one_mobile_noiseless_no_gps Experiment Report

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This is a summary of the data from the one_mobile_noiseless_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.
## -0.1514  0.1342  0.1342  0.1328  0.1342  0.2492
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.312600 -0.312500 -0.312500 -0.308100 -0.312400  0.002268
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14100 -1.44000 -0.05255  0.01221  1.59100  3.14000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000158 0.3401000 0.3401000 0.3363000 0.3401000 0.3433000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.1498  0.1286  0.1286  0.1272  0.1287  0.2420
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.299300 -0.299200 -0.299200 -0.295100 -0.299200  0.002269
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.13800 -1.44000 -0.05491  0.01126  1.58700  3.14100
```

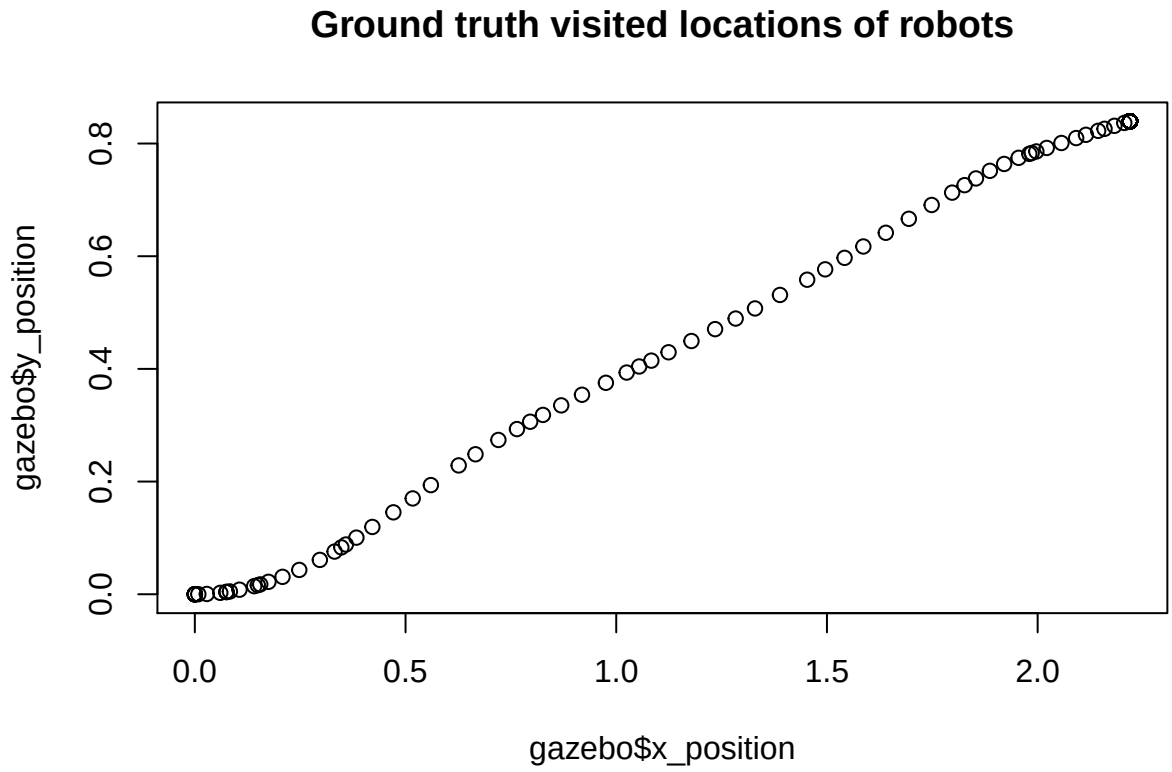
```
summary(discrete$horizontal_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0000158 0.3257000 0.3257000 0.3221000 0.3257000 0.3304000
```

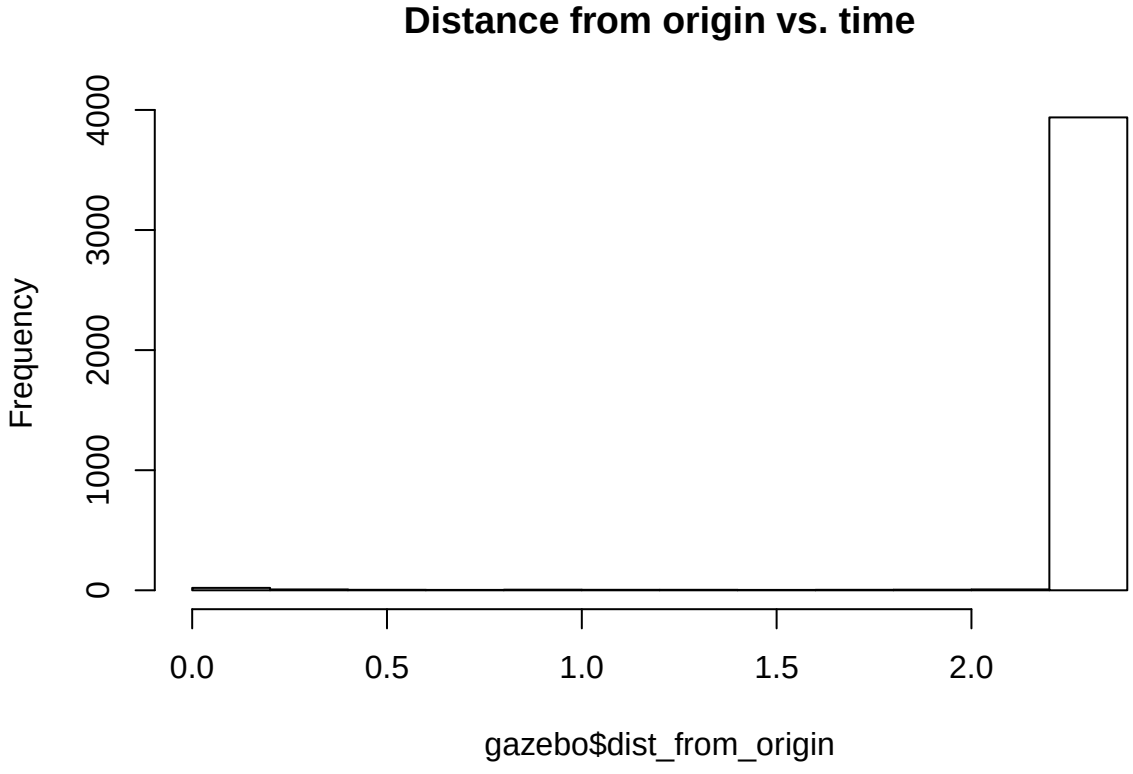
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

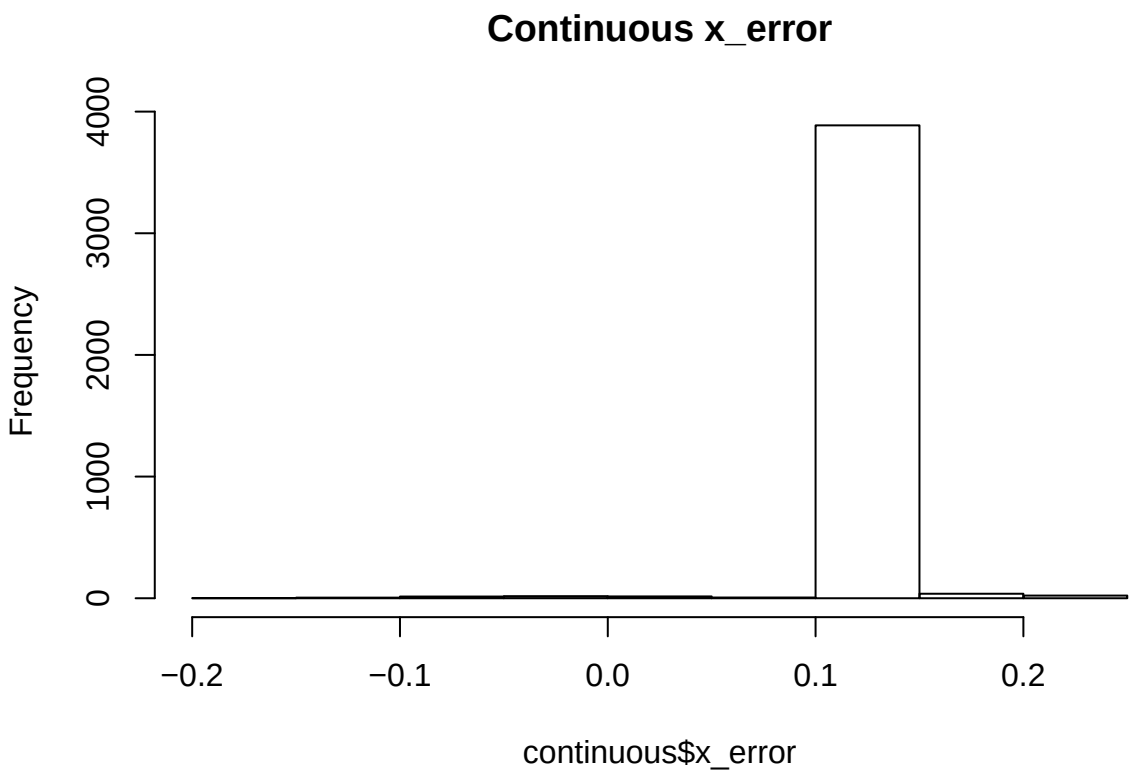
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



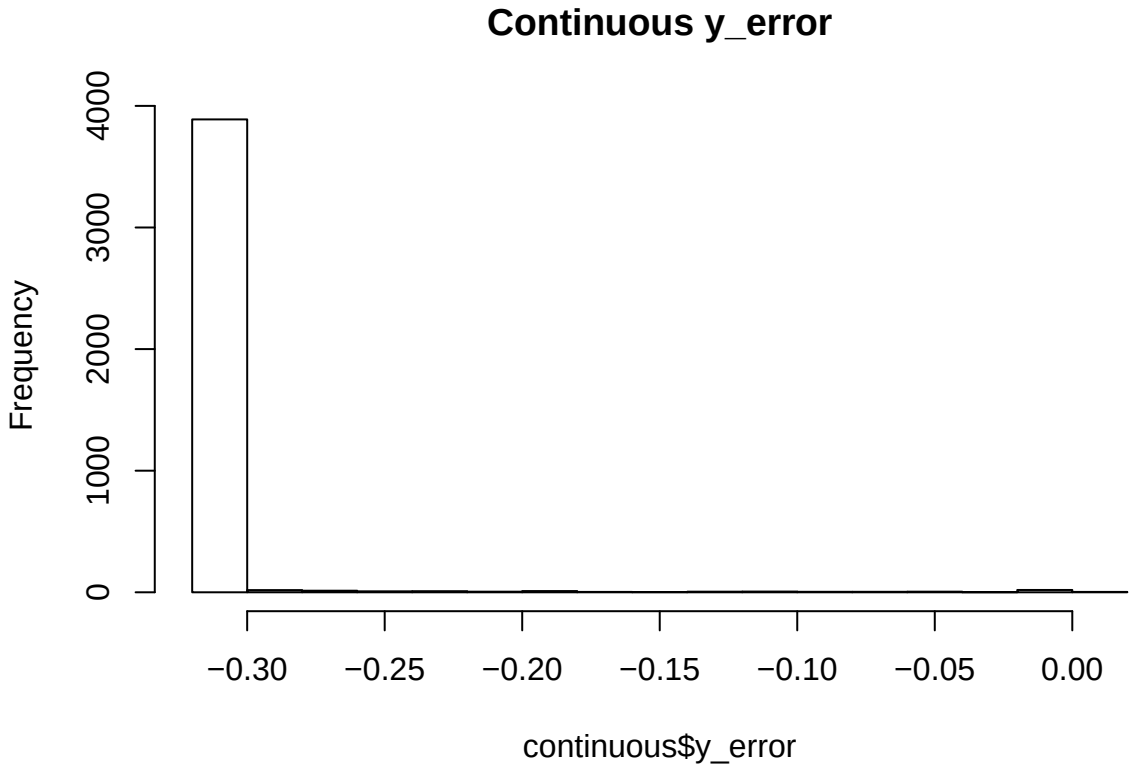

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



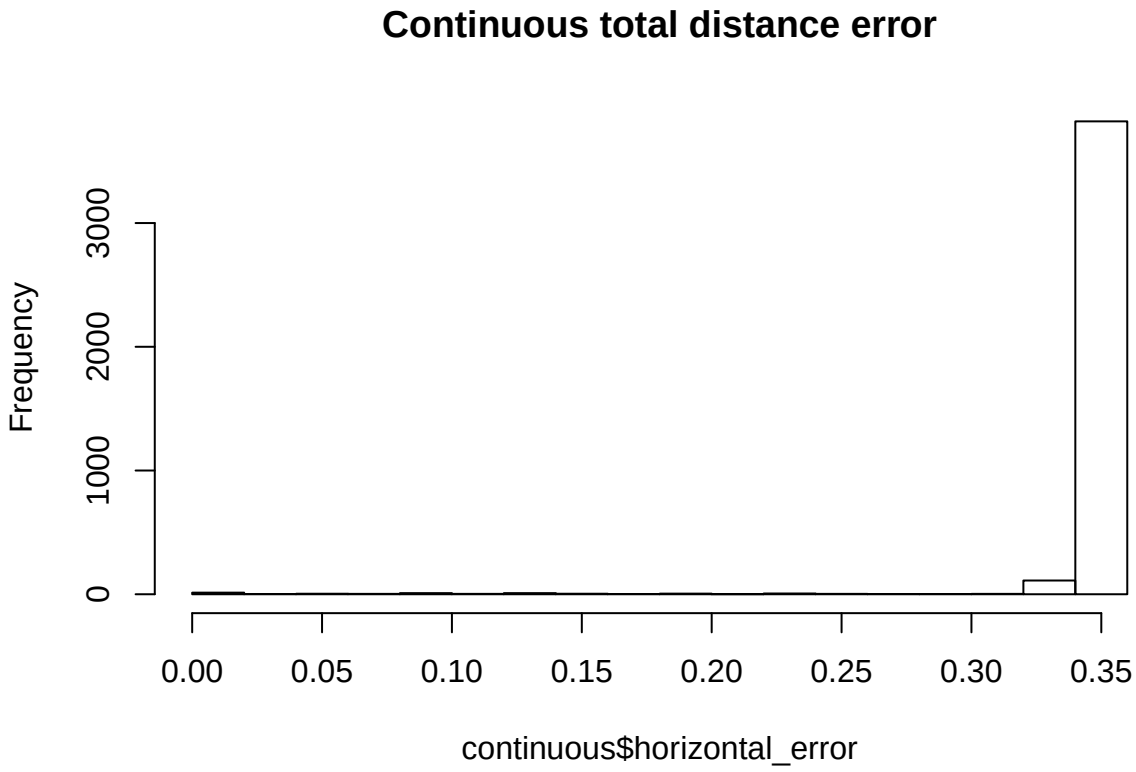

```r
hist(continuous$x_error,
     main = "Continuous x_error")
```



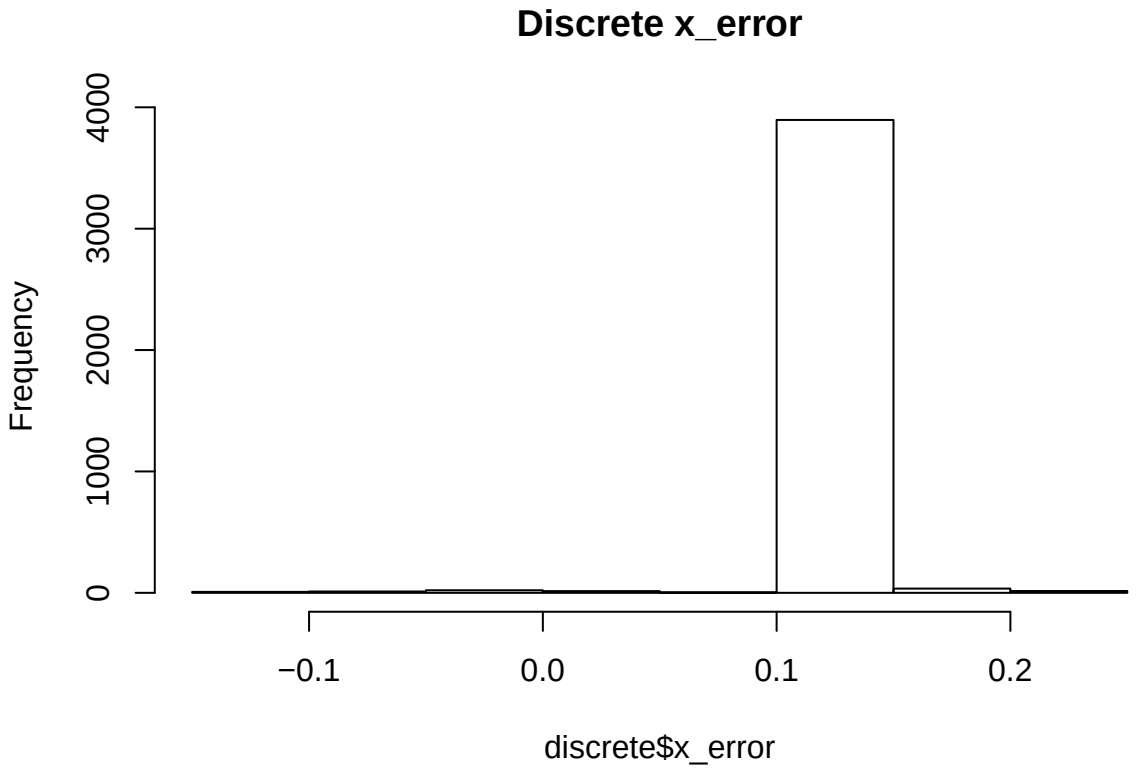

```
hist(continuous$y_error,
      main = "Continuous y_error")
```



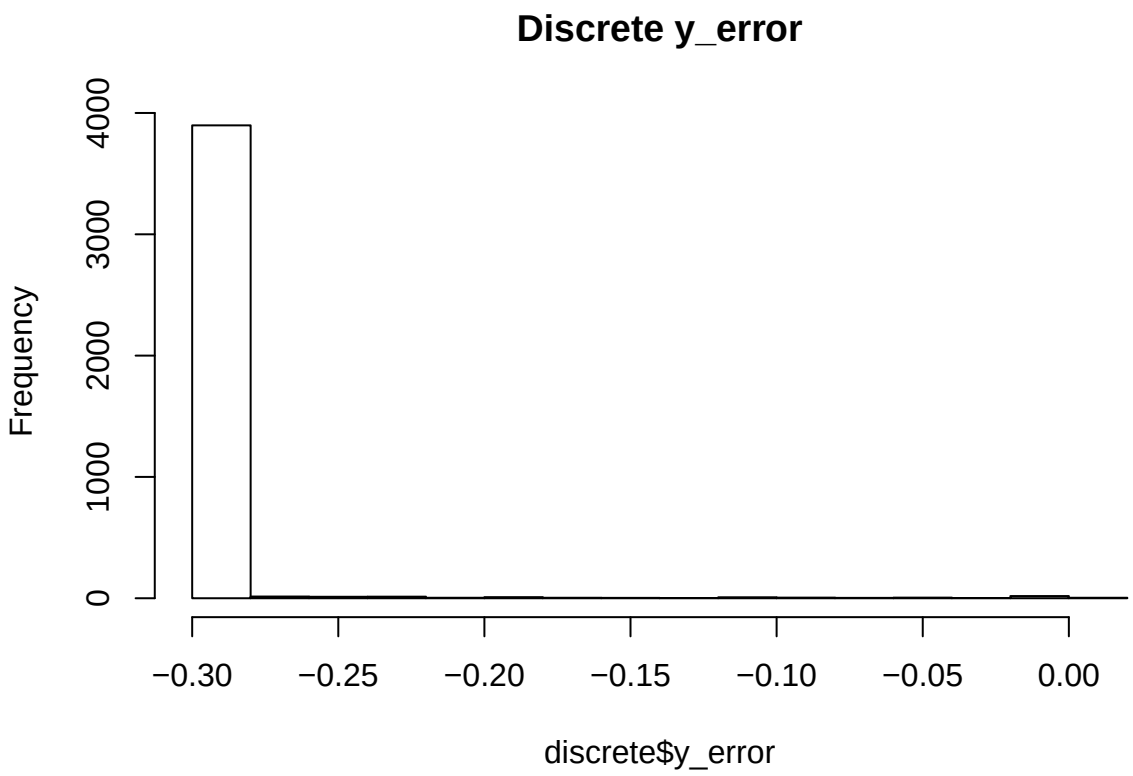

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



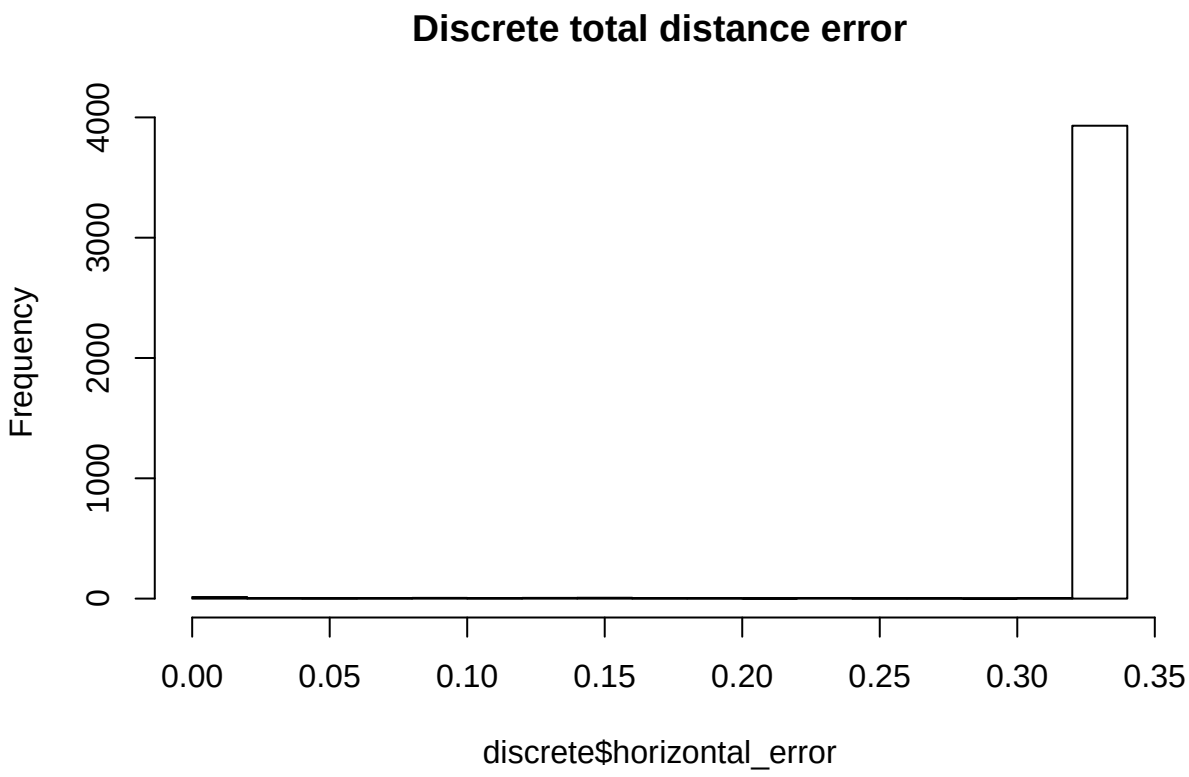

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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 - 04:26:34 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-mobile-noiseless-no-gps Experiment}
##   \label{tab:one_mobile_noiseless_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 & 4,004 & 2.063 & 0.182 & $-$0.000 & 2.085 \\
## y\_position & 4,004 & 1.139 & 0.107 & $-$0.000 & 1.152 \\
## yaw & 4,004 & 0.709 & 0.069 & $-$0.000 & 0.805 \\
## x\_variance & 4,004 & 22.629 & 12.998 & 0.144 & 45.119 \\
## y\_variance & 4,004 & 22.629 & 12.998 & 0.144 & 45.119 \\
## yaw\_variance & 4,004 & 20.334 & 11.680 & 0.130 & 40.546 \\
## yaw\_error & 4,004 & 0.012 & 1.781 & $-$3.141 & 3.140 \\
## x\_error & 4,004 & 0.133 & 0.022 & $-$0.151 & 0.249 \\
## y\_error & 4,004 & $-$0.308 & 0.031 & $-$0.313 & 0.002 \\
## horizontal\_error & 4,004 & 0.336 & 0.030 & 0.00002 & 0.343 \\
```

```
## \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 - 04:26:34 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-mobile-noiseless-no-gps Experiment}
##   \label{tab:one_mobile_noiseless_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 & 4,004 & 2.068 & 0.182 & 0.000 & 2.090 \\
## y\_position & 4,004 & 1.126 & 0.106 & $-$0.000 & 1.139 \\
## yaw & 4,004 & 0.712 & 0.071 & $-$0.000 & 0.796 \\
## x\_variance & 4,004 & 22.634 & 12.998 & 0.144 & 45.120 \\
## y\_variance & 4,004 & 22.634 & 12.998 & 0.144 & 45.120 \\
## yaw\_variance & 4,004 & 20.339 & 11.680 & 0.130 & 40.546 \\
## x\_error & 4,004 & 0.127 & 0.022 & $-$0.150 & 0.242 \\
## y\_error & 4,004 & $-$0.295 & 0.029 & $-$0.299 & 0.002 \\
## horizontal\_error & 4,004 & 0.322 & 0.029 & 0.00002 & 0.330 \\
## yaw\_error & 4,004 & 0.011 & 1.781 & $-$3.138 & 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)
}
```