one_stationary Experiment Report

Matthew Swartwout

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This is a summary of the data from the one_stationary 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.
## 0.0000151 0.0001402 0.0002648 0.0002645 0.0003886 0.0005128
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 5.148e-10 1.601e-08 4.478e-08 5.020e-08 8.022e-08 1.270e-07
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 4.985e-05 1.615e-04 2.602e-04 2.545e-04 3.335e-04 4.431e-04
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000151 0.0001402 0.0002648 0.0002645 0.0003886 0.0005128
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -0.95150 -0.04910  0.02366 -0.11050  0.09772  0.22950
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.1296  0.0000  0.2302  0.2577  0.5516  0.7665
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.186e-05  9.595e-06  3.084e-05  3.821e-05  6.129e-05  1.630e-04
```

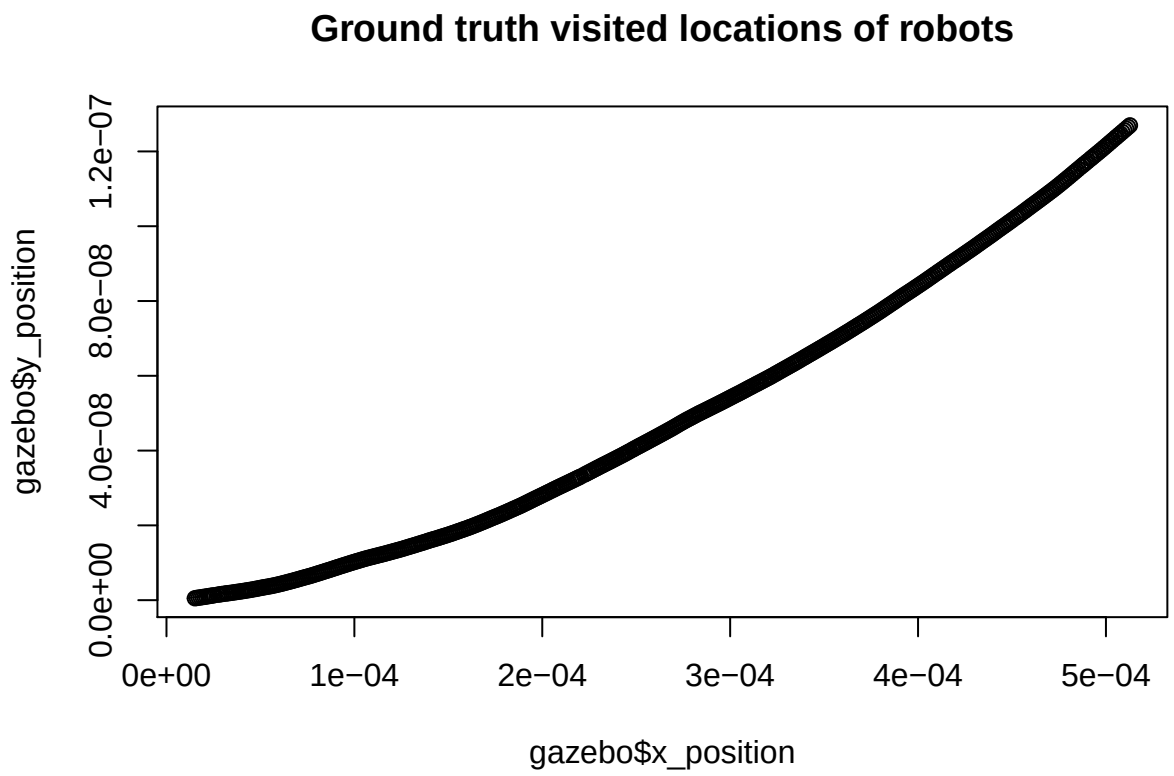
```
summary(discrete$horizontal_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000151 0.1187000 0.2635000 0.4131000 0.5538000 1.2220000
```

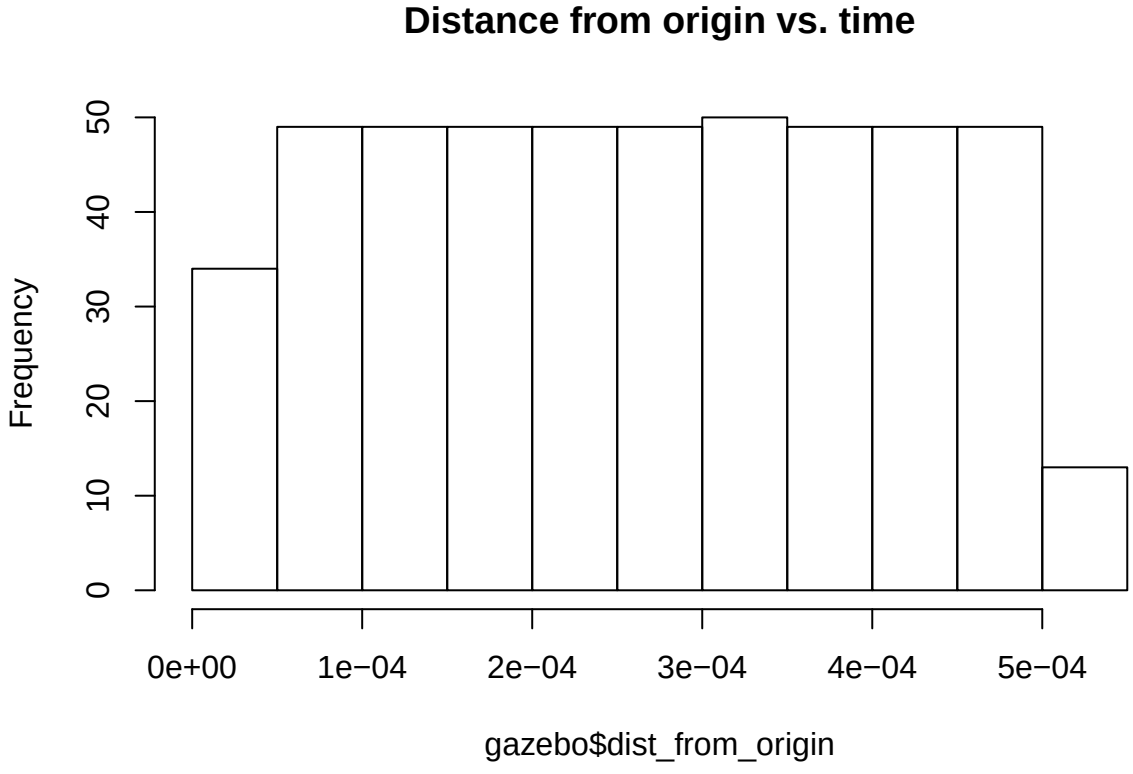
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

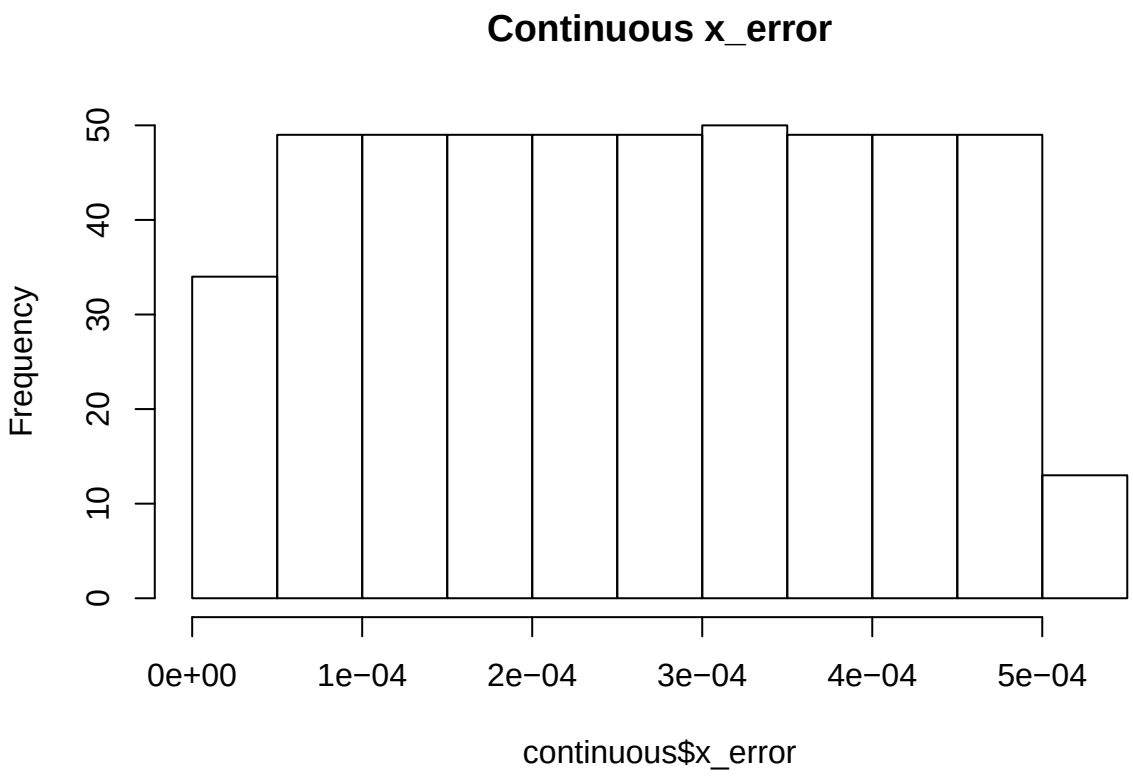
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



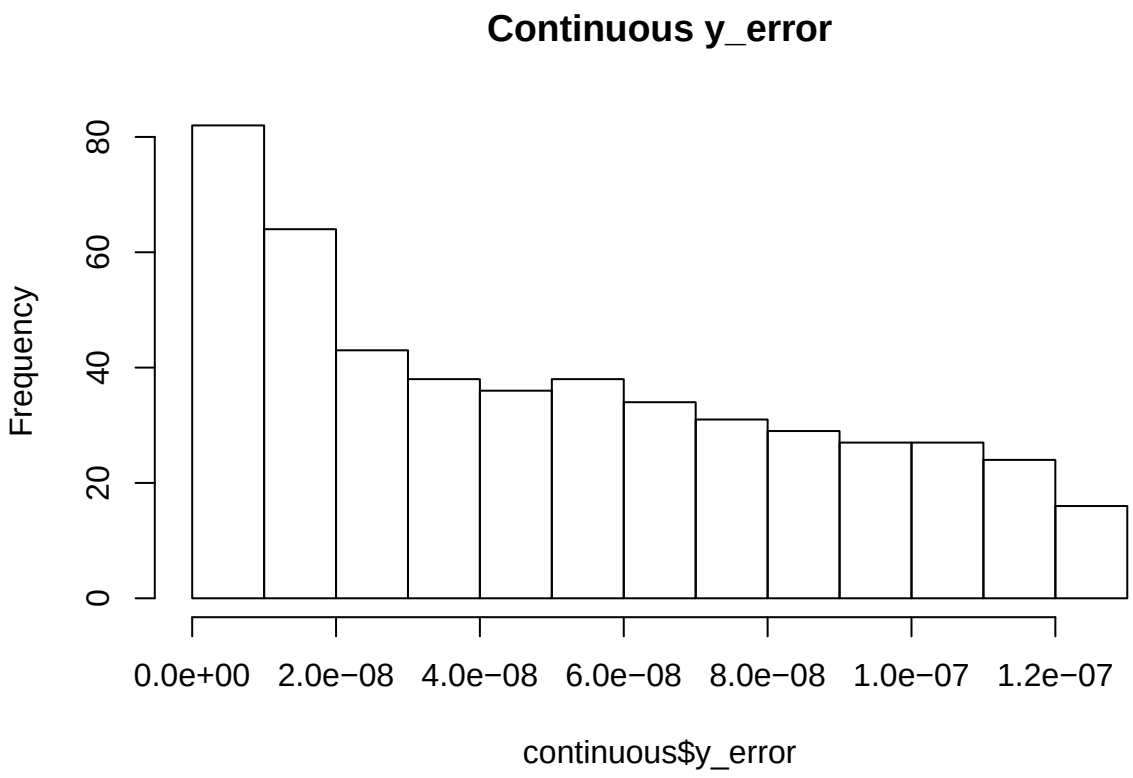

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



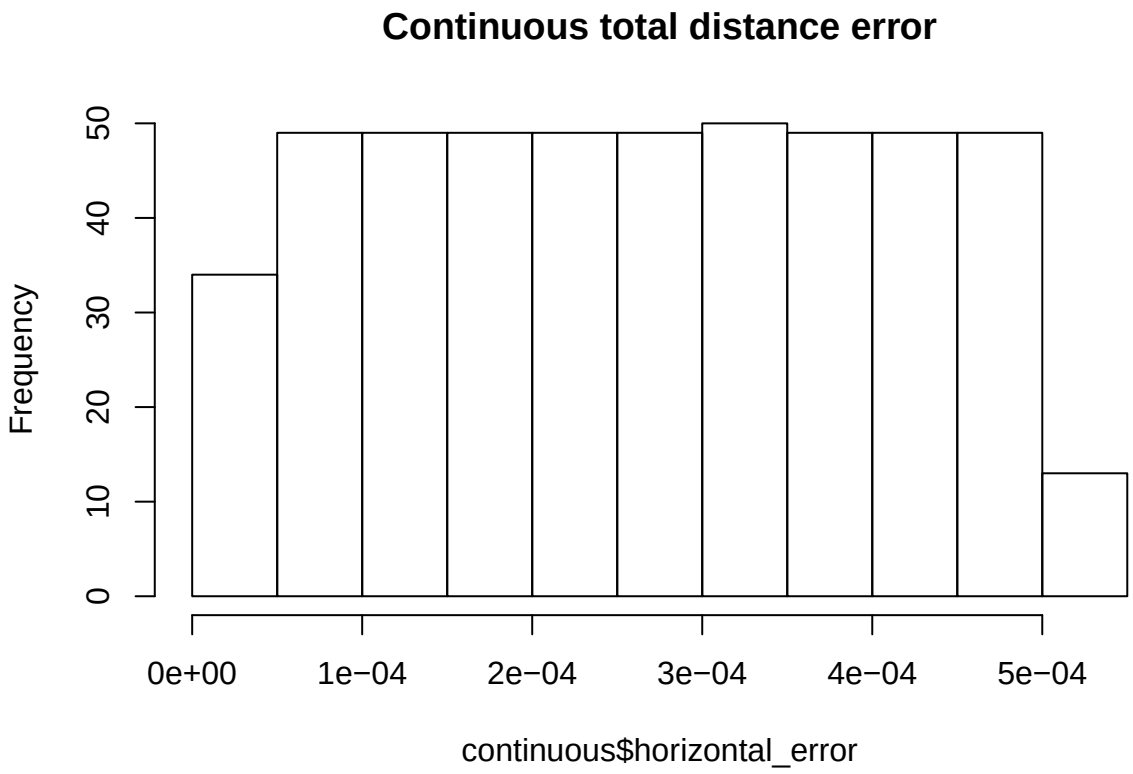

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



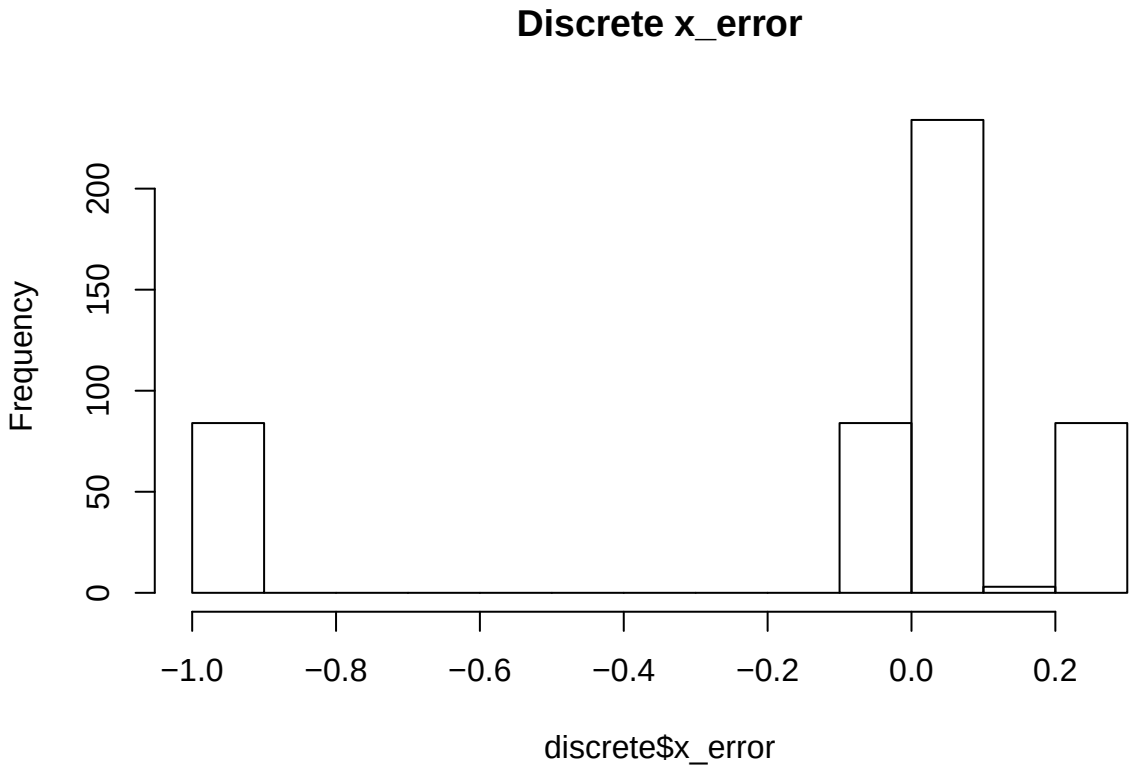

```
hist(continuous$y_error,
      main = "Continuous y_error")
```



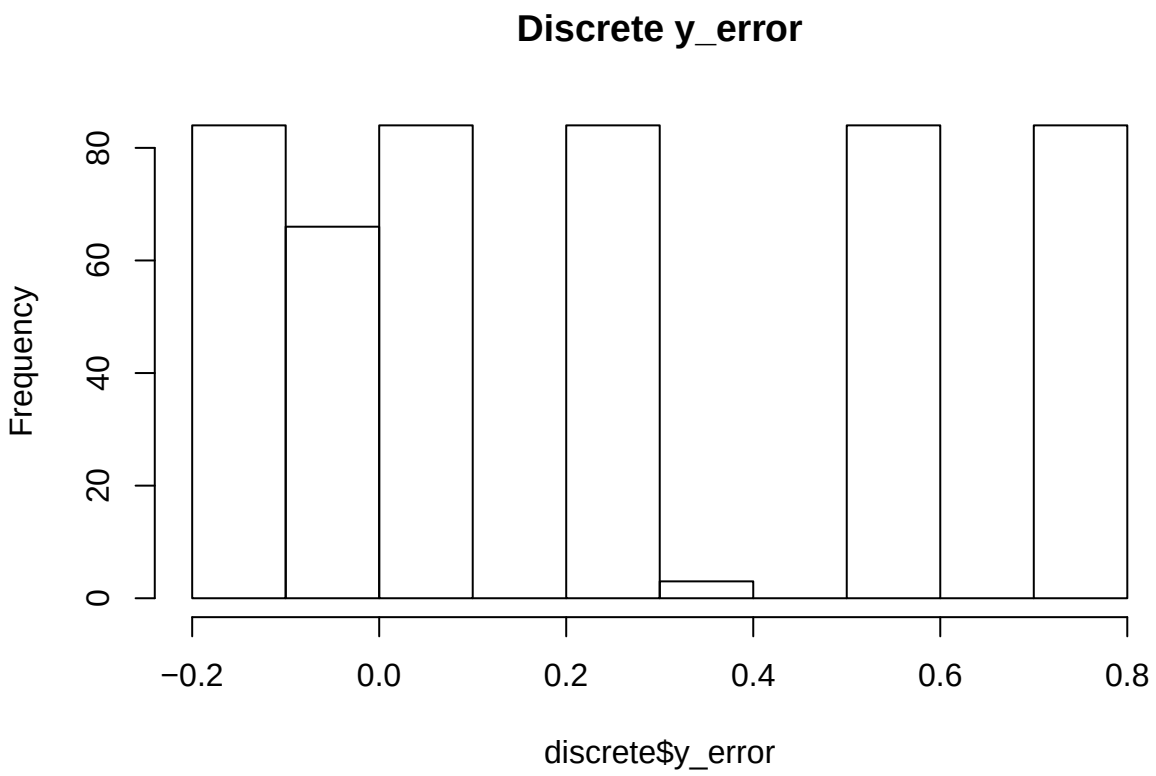

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



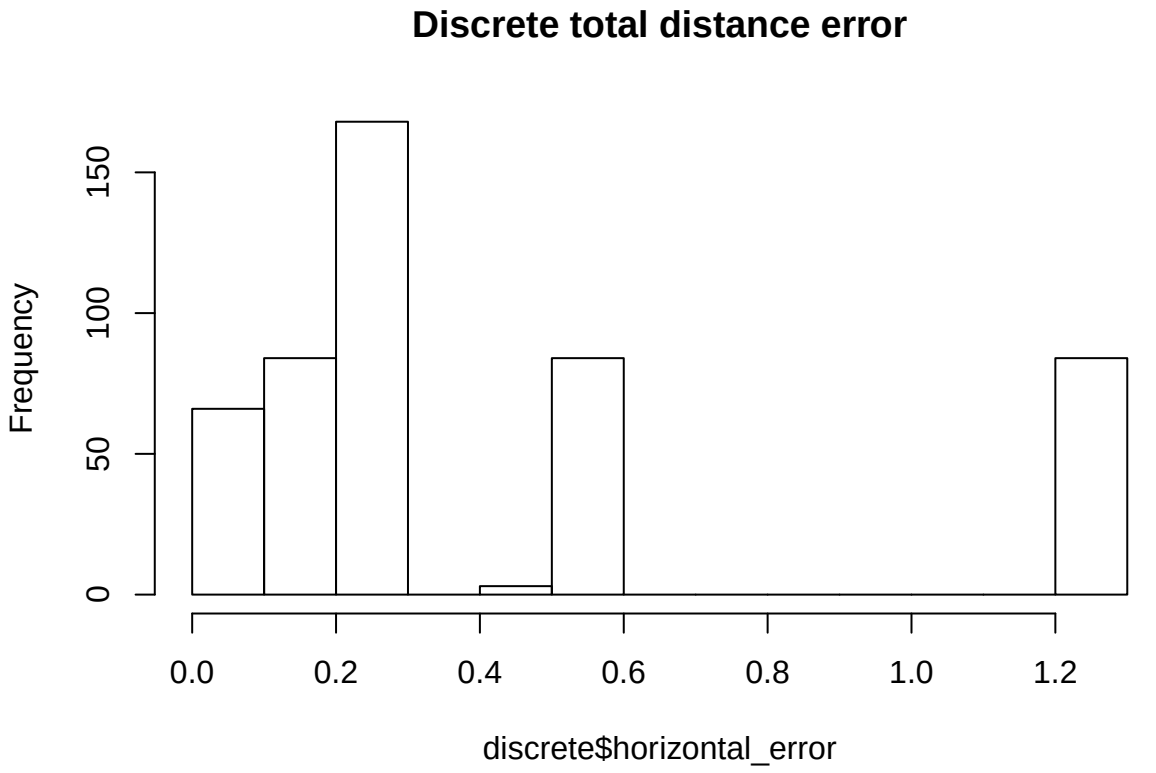

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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: Wed, Aug 10, 2016 - 04:37:37 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-stationary Experiment}
##   \label{tab:one_stationary_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 & 489 & 0.000 & 0.000 & $-$0 & 0 \\
## y\_position & 489 & 0.000 & 0.000 & $-$0 & 0 \\
## yaw & 489 & $-$0.000 & 0.000 & $-$0 & 0 \\
## x\_variance & 489 & 1.538 & 0.842 & 0.077 & 2.989 \\
## y\_variance & 489 & 1.538 & 0.842 & 0.077 & 2.989 \\
## yaw\_variance & 489 & 1.844 & 1.010 & 0.092 & 3.583 \\
## yaw\_error & 489 & 0.0003 & 0.0001 & 0.00005 & 0.0004 \\
## x\_error & 489 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_error & 489 & 0.0000001 & 0.00000004 & 0.000 & 0.0000001 \\
## horizontal\_error & 489 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
```

```
## \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: Wed, Aug 10, 2016 - 04:37:37 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-stationary Experiment}
##   \label{tab:one_stationary_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 & 489 & 0.111 & 0.394 & $-$0.229 & 0.952 \\
## y\_position & 489 & $-$0.258 & 0.317 & $-$0.766 & 0.130 \\
## yaw & 489 & 0.0002 & 0.0001 & $-$0.000 & 0.0004 \\
## x\_variance & 489 & 1.035 & 0.411 & 0.077 & 1.660 \\
## y\_variance & 489 & 1.035 & 0.411 & 0.077 & 1.660 \\
## yaw\_variance & 489 & 0.381 & 0.172 & 0.088 & 0.695 \\
## x\_error & 489 & $-$0.111 & 0.394 & $-$0.952 & 0.229 \\
## y\_error & 489 & 0.258 & 0.317 & $-$0.130 & 0.766 \\
## horizontal\_error & 489 & 0.413 & 0.404 & 0.00002 & 1.222 \\
## yaw\_error & 489 & 0.00004 & 0.00004 & $-$0.00003 & 0.0002 \\
## \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)
}
```