one_mobile_no_gps Experiment Report

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This is a summary of the data from the one_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.
##  -4.385   2.316 113.800 138.500 253.300 388.000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -358.600 -232.400 -101.700 -126.200   -1.378    4.359
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1400000 -1.5490000  0.0005932  0.0078680  1.5720000  3.1420000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   3.609 152.600 188.400 343.800 528.300
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -4.230   2.456 100.500 122.100 223.100 341.500
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -403.300 -261.700 -115.100 -142.300   -1.394    3.709
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1420000 -1.5530000  0.0000936  0.0070620  1.5780000  3.1410000
```

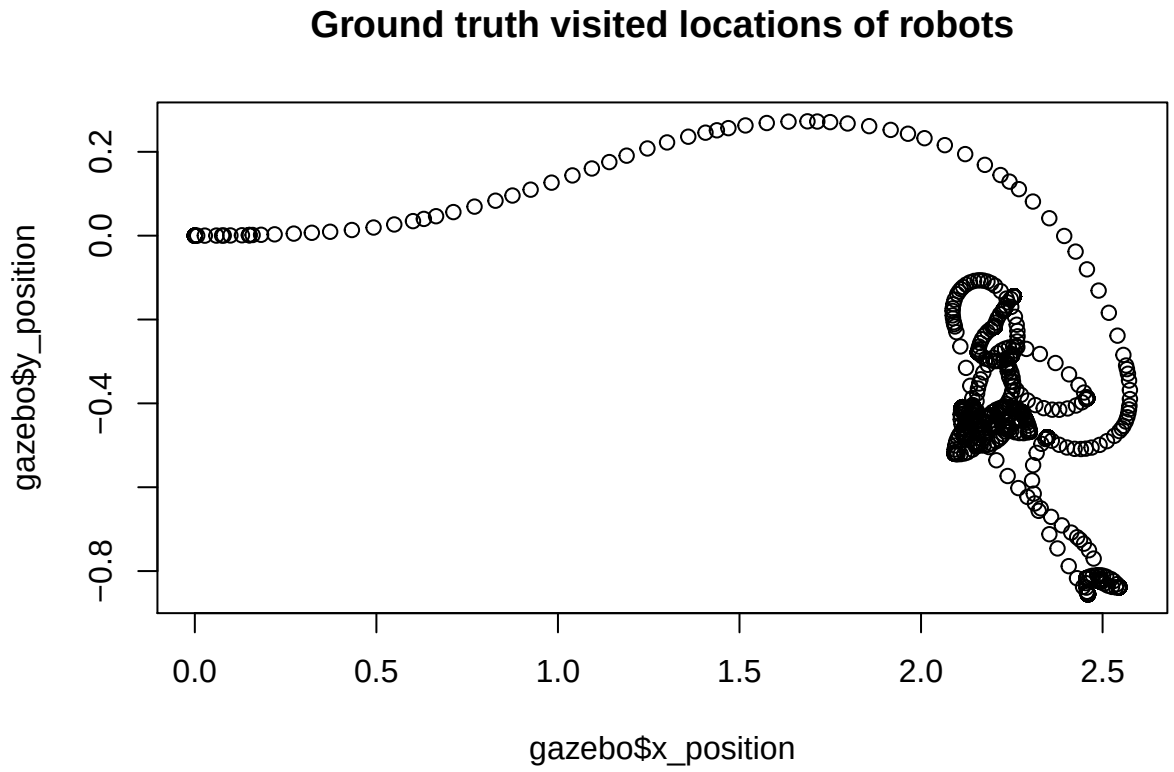
```
summary(discrete$horizontal_error)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   3.325 152.700 188.500 343.900 528.400
```

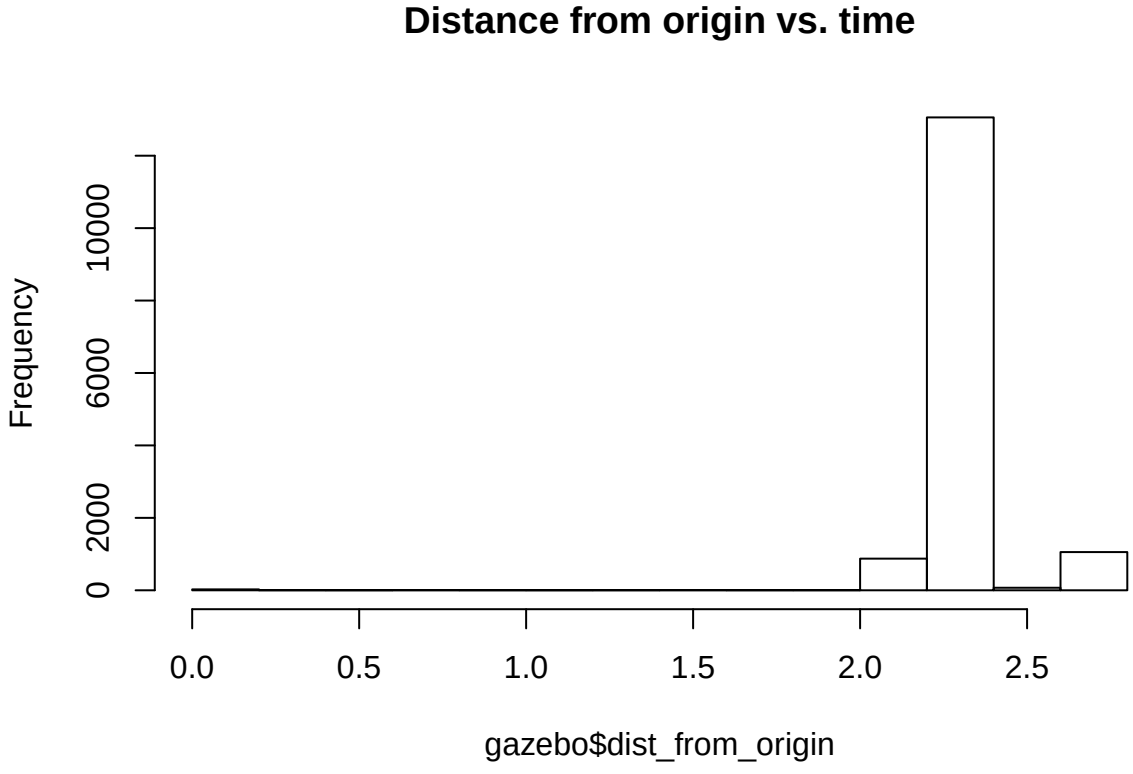
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

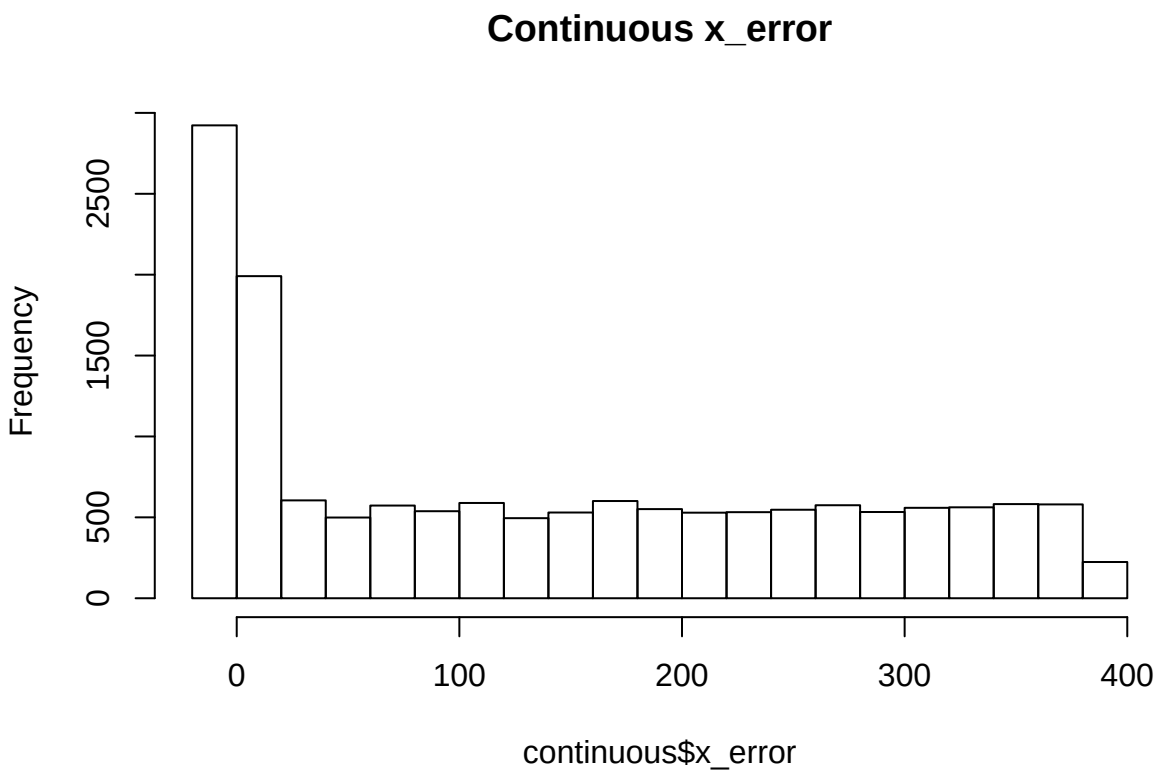
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



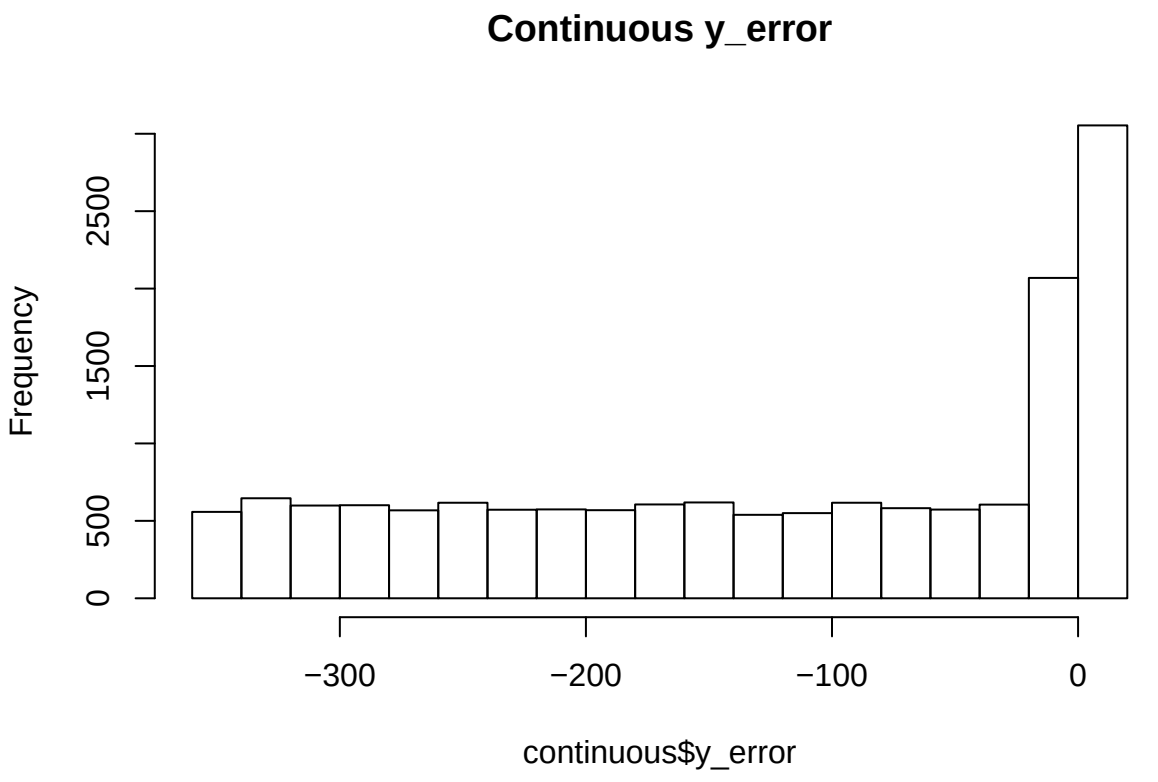

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



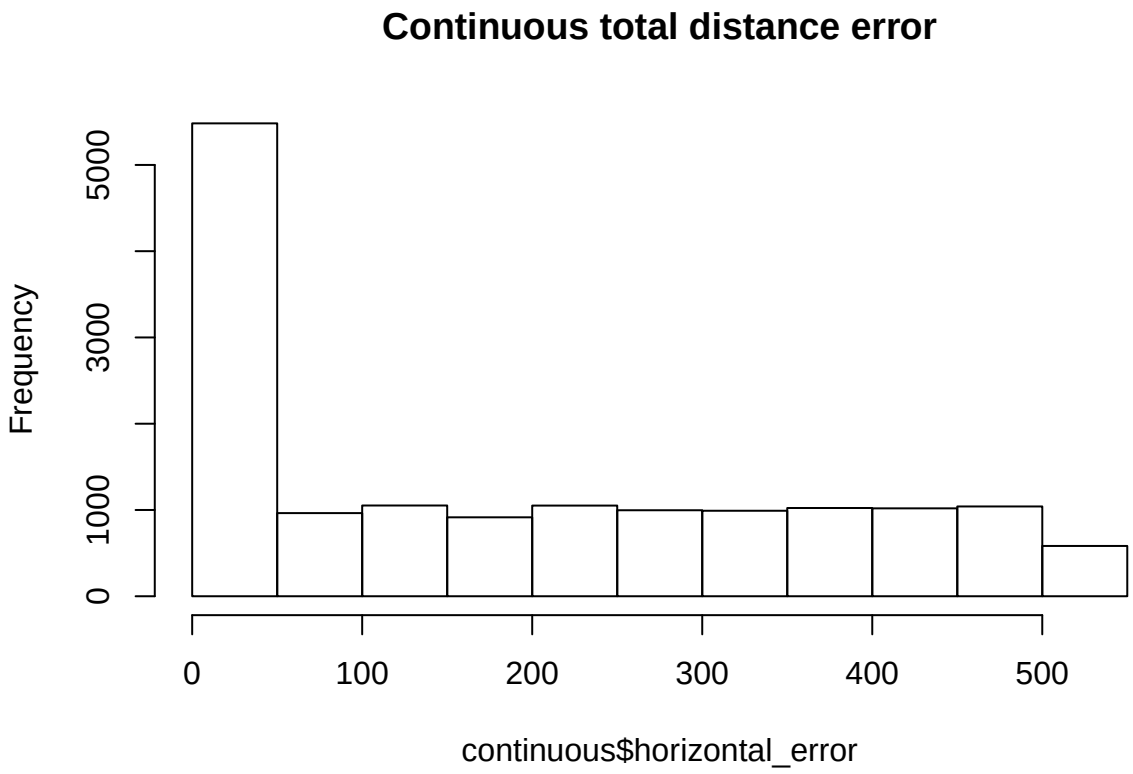

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



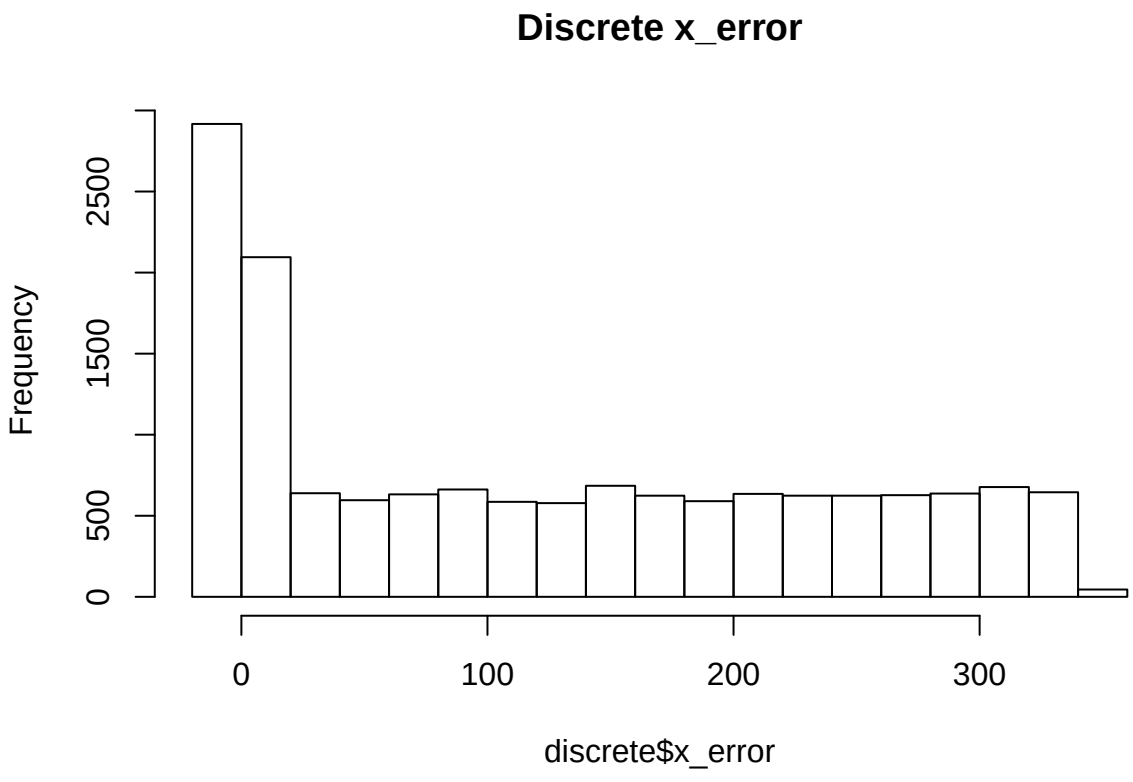

```
hist(continuous$y_error,
      main = "Continuous y_error")
```



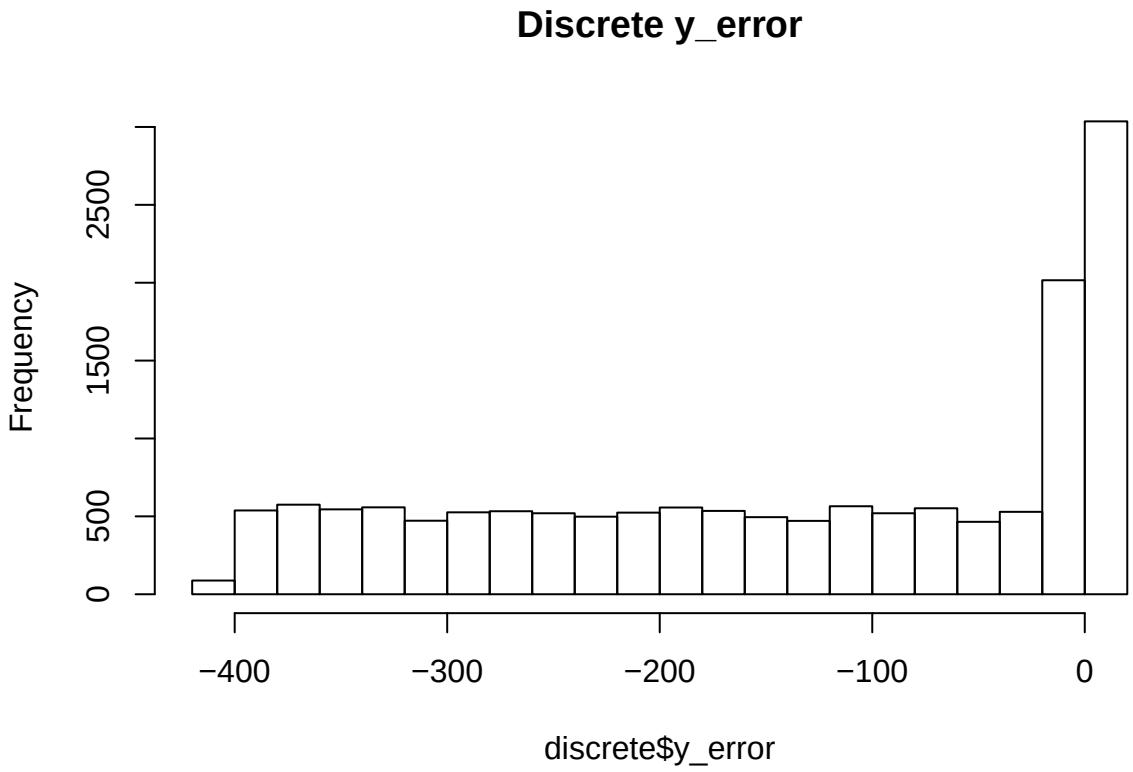

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



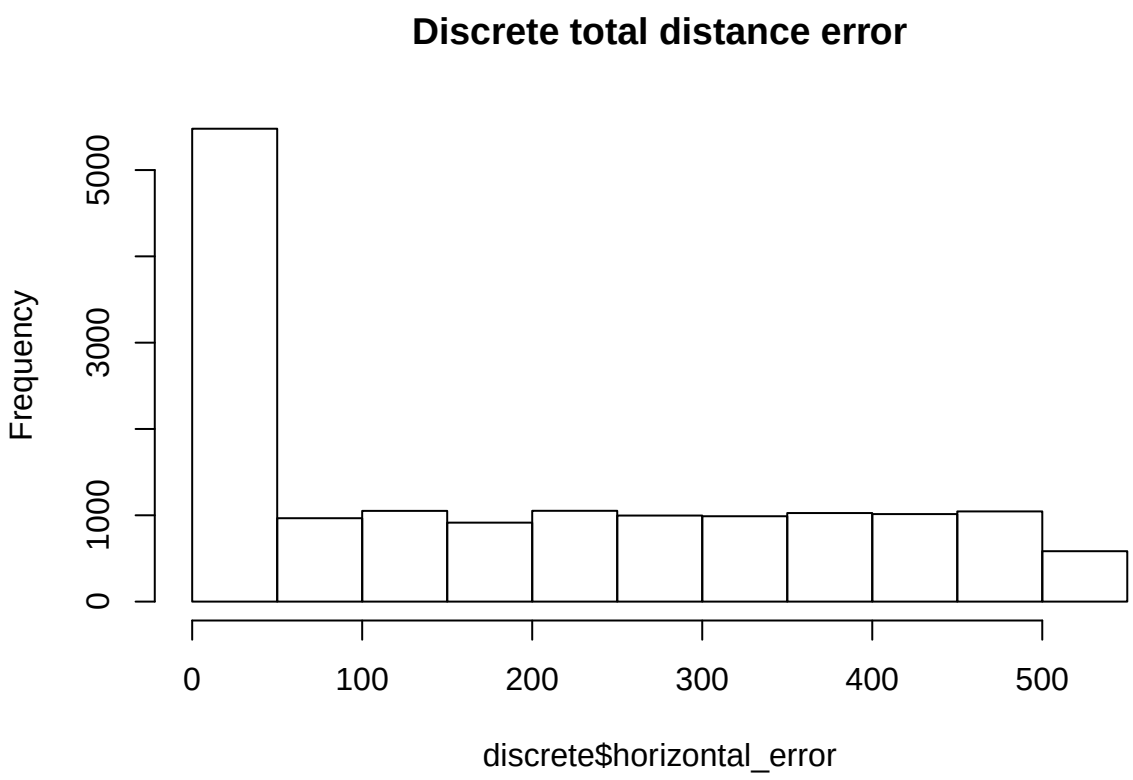

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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: Mon, Aug 15, 2016 - 10:02:43 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-mobile-no-gps Experiment}
##   \label{tab:one_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 & 15,118 & $-$136.239 & 129.977 & $-$385.715 & 6.877 \\
## y\_position & 15,118 & 125.921 & 120.523 & $-$4.774 & 358.472 \\
## yaw & 15,118 & 1.610 & 1.562 & $-$3.087 & 3.136 \\
## x\_variance & 15,118 & 199.332 & 168.548 & 0.071 & 522.246 \\
## y\_variance & 15,118 & 180.078 & 150.771 & 0.071 & 468.746 \\
## yaw\_variance & 15,118 & 265.377 & 228.204 & 0.086 & 704.166 \\
## yaw\_error & 15,118 & 0.008 & 1.809 & $-$3.140 & 3.142 \\
## x\_error & 15,118 & 138.503 & 129.967 & $-$4.385 & 387.971 \\
## y\_error & 15,118 & $-$126.159 & 120.425 & $-$358.616 & 4.359 \\
## horizontal\_error & 15,118 & 188.444 & 176.016 & 0.00001 & 528.325 \\
```

```
## \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 - 10:02:43 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-mobile-no-gps Experiment}
##   \label{tab:one_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.} & \multi
## \hline \\[-1.8ex]
## x\_position & 15,118 & $-$119.825 & 114.391 & $-$339.252 & 6.721 \\
## y\_position & 15,118 & 142.037 & 135.397 & $-$4.273 & 403.110 \\
## yaw & 15,118 & 1.507 & 1.539 & $-$3.104 & 3.043 \\
## x\_variance & 15,118 & 165.323 & 136.324 & 0.071 & 425.333 \\
## y\_variance & 15,118 & 214.152 & 183.028 & 0.071 & 565.731 \\
## yaw\_variance & 15,118 & 265.412 & 228.221 & 0.086 & 704.208 \\
## x\_error & 15,118 & 122.090 & 114.381 & $-$4.230 & 341.508 \\
## y\_error & 15,118 & $-$142.275 & 135.298 & $-$403.255 & 3.709 \\
## horizontal\_error & 15,118 & 188.478 & 176.104 & 0.00001 & 528.433 \\
## yaw\_error & 15,118 & 0.007 & 1.809 & $-$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)
}
```