one_stationary Experiment Report

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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.
## 9.357e-07 2.395e-06 3.595e-06 3.555e-06 4.540e-06 6.938e-06
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.677e-10 1.059e-08 2.309e-08 2.430e-08 3.713e-08 5.177e-08
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 5.396e-05 9.146e-05 1.053e-04 1.018e-04 1.121e-04 1.423e-04
```

```
summary(continuous$position_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 9.358e-07 2.395e-06 3.596e-06 3.555e-06 4.540e-06 6.939e-06
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -0.38770 -0.21910 -0.02515 -0.09512  0.03390  0.06671
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.1016  0.2531  0.2217  0.2668  0.5130
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -4.011e-05 -1.320e-05 -4.191e-06  5.644e-06  9.276e-06  9.864e-05
```

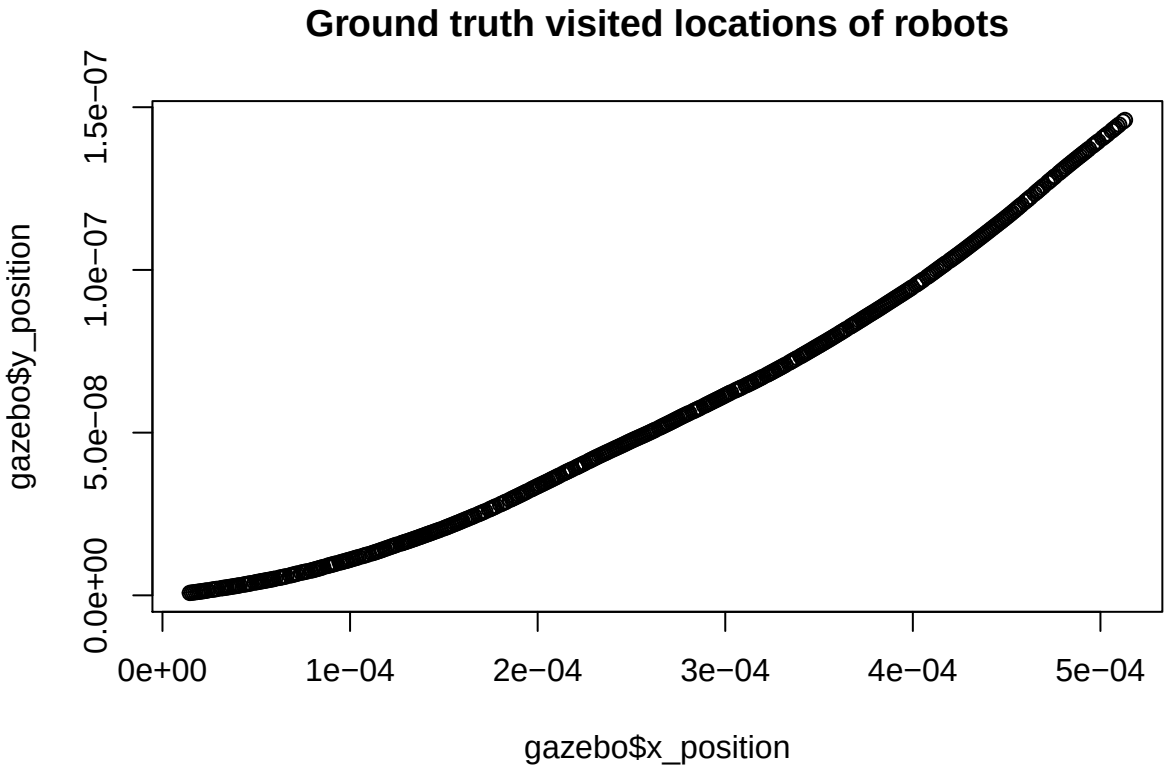
```r
summary(discrete$position_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000014 0.1071000 0.2680000 0.2601000 0.3347000 0.6326000
```

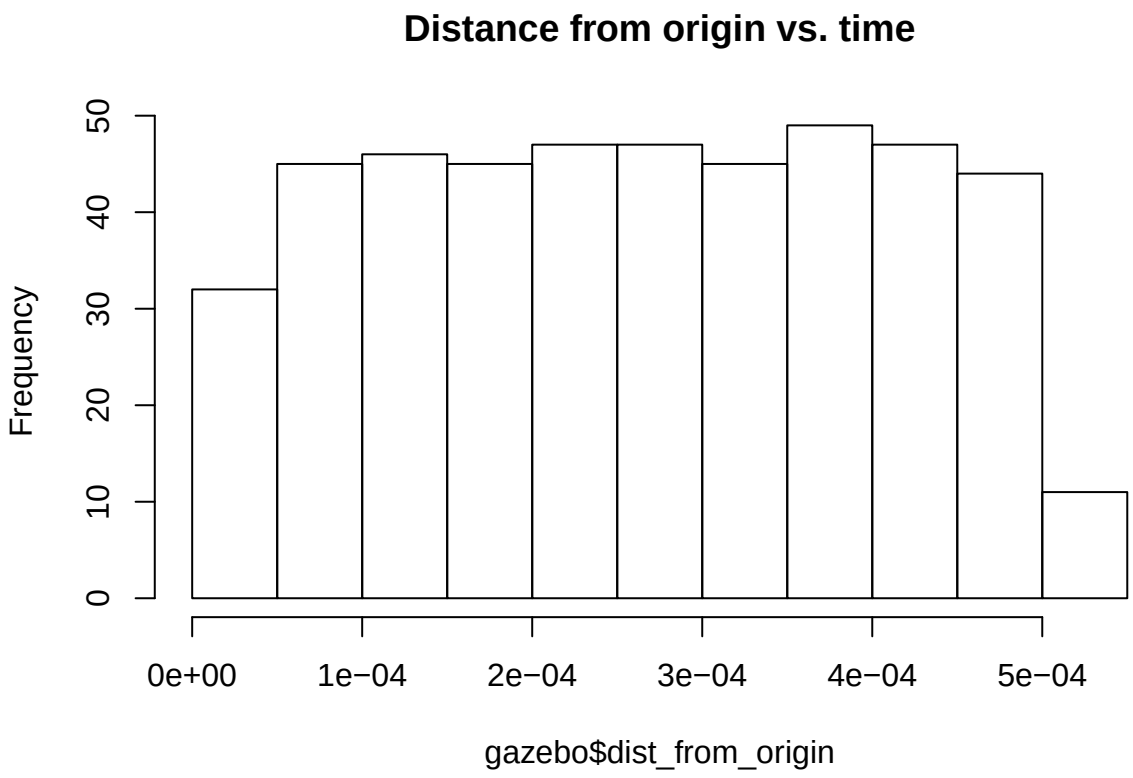
```r
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

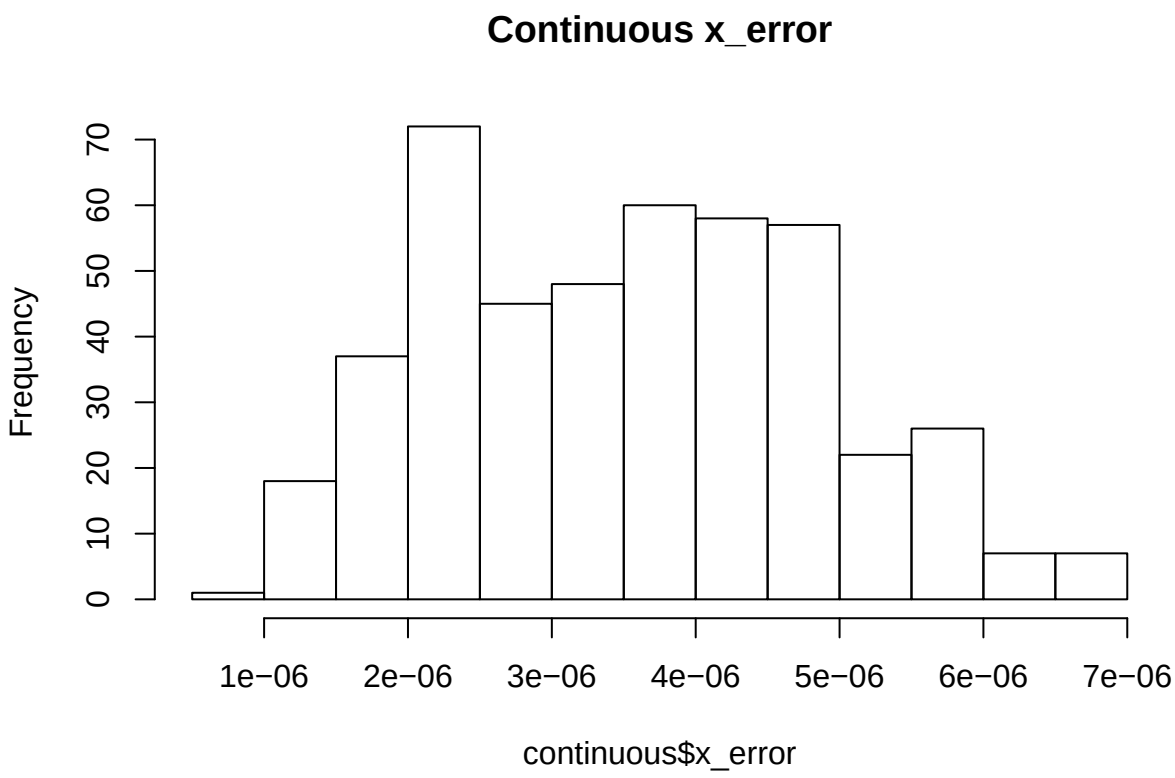
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



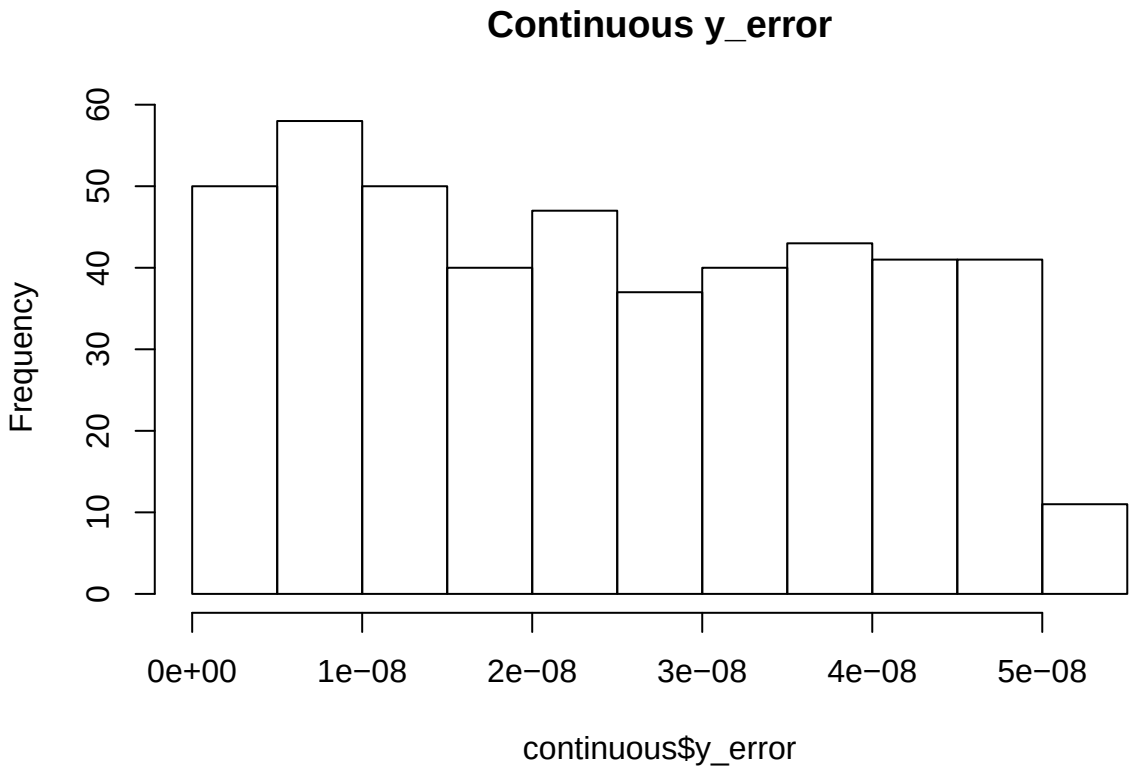

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



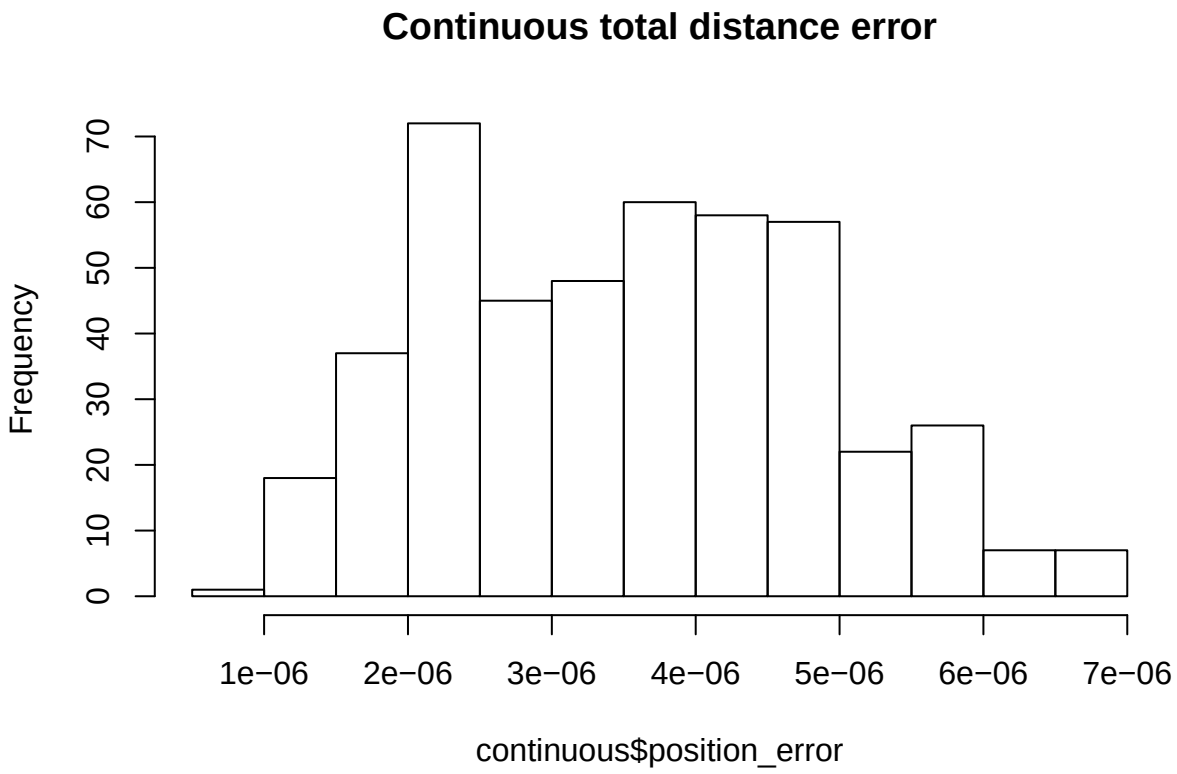

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



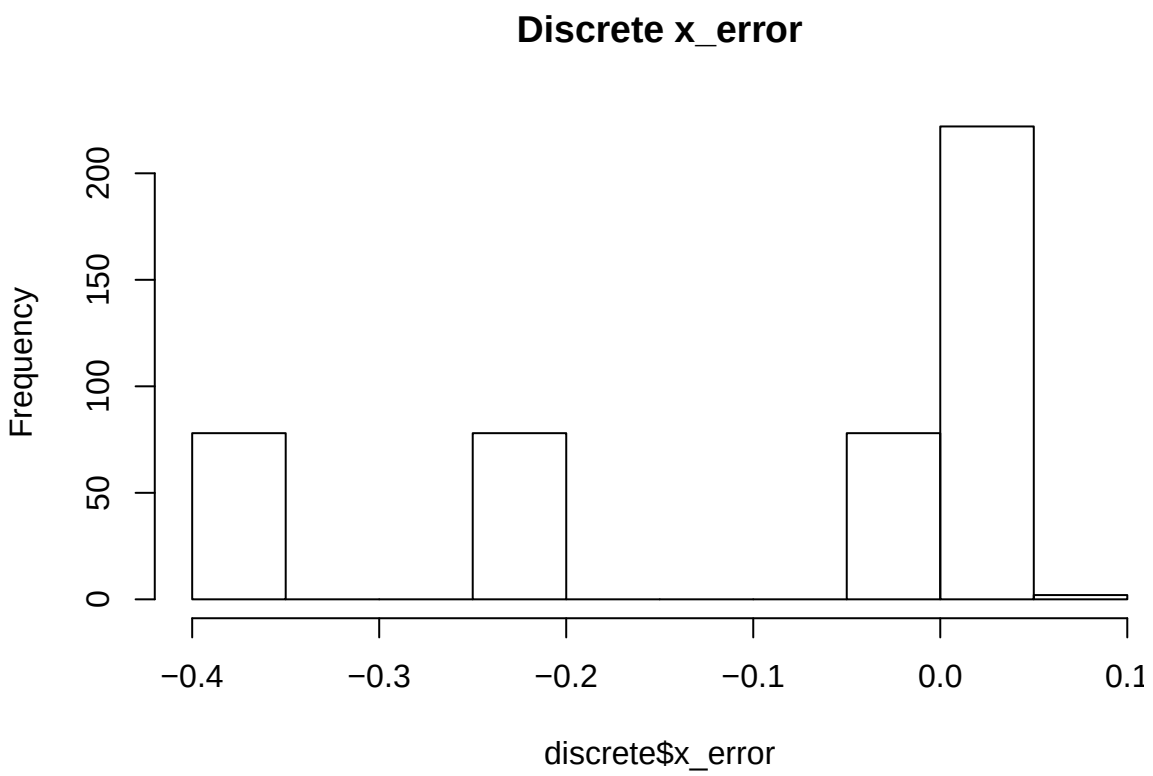
```r
hist(continuous$y_error,
     main = "Continuous y_error")
```



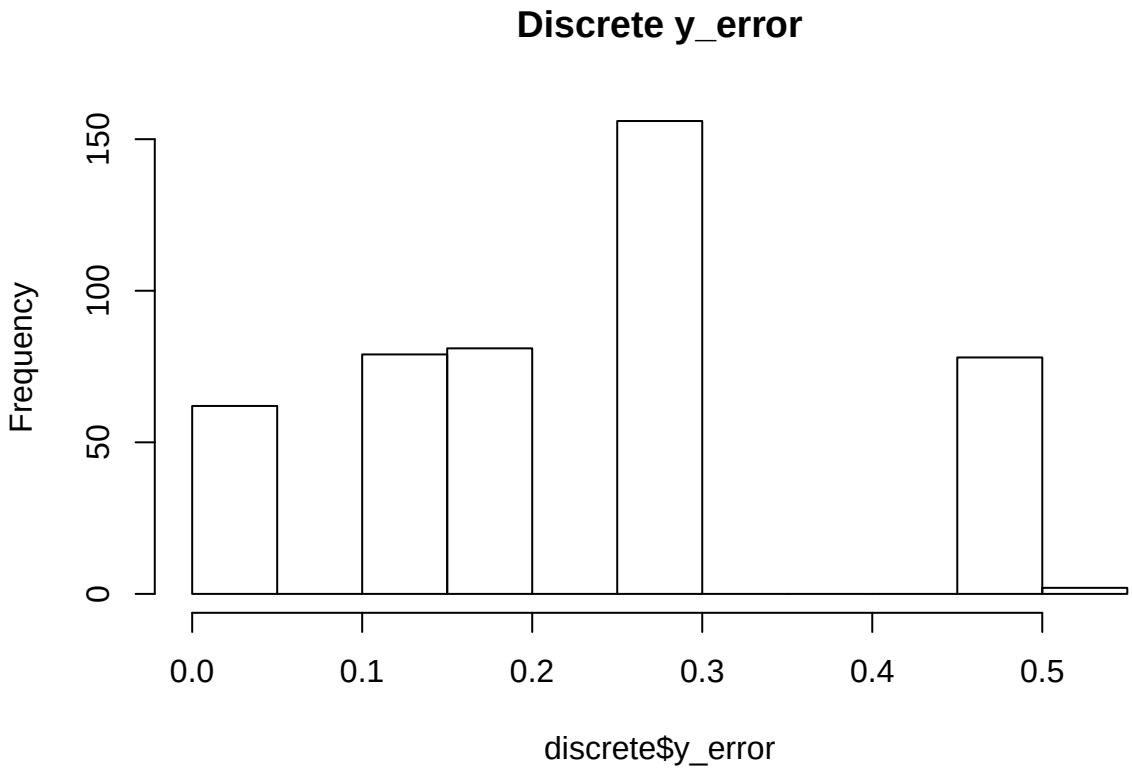

```r
hist(continuous$position_error,
     main = "Continuous total distance error")
```



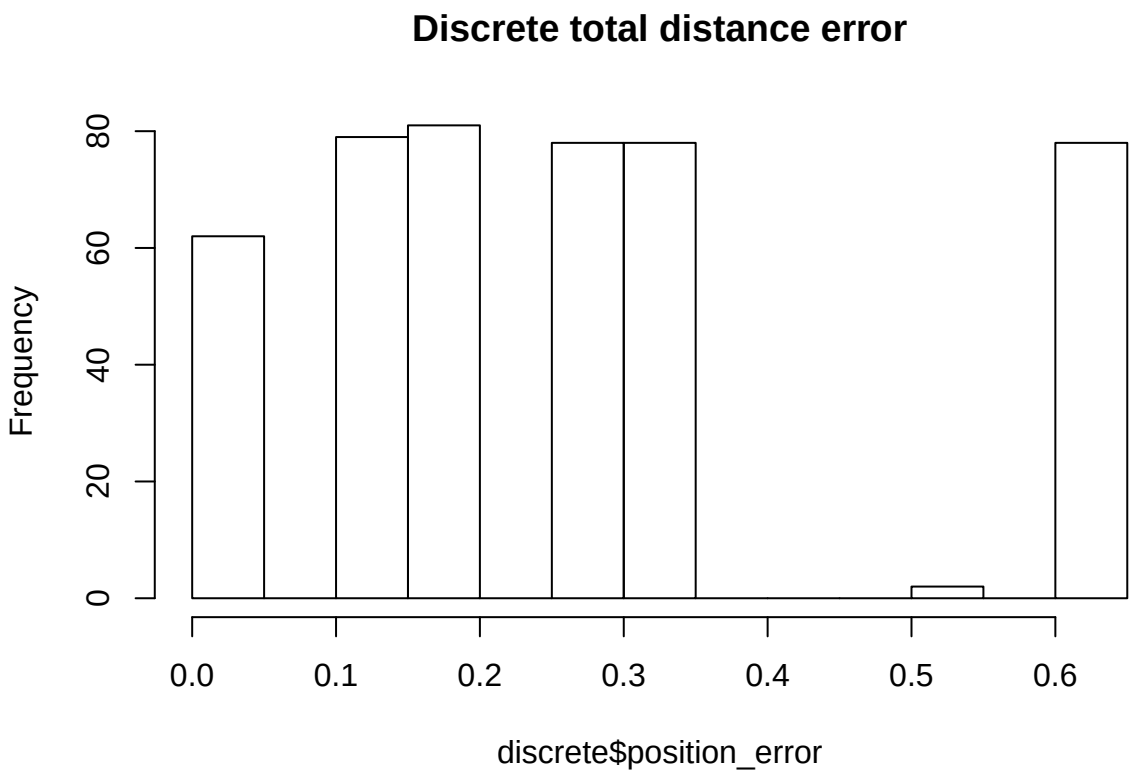

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



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




```r
hist (discrete$position_error,
      main = "Discrete total distance error")
```




```
figure_dir <- "/home/matt/thesis/writing/r_figures/"
filename = paste0(figure_dir, params$experiment, "_continuous_error.pdf")
pdf(filename)
plot(continuous$position_error, main="Continuous Filter Error", sub=paste0("For ", params$experiment, "

dev.off()
```

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

```
filename = paste0(figure_dir, params$experiment, "_discrete_error.pdf")
pdf(filename)
plot(discrete$position_error, main="Discrete Filter Error", sub=paste0("For ", params$experiment, " Exp
dev.off()
```

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

```
if (params$experiment == "one_stationary_noiseless") {
    gazebo$position_error <- sqrt(gazebo$x_position ^ 2 + gazebo$y_position ^ 2)
    pdf(paste0(figure_dir, "gazebo_odom_drift.pdf"))

    plot(gazebo$position_error, main="Gazebo Odometry Drift for Stationary Robot with Noiseless Odometry
    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="htbp",
          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: Fri, Aug 19, 2016 - 02:43:36 PM
## \begin{table}[htbp] \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 & 458 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\
## y\_position & 458 & 0.00000003 & 0.00000003 & $-$0.000 & 0.0000001 \\
## yaw & 458 & 0.0002 & 0.0001 & $-$0.00001 & 0.0004 \\
## x\_variance & 458 & 1.536 & 0.839 & 0.076 & 2.993 \\
## y\_variance & 458 & 1.536 & 0.839 & 0.076 & 2.993 \\
## yaw\_variance & 458 & 1.841 & 1.006 & 0.091 & 3.588 \\
## x\_error & 458 & 0.000004 & 0.000001 & 0.000001 & 0.00001 \\
## y\_error & 458 & 0.00000002 & 0.00000002 & 0.000 & 0.0000001 \\
## yaw\_error & 458 & 0.0001 & 0.00002 & 0.0001 & 0.0001 \\
## position\_error & 458 & 0.000004 & 0.000001 & 0.000001 & 0.00001 \\
## \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="htbp",
          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: Fri, Aug 19, 2016 - 02:43:36 PM
## \begin{table}[htbp] \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 & 458 & 0.095 & 0.159 & $-$0.066 & 0.388 \\
## y\_position & 458 & $-$0.222 & 0.155 & $-$0.513 & 0.000 \\
## yaw & 458 & 0.0003 & 0.0001 & $-$0.000002 & 0.001 \\
## x\_variance & 458 & 1.030 & 0.410 & 0.070 & 1.651 \\
## y\_variance & 458 & 1.030 & 0.410 & 0.070 & 1.651 \\
## yaw\_variance & 458 & 0.376 & 0.171 & 0.084 & 0.690 \\
## x\_error & 458 & $-$0.095 & 0.159 & $-$0.388 & 0.067 \\
## y\_error & 458 & 0.222 & 0.155 & 0.000 & 0.513 \\
## yaw\_error & 458 & 0.00001 & 0.00003 & $-$0.00004 & 0.0001 \\
## position\_error & 458 & 0.260 & 0.199 & 0.000001 & 0.633 \\
## \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="htbp",
              label="tab:gazebo_stationary_noiseless_summary",
              title="Ground Truth Noiseless Odometry for Stationary Robot located at Origin",
              digits.extra = 20)
}
```