one_stationary_noiseless Experiment Report

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This is a summary of the data from the one_stationary_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.
## 1.519e-05 1.383e-04 2.620e-04 2.629e-04 3.882e-04 5.119e-04
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.599e-10 1.053e-08 2.664e-08 3.401e-08 5.391e-08 9.374e-08
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 5.472e-05 9.873e-05 1.723e-04 1.868e-04 2.584e-04 3.673e-04
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.519e-05 1.383e-04 2.620e-04 2.629e-04 3.882e-04 5.119e-04
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -4.850e-04 -2.749e-04 -1.505e-04 -1.525e-04 -2.321e-05  8.222e-05
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -8.503e-08 -2.827e-08 -9.538e-09 -1.528e-08 -7.374e-10  5.728e-09
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -1.578e-05  1.760e-05  3.408e-05  3.863e-05  5.684e-05  1.169e-04
```

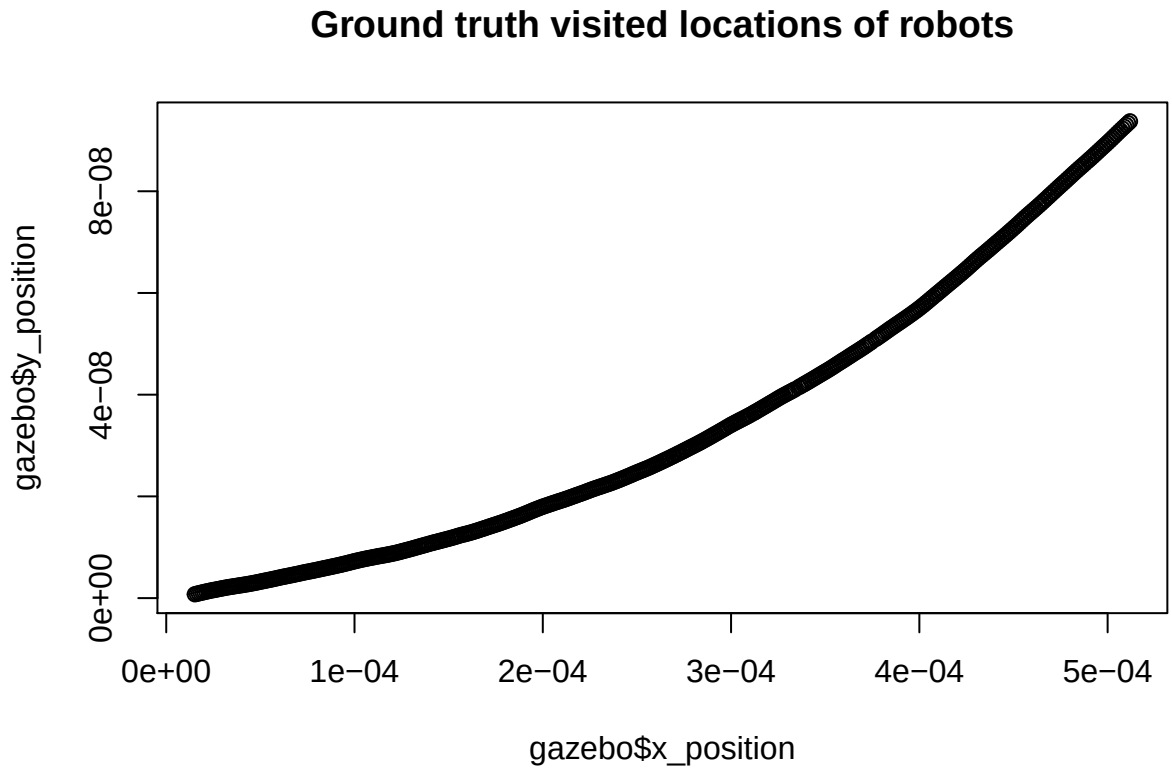
```
summary(discrete$horizontal_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 3.006e-07 5.273e-05 1.505e-04 1.681e-04 2.749e-04 4.850e-04
```

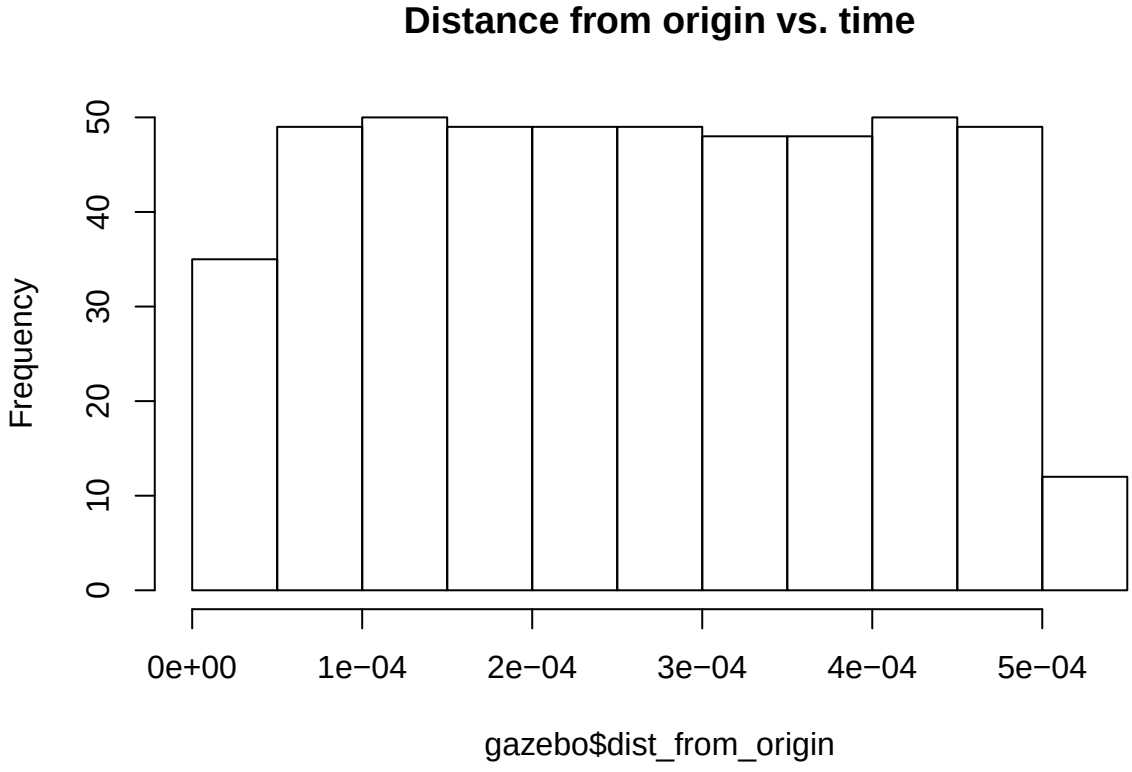
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

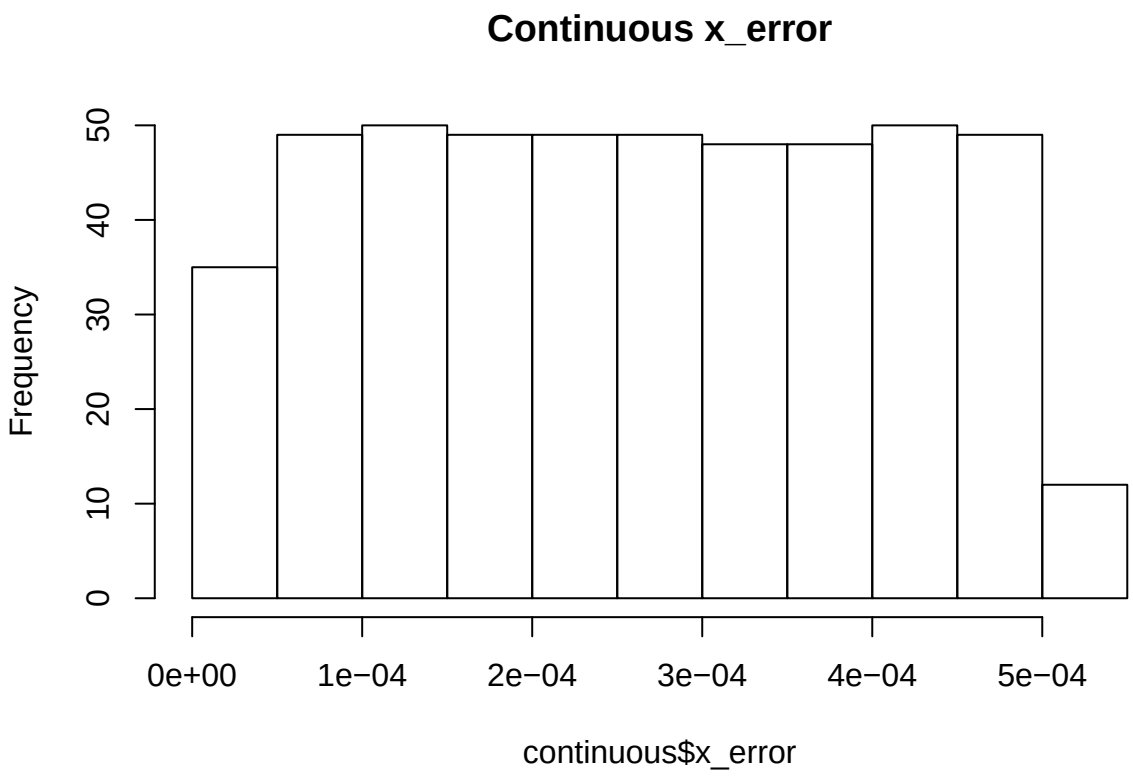
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



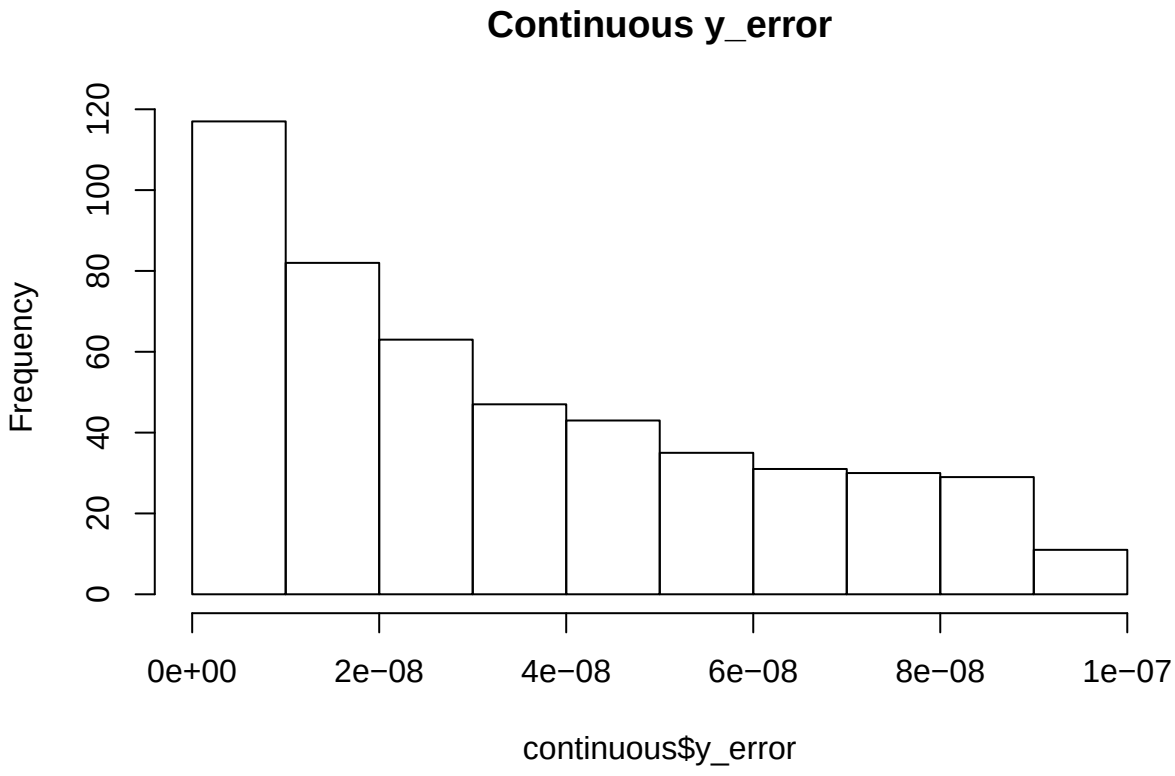

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



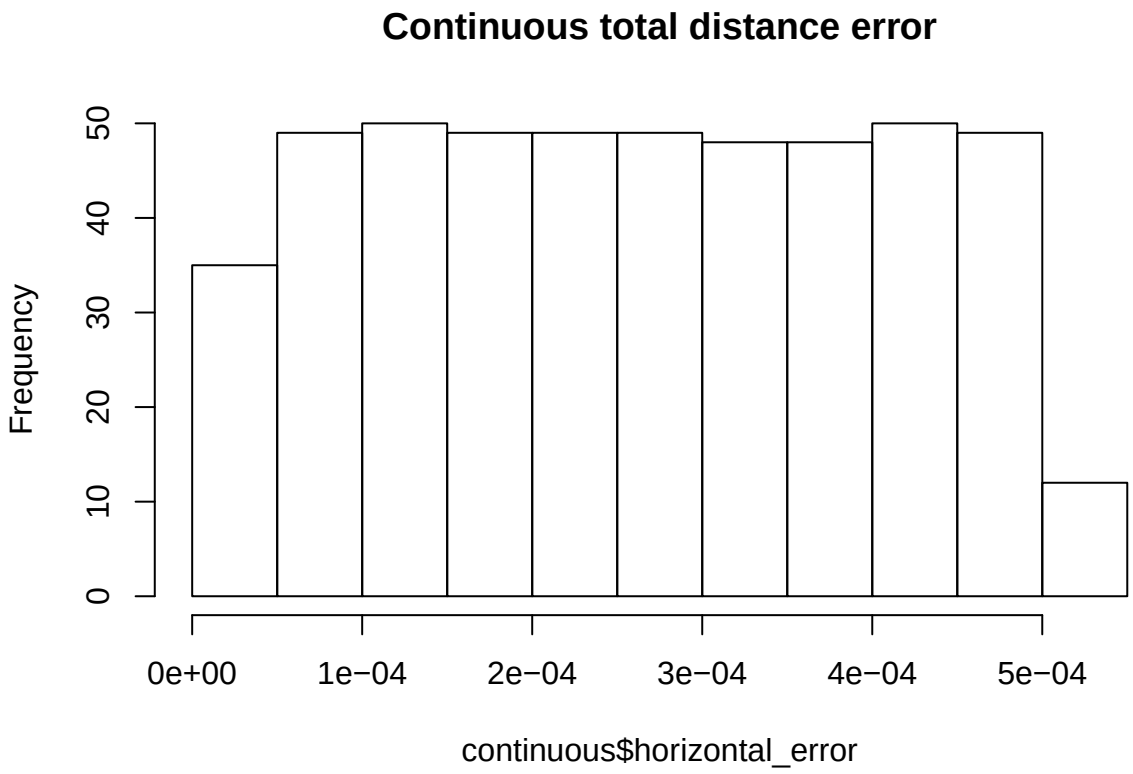

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



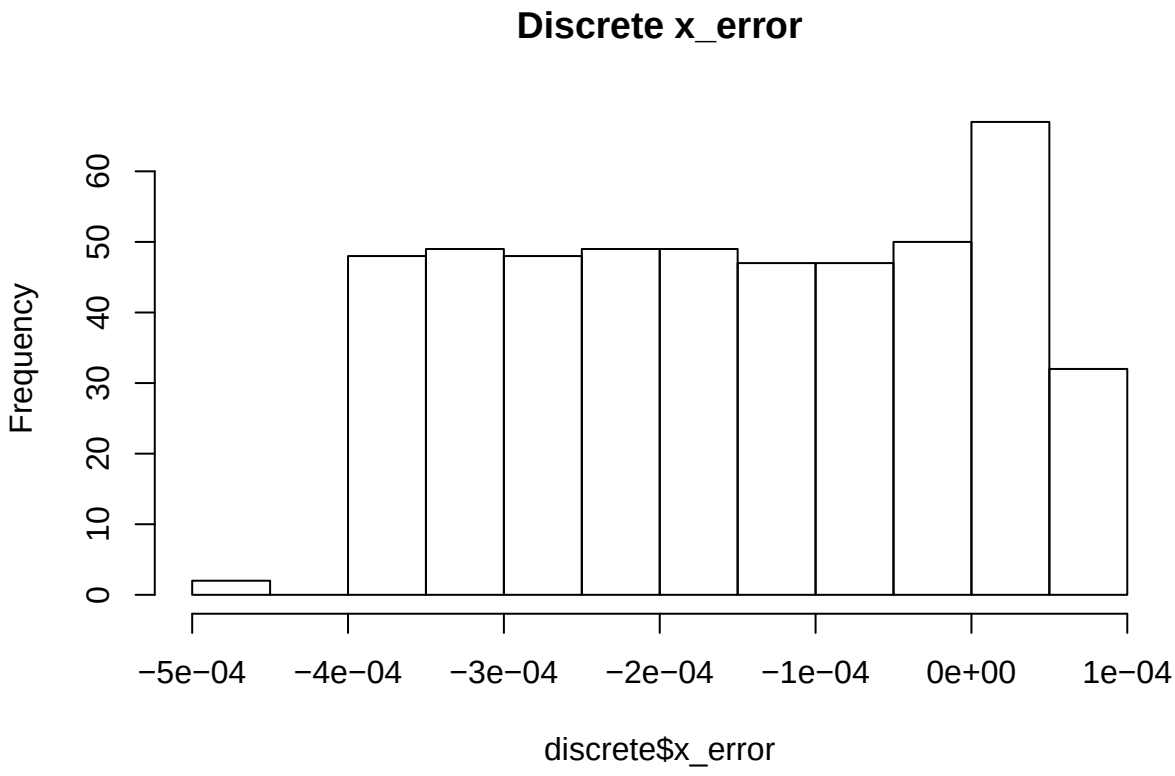

```
hist(continuous$y_error,
      main = "Continuous y_error")
```



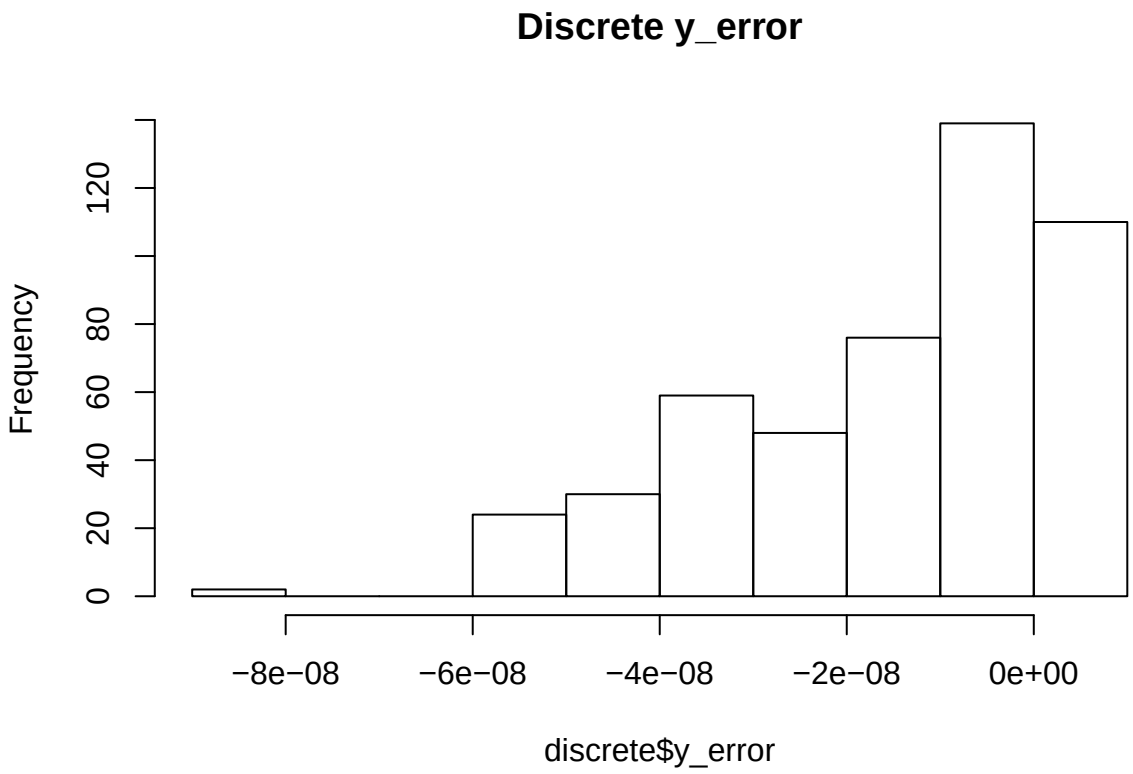

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



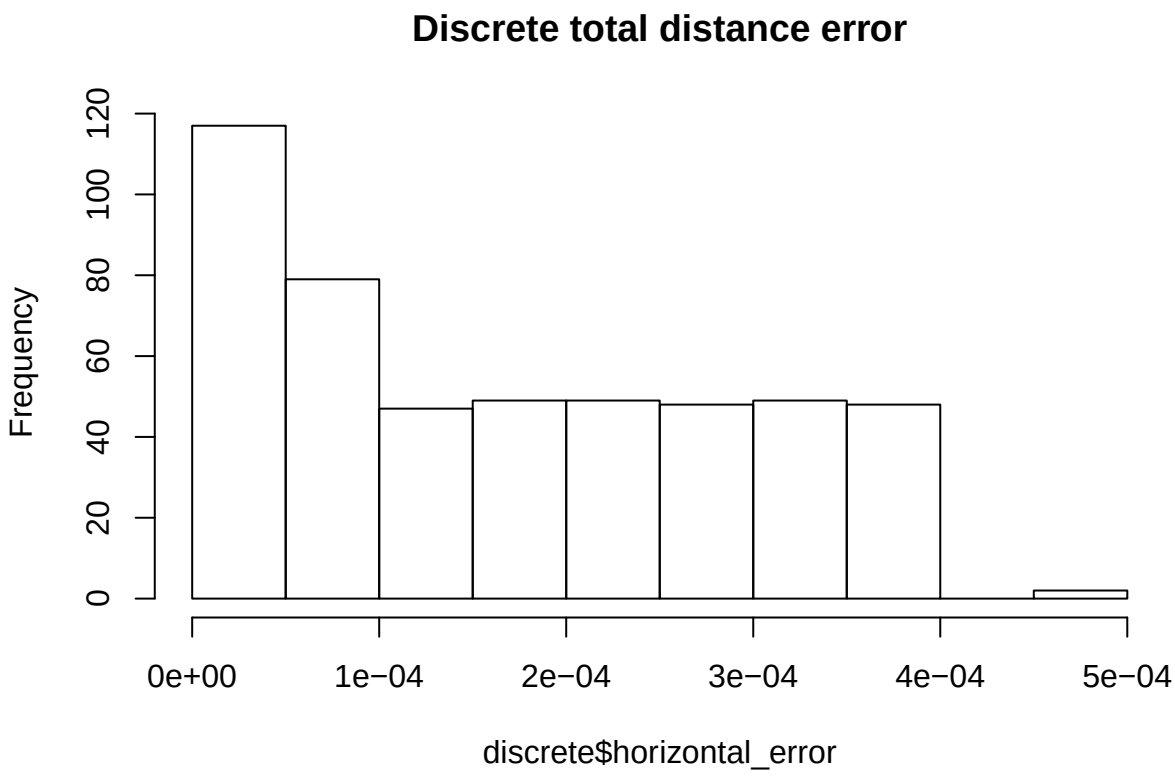

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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()
}
```

```
## pdf
##   2
```

```
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 - 04:37:58 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-stationary-noiseless Experiment}
##   \label{tab:one_stationary_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 & 488 & $-$0.000 & 0.000 & $-$0 & 0 \\
## y\_position & 488 & 0.000 & 0.000 & $-$0 & 0 \\
## yaw & 488 & $-$0.000 & 0.000 & $-$0 & 0 \\
## x\_variance & 488 & 1.528 & 0.843 & 0.077 & 2.988 \\
## y\_variance & 488 & 1.528 & 0.843 & 0.077 & 2.988 \\
## yaw\_variance & 488 & 1.831 & 1.011 & 0.092 & 3.582 \\
## yaw\_error & 488 & 0.0002 & 0.0001 & 0.0001 & 0.0004 \\
```

```
## x\_error & 488 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_error & 488 & 0.00000003 & 0.00000003 & 0.000 & 0.0000001 \\
## horizontal\_error & 488 & 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.harvard
## % Date and time: Wed, Aug 10, 2016 - 04:37:58 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-stationary-noiseless Experiment}
##   \label{tab:one_stationary_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 & 488 & 0.0004 & 0.0003 & $-$0.000 & 0.001 \\
## y\_position & 488 & 0.00000005 & 0.00000004 & $-$0.000 & 0.0000002 \\
## yaw & 488 & 0.0001 & 0.0001 & $-$0.000 & 0.0003 \\
## x\_variance & 488 & 0.393 & 0.149 & 0.083 & 0.664 \\
## y\_variance & 488 & 0.393 & 0.149 & 0.083 & 0.664 \\
## yaw\_variance & 488 & 0.383 & 0.171 & 0.090 & 0.691 \\
## x\_error & 488 & $-$0.0002 & 0.0001 & $-$0.0005 & 0.0001 \\
## y\_error & 488 & $-$0.00000002 & 0.00000002 & $-$0.0000001 & 0.000 \\
## horizontal\_error & 488 & 0.0002 & 0.0001 & 0.0000003 & 0.0005 \\
## yaw\_error & 488 & 0.00004 & 0.00003 & $-$0.00002 & 0.0001 \\
## \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)
}
```

```
##
## % 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 - 04:37:58 PM
## \begin{table}[h] \centering
##   \caption{Ground Truth Noiseless Odometry for Stationary Robot located at Origin}
```

```
##   \label{tab:gazebo_stationary_noiseless_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 & 488 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_position & 488 & 0.00000003 & 0.00000003 & 0.000 & 0.0000001 \\
## yaw & 488 & 0.0002 & 0.0001 & 0.0001 & 0.0004 \\
## x\_variance & 488 & 0.100 & 0.000 & 0.100 & 0.100 \\
## y\_variance & 488 & 0.100 & 0.000 & 0.100 & 0.100 \\
## yaw\_variance & 488 & 0.050 & 0.000 & 0.050 & 0.050 \\
## dist\_from\_origin & 488 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## horizontal\_error & 488 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```