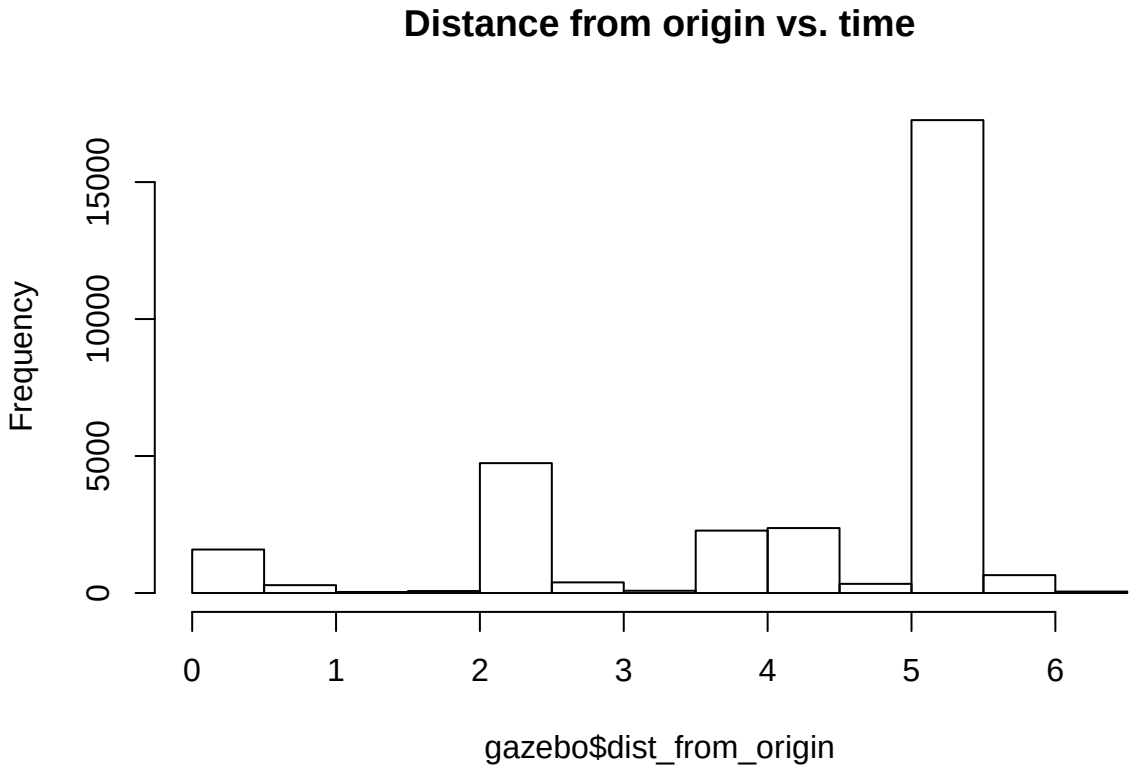
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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

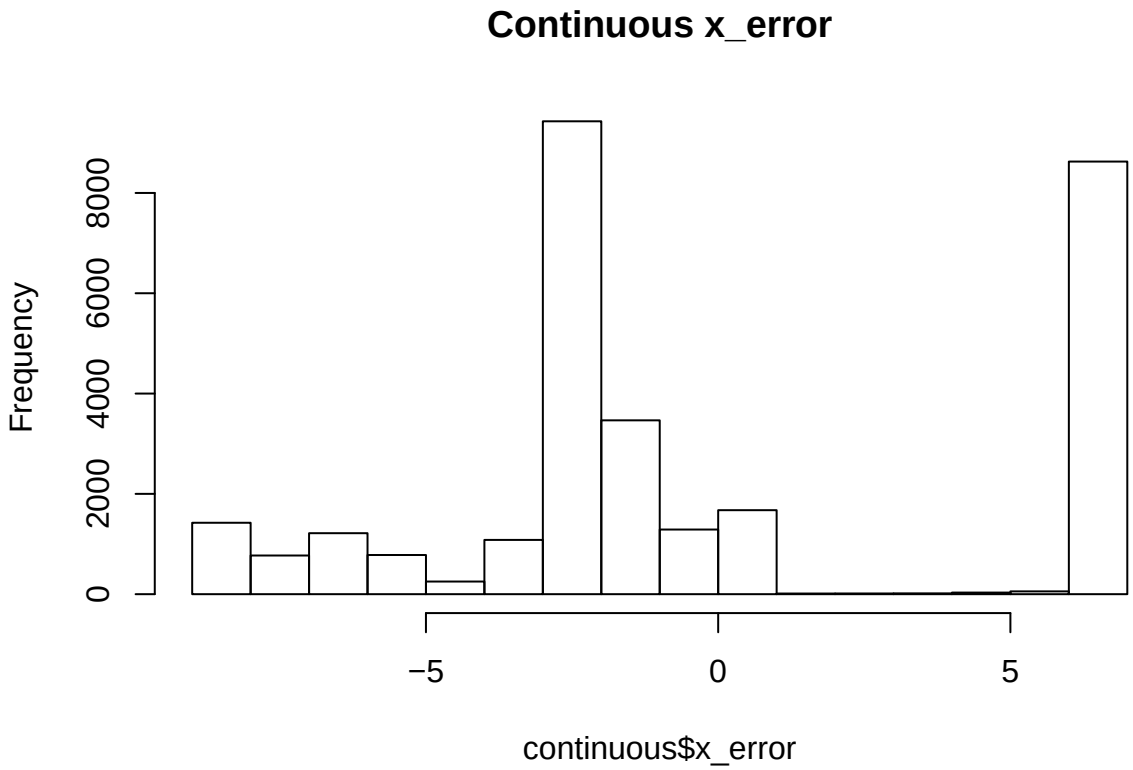
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



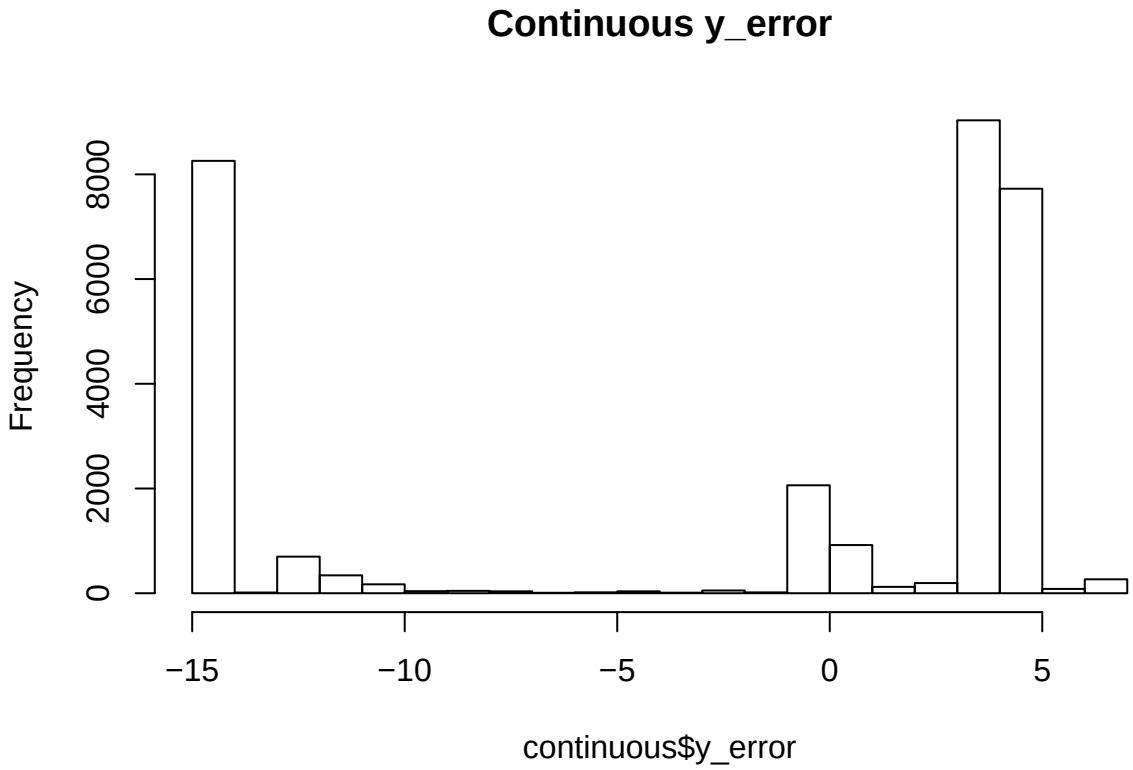

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



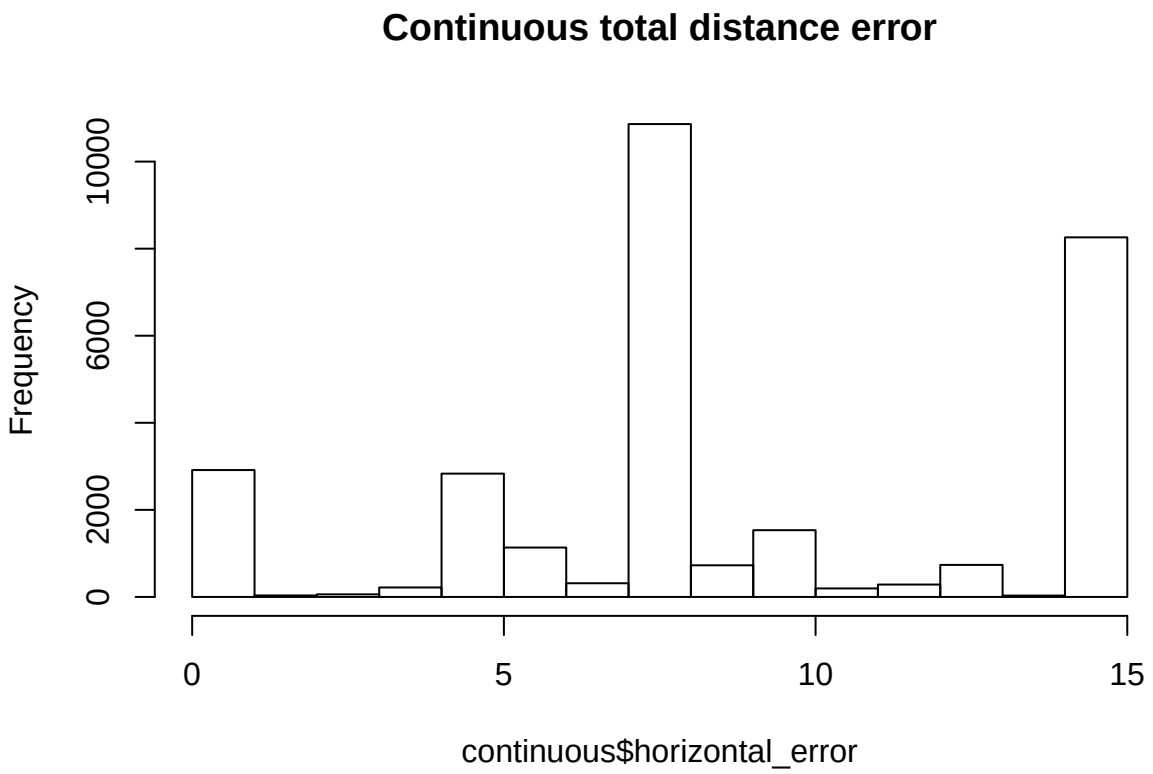
```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



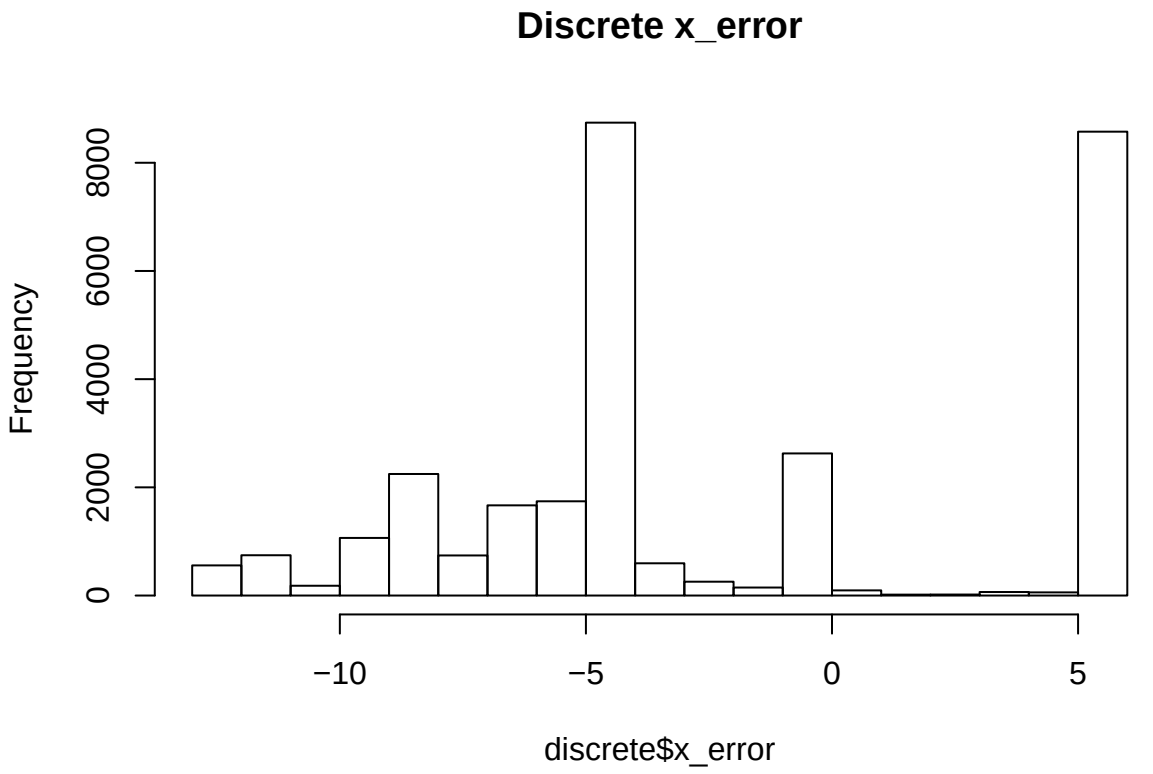

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



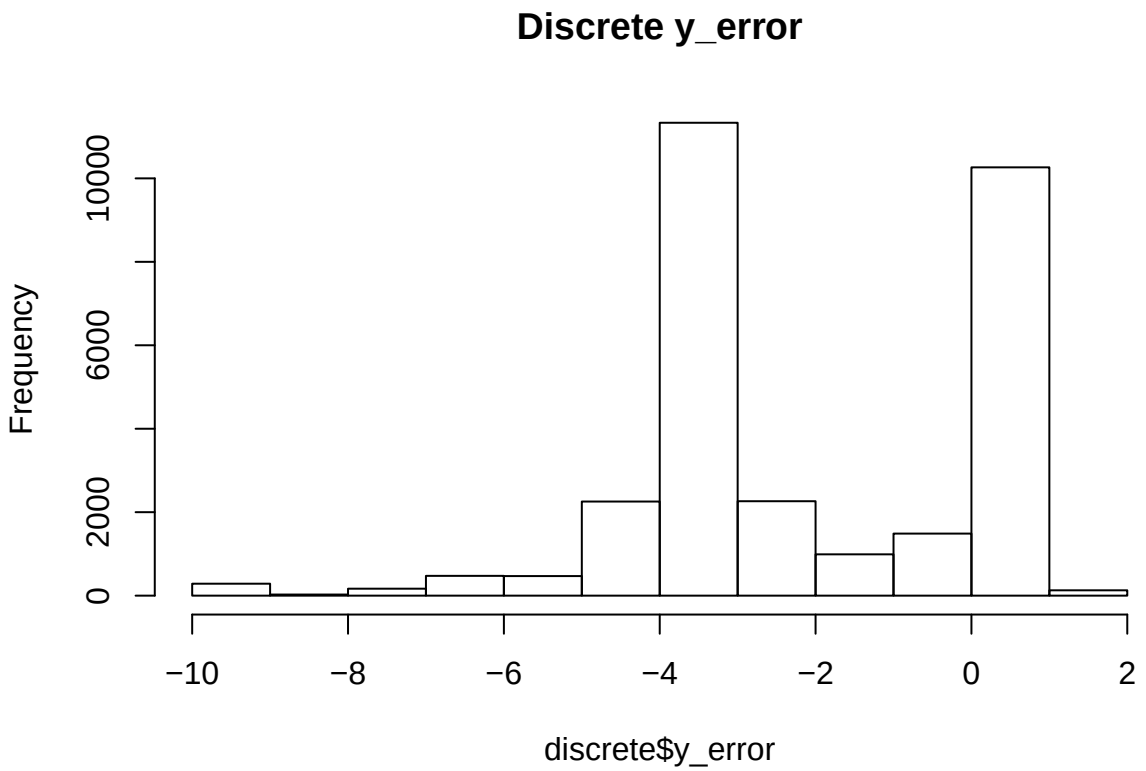
```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



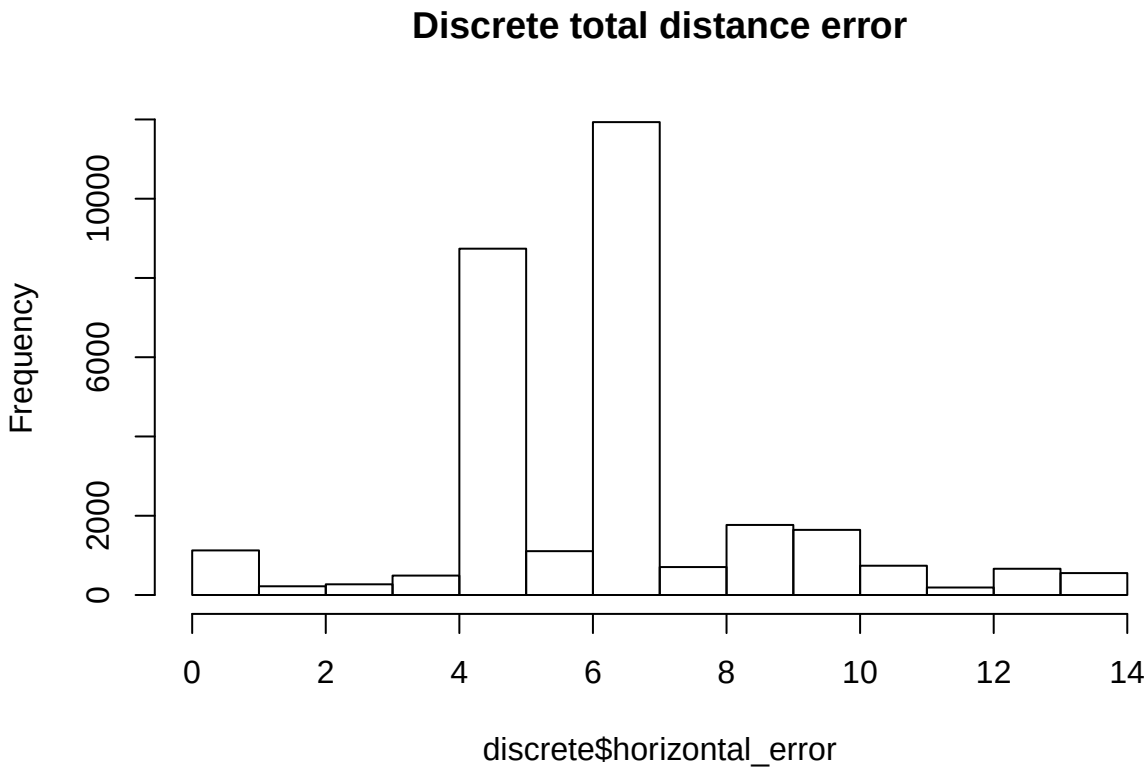

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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 - 10:07:32 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-mobile-noiseless-no-gps Experiment}
##   \label{tab:two_mobile_noiseless_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 & 30,142 & $-$2.049 & 3.343 & $-$6.379 & 4.281 \\
## y\_position & 30,142 & $-$0.409 & 8.645 & $-$8.817 & 11.982 \\
## yaw & 30,142 & $-$0.511 & 1.978 & $-$3.064 & 3.140 \\
## x\_variance & 30,142 & 83.545 & 48.431 & 0.120 & 168.059 \\
## y\_variance & 30,142 & 83.545 & 48.431 & 0.120 & 168.059 \\
## yaw\_variance & 30,142 & 75.752 & 43.729 & 0.110 & 151.691 \\
## yaw\_error & 30,142 & 0.008 & 1.818 & $-$3.141 & 3.141 \\
## x\_error & 30,142 & $-$0.183 & 4.691 & $-$8.096 & 6.554 \\
```

```
## y\_error & 30,142 & $-$2.189 & 8.165 & $-$14.335 & 6.971 \\
## horizontal\_error & 30,142 & 8.578 & 4.463 & 0.000001 & 14.544 \\
## \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 - 10:07:32 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-mobile-noiseless-no-gps Experiment}
##   \label{tab:two_mobile_noiseless_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.} & \multi
## \hline \\[-1.8ex]
## x\_position & 30,142 & 0.283 & 3.962 & $-$4.859 & 8.946 \\
## y\_position & 30,142 & $-$0.520 & 2.720 & $-$3.005 & 9.744 \\
## yaw & 30,142 & $-$1.671 & 1.322 & $-$3.136 & 3.141 \\
## x\_variance & 30,142 & 29.180 & 32.713 & 0.0001 & 99.104 \\
## y\_variance & 30,142 & 29.180 & 32.713 & 0.0001 & 99.104 \\
## yaw\_variance & 30,142 & 75.761 & 43.731 & 0.116 & 151.696 \\
## x\_error & 30,142 & $-$2.515 & 5.374 & $-$12.732 & 5.034 \\
## y\_error & 30,142 & $-$2.078 & 2.279 & $-$9.868 & 1.558 \\
## horizontal\_error & 30,142 & 6.262 & 2.345 & 0.00002 & 13.471 \\
## yaw\_error & 30,142 & 0.010 & 1.814 & $-$3.141 & 3.142 \\
## \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)
}
```