two_mobile_noiseless Experiment Report

Matthew Swartwout

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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.
## -0.972300  0.000080  0.000106  2.647000  5.315000 10.300000
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -16.990000 -12.430000  -0.000040  -5.807000  -0.000018   0.220900
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14200 -1.63800  0.03852 -0.01666  1.55700  3.13900
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000012  0.000087  0.000108  6.532000 15.830000 17.810000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -0.85740 -0.00001  0.00002  1.97200  0.05006 49.29000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -9.858000 -0.001645 -0.000005 -0.259500  0.000022  3.227000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1410 -1.1500  0.2044  0.1573  1.5630  3.1410
```

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

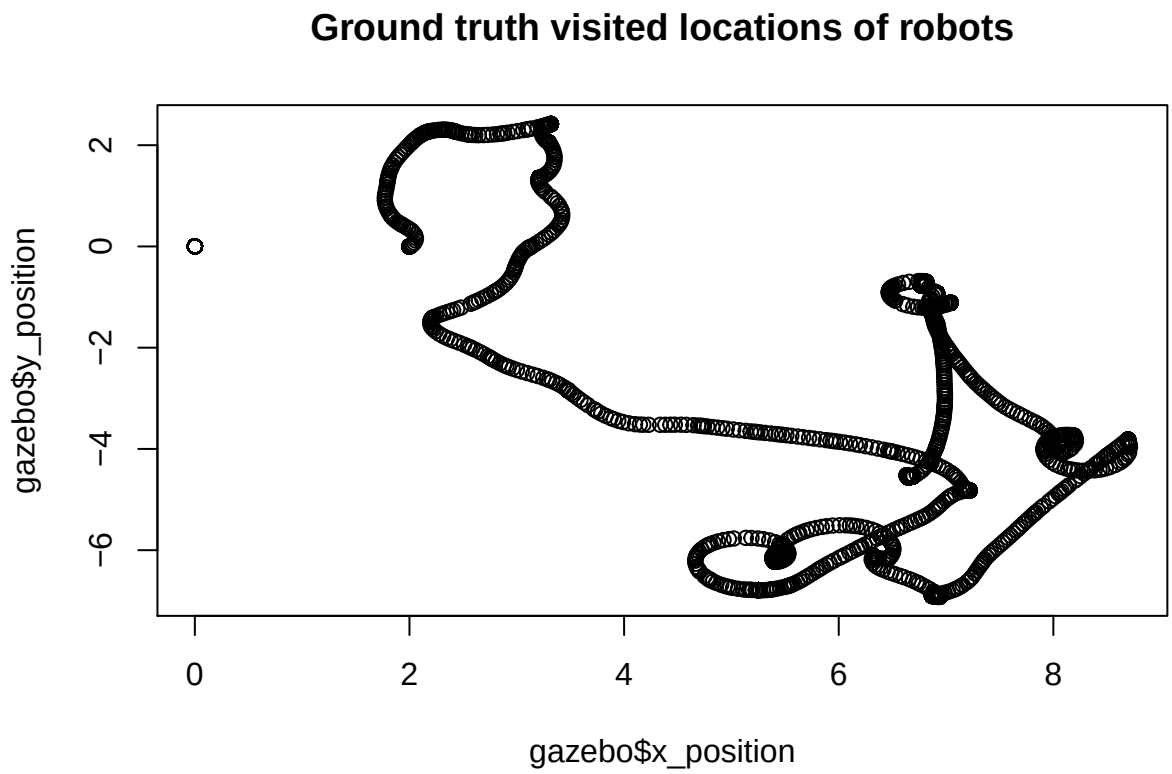
```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00000  0.00003  0.00004  2.08200  0.18210 50.14000
```

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

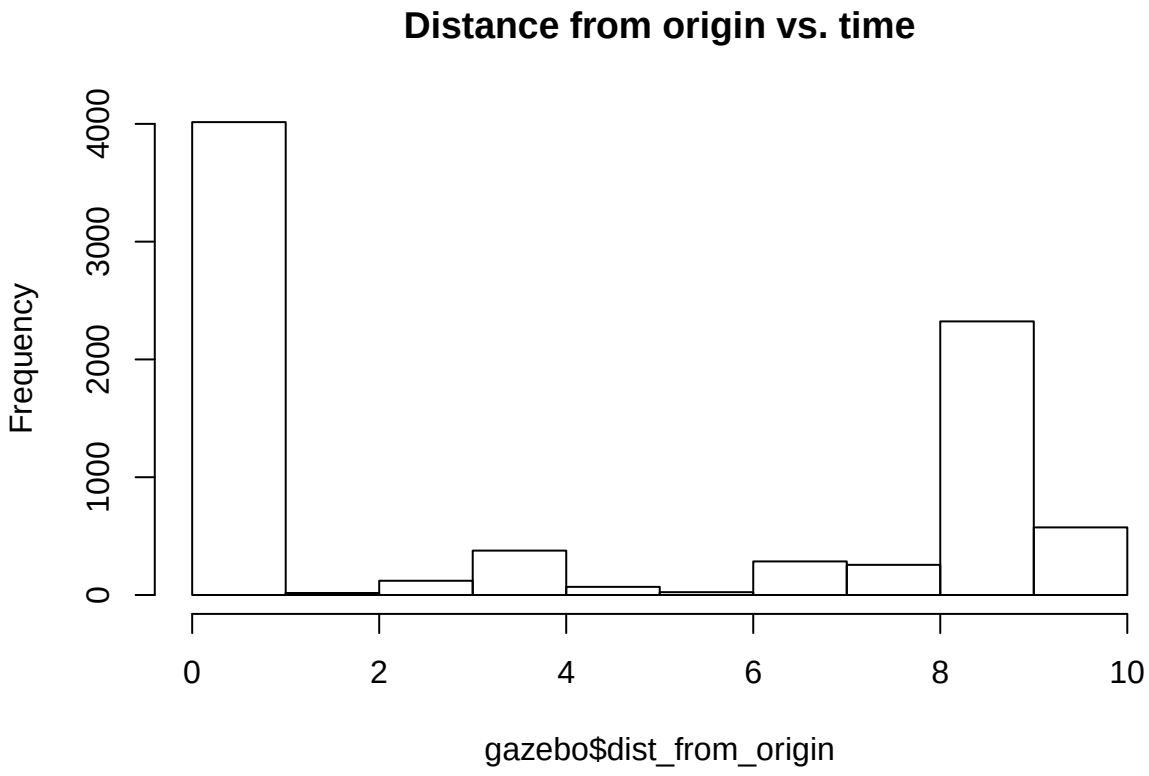
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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

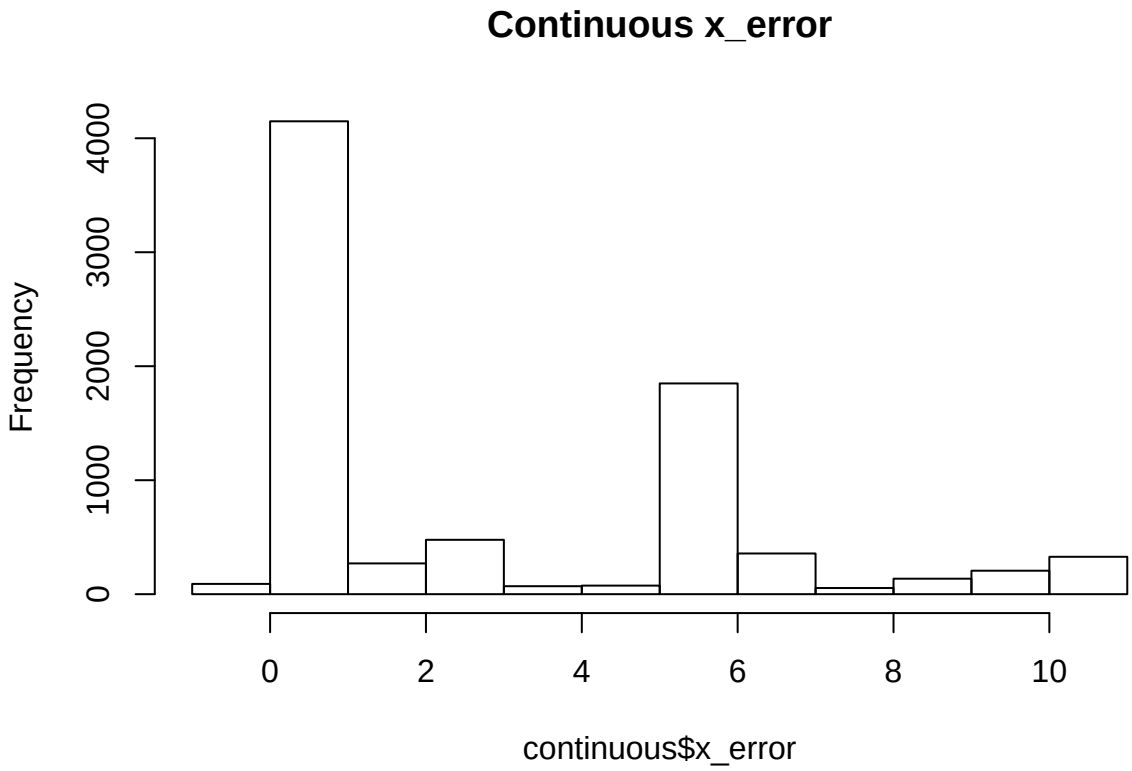
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



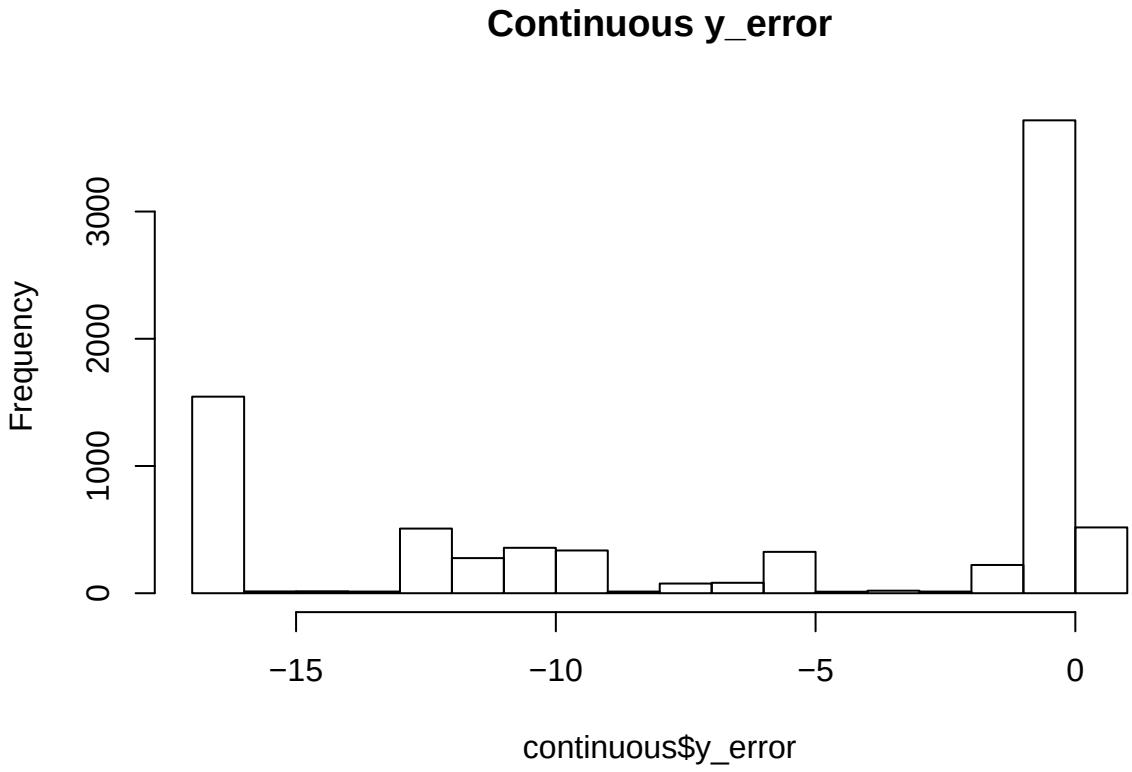

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



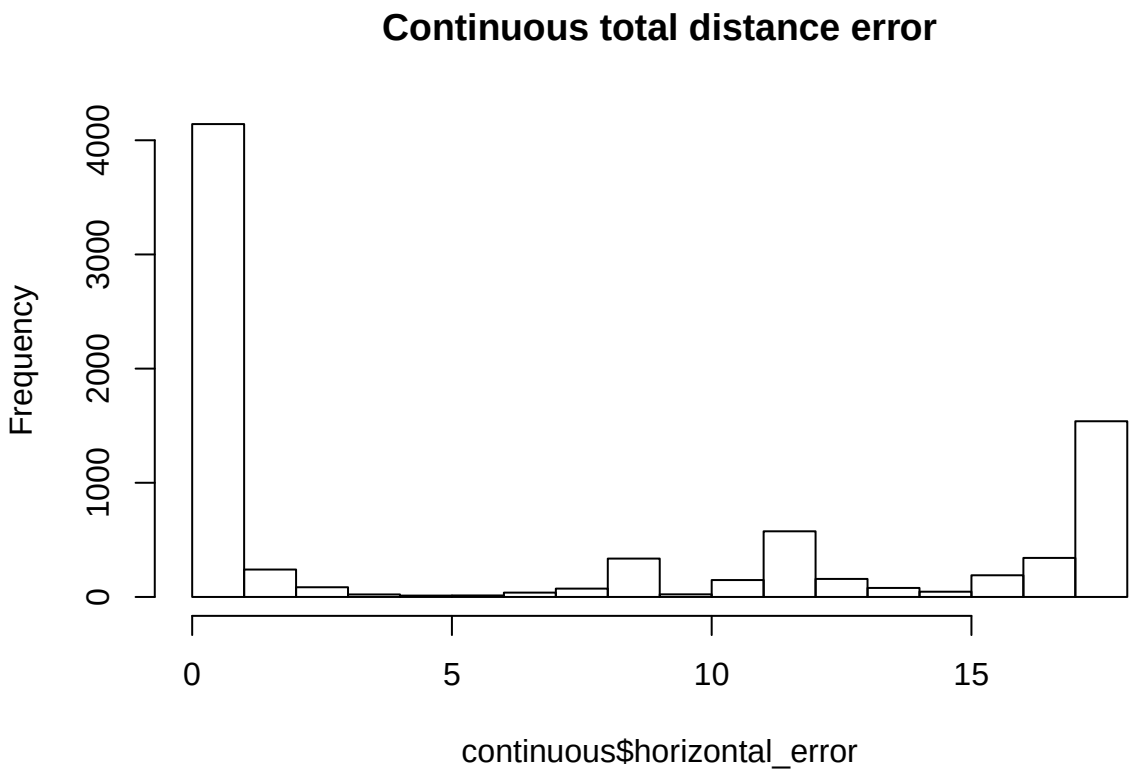
```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



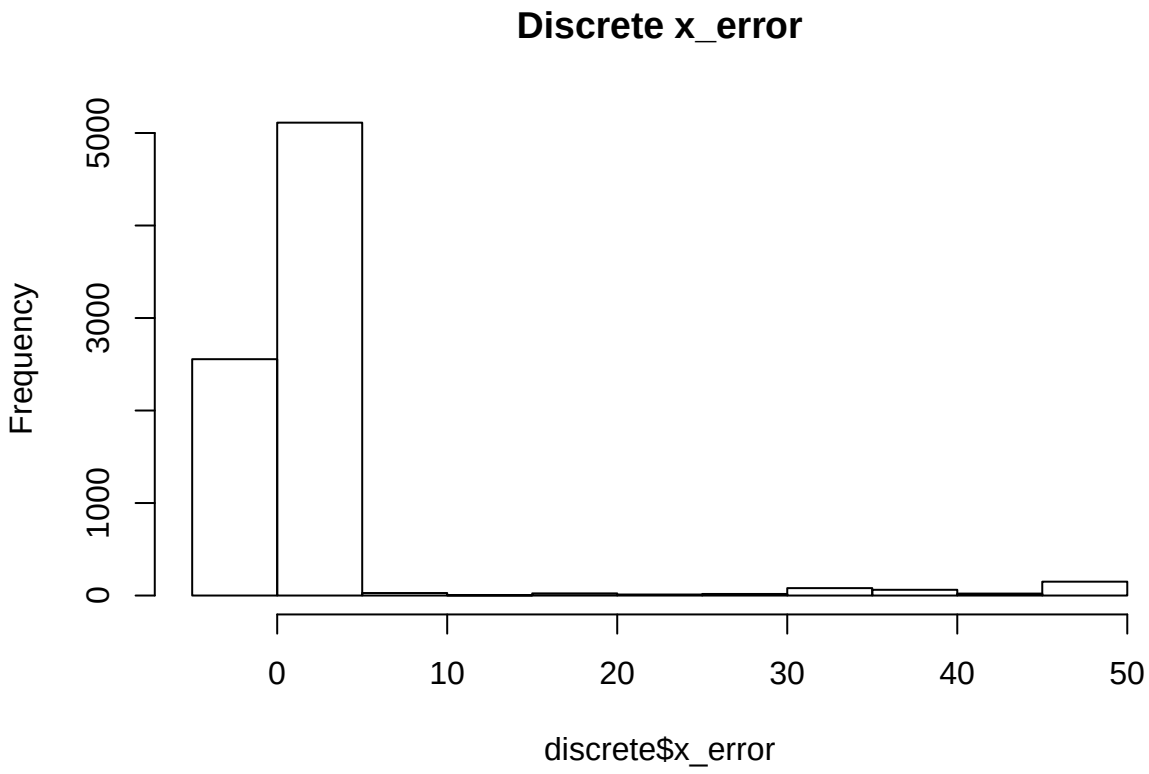

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



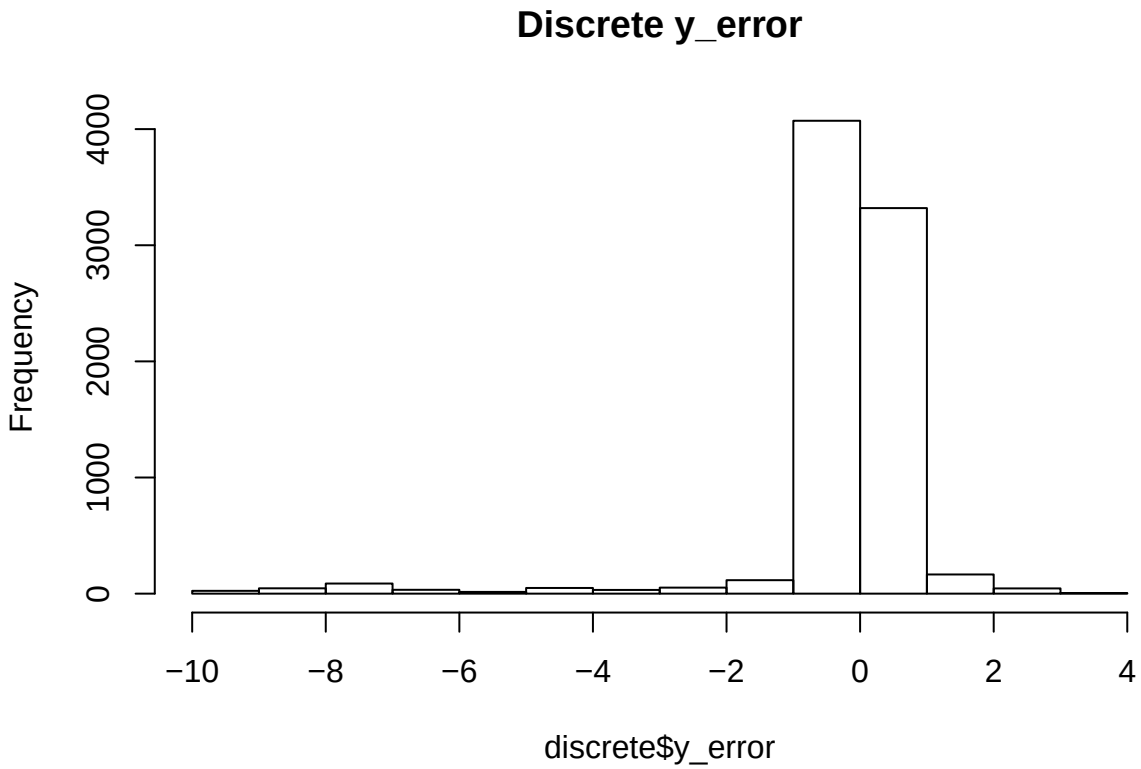
```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



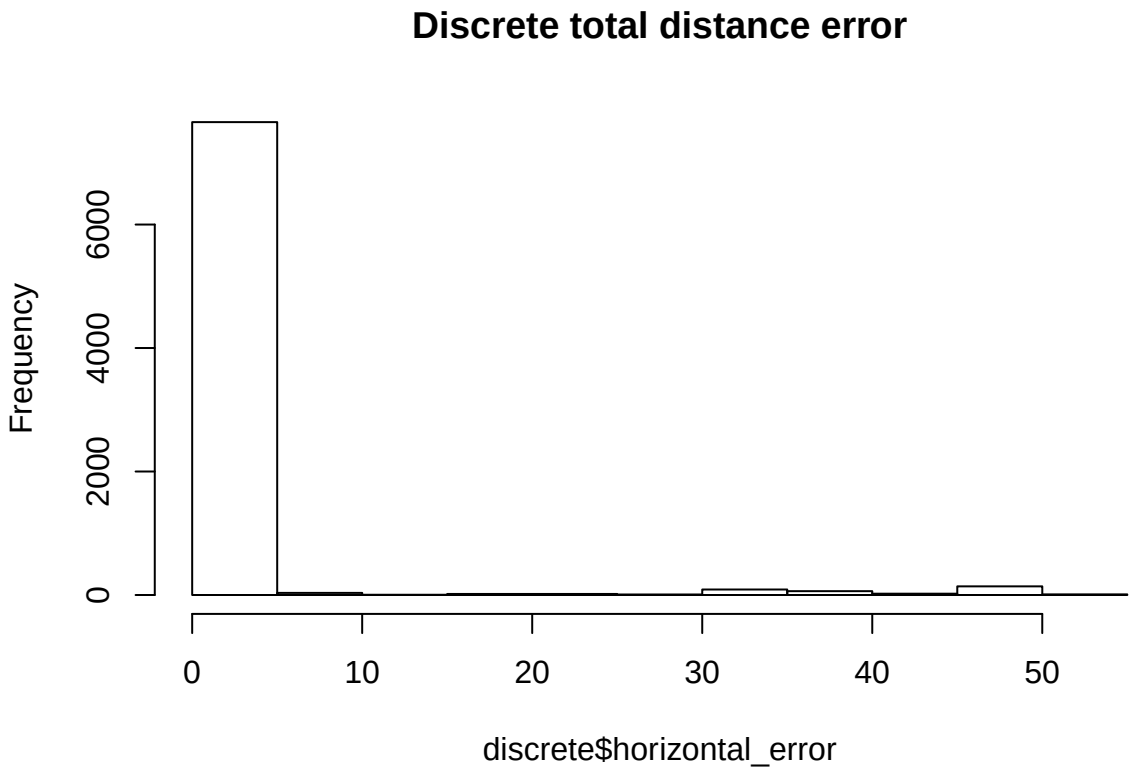

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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 - 04:03:30 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 & 8,061 & 0.455 & 1.520 & $-$3.690 & 4.731 \\
## y\_position & 8,061 & 3.894 & 4.997 & $-$0.000 & 12.446 \\
## yaw & 8,061 & 0.787 & 1.358 & $-$3.139 & 3.137 \\
## x\_variance & 8,061 & 22.252 & 12.804 & 0.122 & 44.511 \\
## y\_variance & 8,061 & 22.252 & 12.804 & 0.122 & 44.511 \\
## yaw\_variance & 8,061 & 20.256 & 11.615 & 0.111 & 40.208 \\
## yaw\_error & 8,061 & $-$0.017 & 1.801 & $-$3.142 & 3.139 \\
## x\_error & 8,061 & 2.647 & 3.240 & $-$0.972 & 10.299 \\
```

```
## y\_error & 8,061 & $-$5.807 & 6.951 & $-$16.994 & 0.221 \\
## horizontal\_error & 8,061 & 6.532 & 7.542 & 0.00001 & 17.806 \\
## \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: Mon, Aug 15, 2016 - 04:03:30 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 & 8,061 & 1.130 & 9.068 & $-$49.294 & 8.674 \\
## y\_position & 8,061 & $-$1.654 & 3.064 & $-$7.010 & 10.386 \\
## yaw & 8,061 & $-$0.019 & 1.796 & $-$3.129 & 3.050 \\
## x\_variance & 8,061 & 0.569 & 0.290 & 0.001 & 1.092 \\
## y\_variance & 8,061 & 0.569 & 0.290 & 0.001 & 1.092 \\
## yaw\_variance & 8,061 & 0.500 & 0.240 & 0.091 & 0.929 \\
## x\_error & 8,061 & 1.972 & 8.182 & $-$0.857 & 49.295 \\
## y\_error & 8,061 & $-$0.260 & 1.354 & $-$9.858 & 3.227 \\
## horizontal\_error & 8,061 & 2.082 & 8.271 & 0.000001 & 50.138 \\
## yaw\_error & 8,061 & 0.157 & 1.734 & $-$3.141 & 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)
}
```