two_mobile_restricted Experiment Report

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This is a summary of the data from the two_mobile_restricted 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.
## -45.0200 -28.8900 -19.2400 -16.8300   0.9163  15.6900
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -20.0000  -8.9750   0.8386   6.9890  12.3300  65.5800
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14200 -1.25800  0.02775  0.08601  1.57400  3.14100
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00001 12.07000 23.94000 28.33000 44.82000 69.10000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -15.29000  -0.72960   0.01645   0.20160   0.68880  60.47000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -16.03000  -0.70320   0.01606   0.10860   0.74200  28.65000
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1420000 -1.2780000  0.0000862  0.0385700  1.3580000  3.1410000
```

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

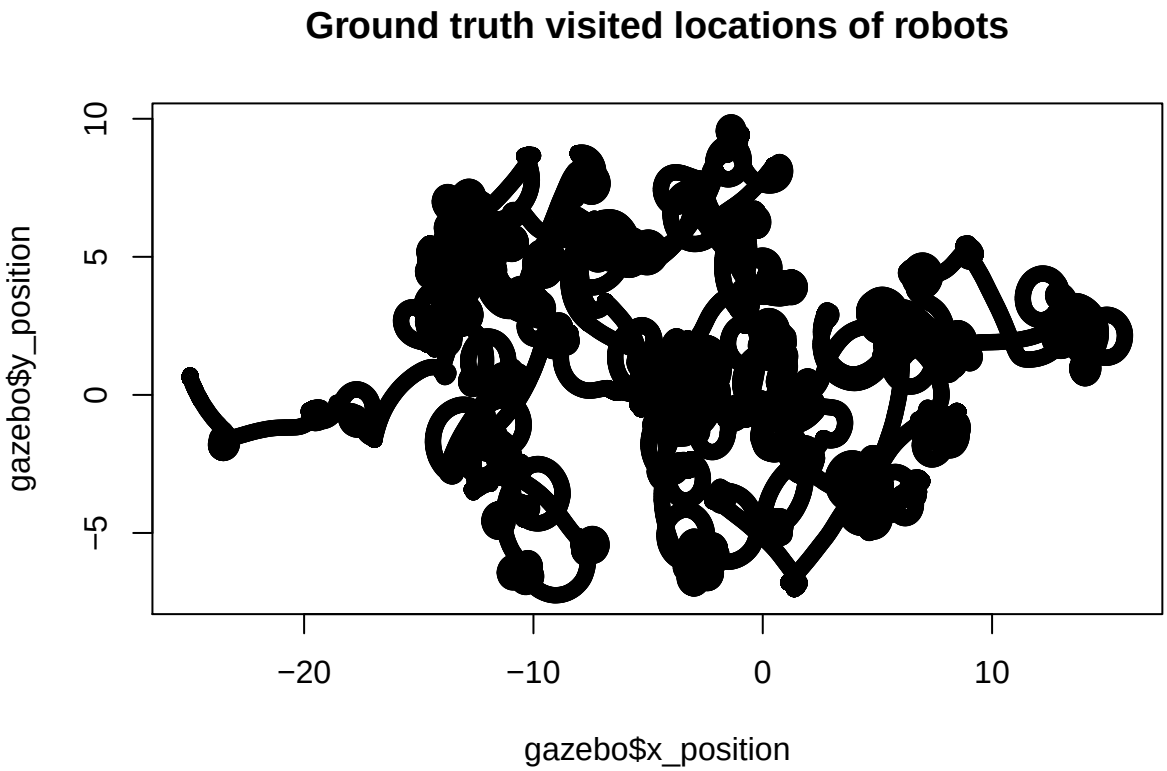
```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00126  0.69550  1.30100  1.98900  2.27400 65.61000
```

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

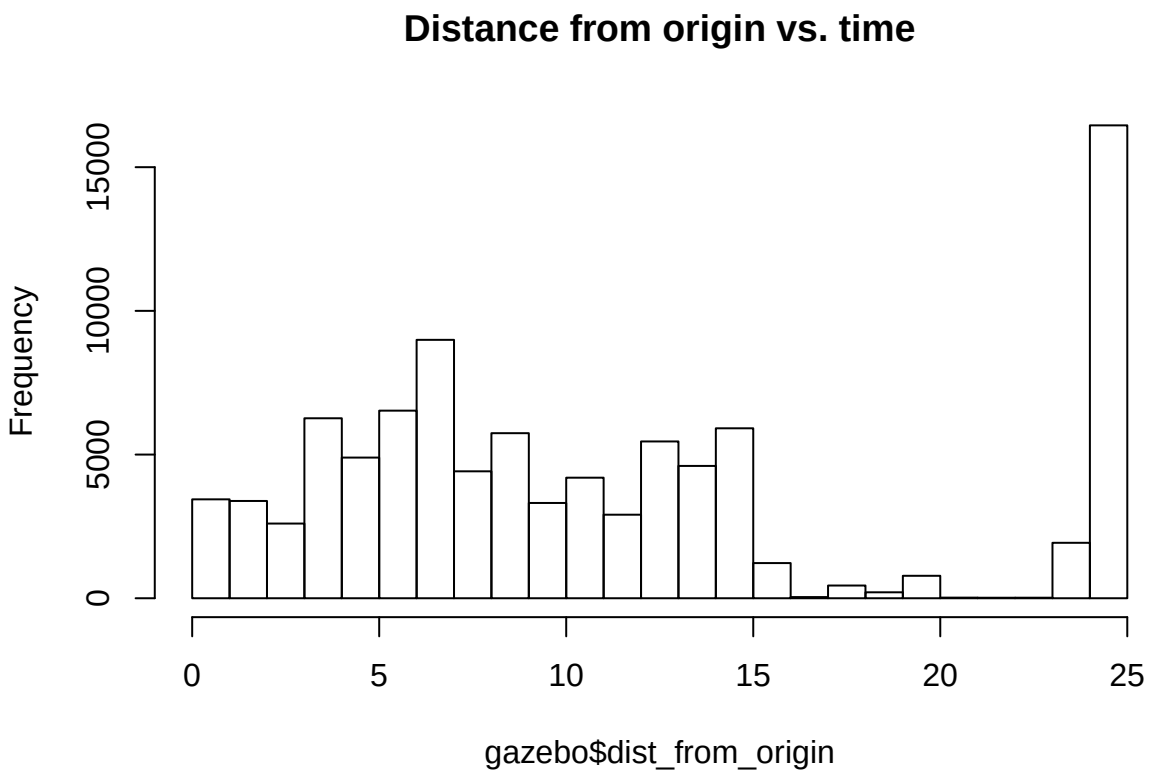
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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")
```

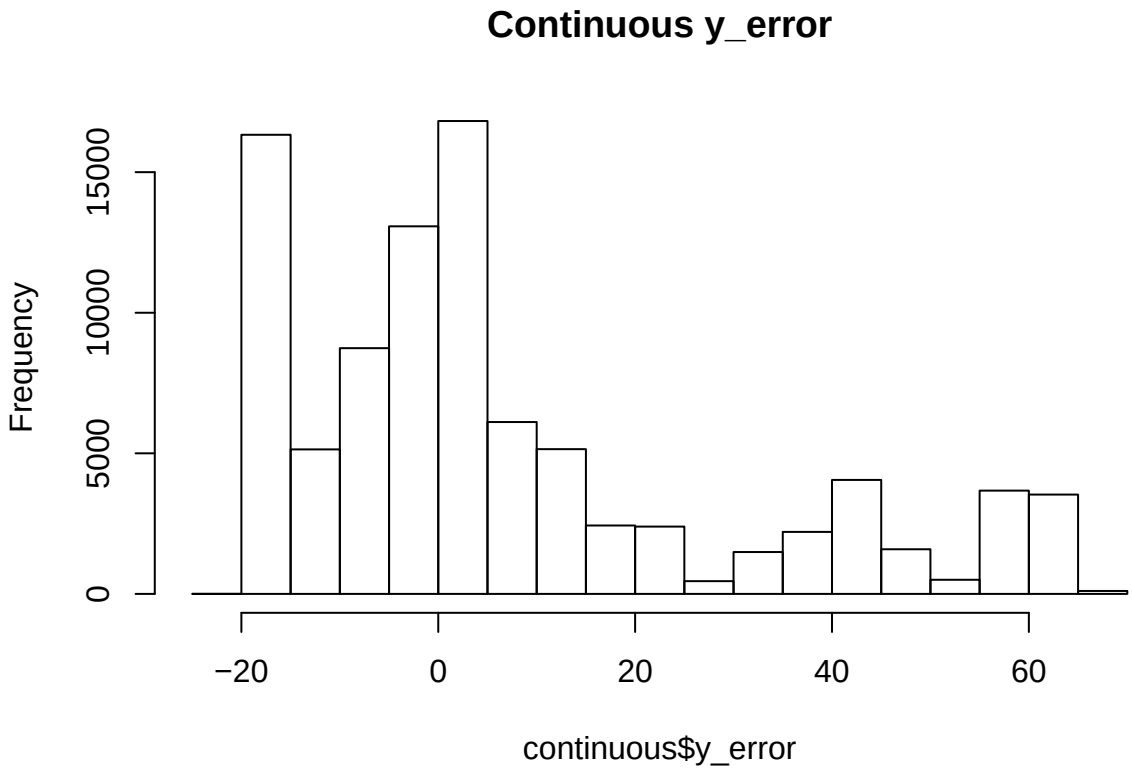



```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



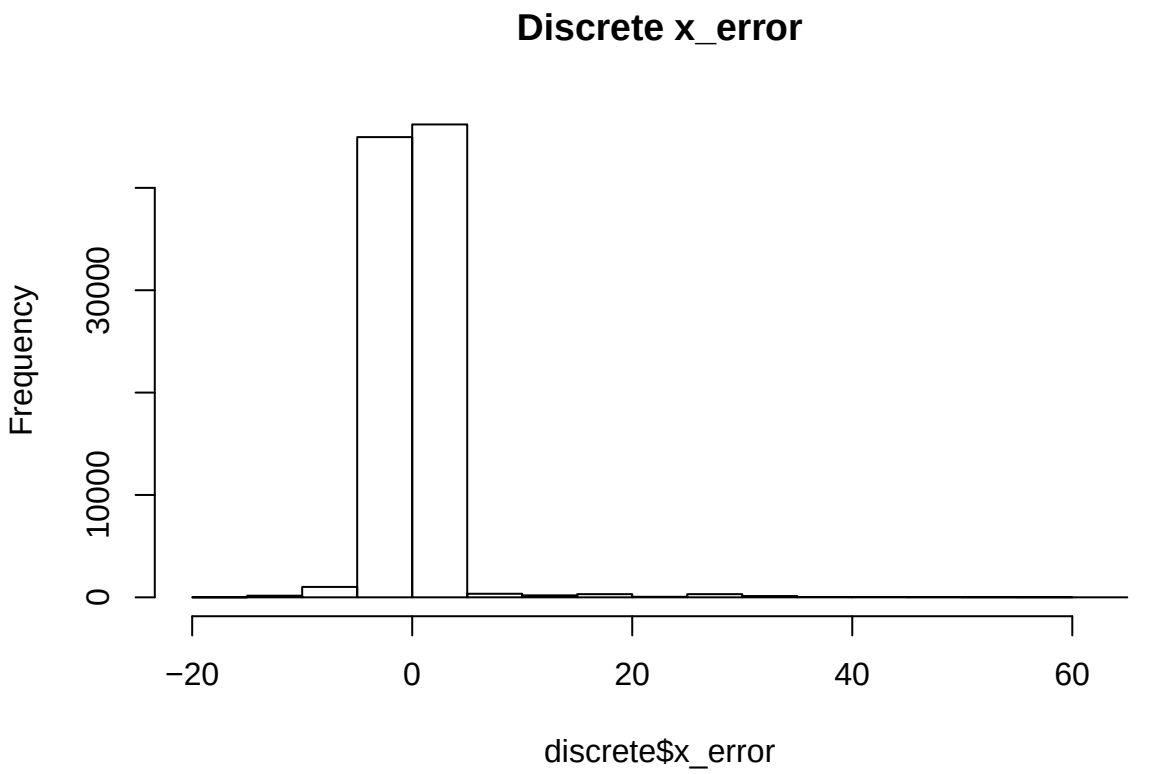

```
hist(continuous$x_error,
     main = "Continuous x_error")
```

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

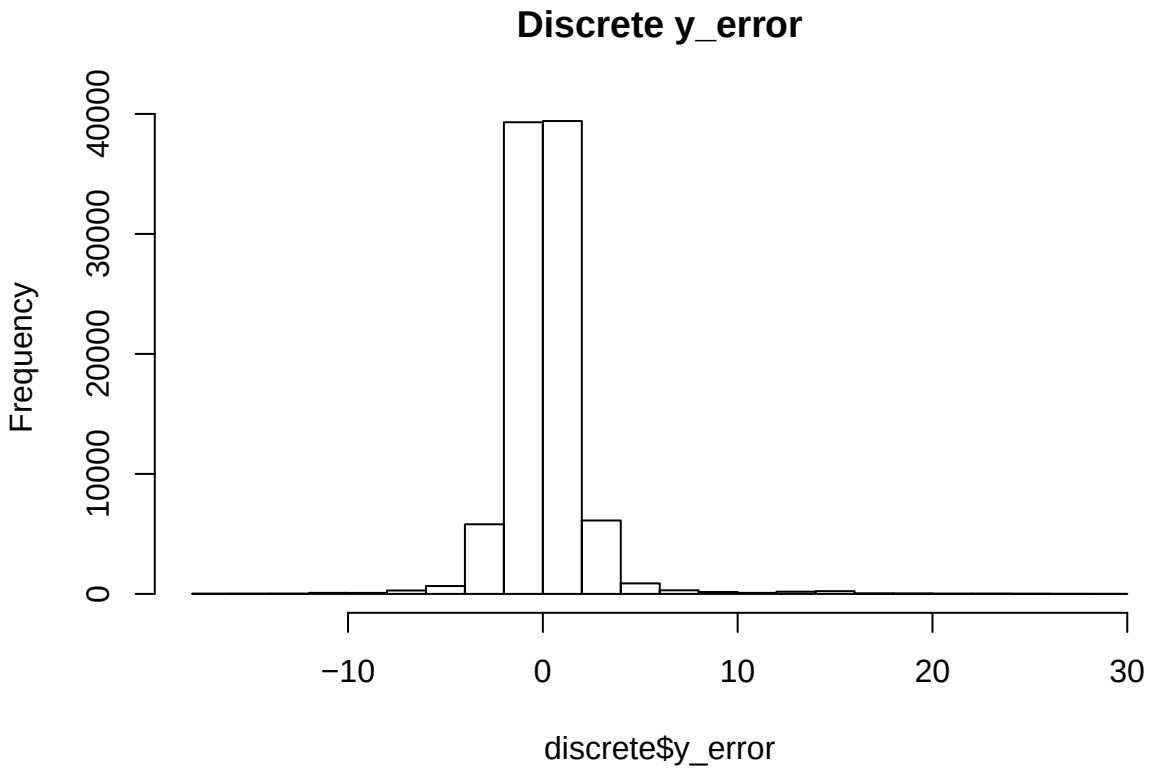



```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```

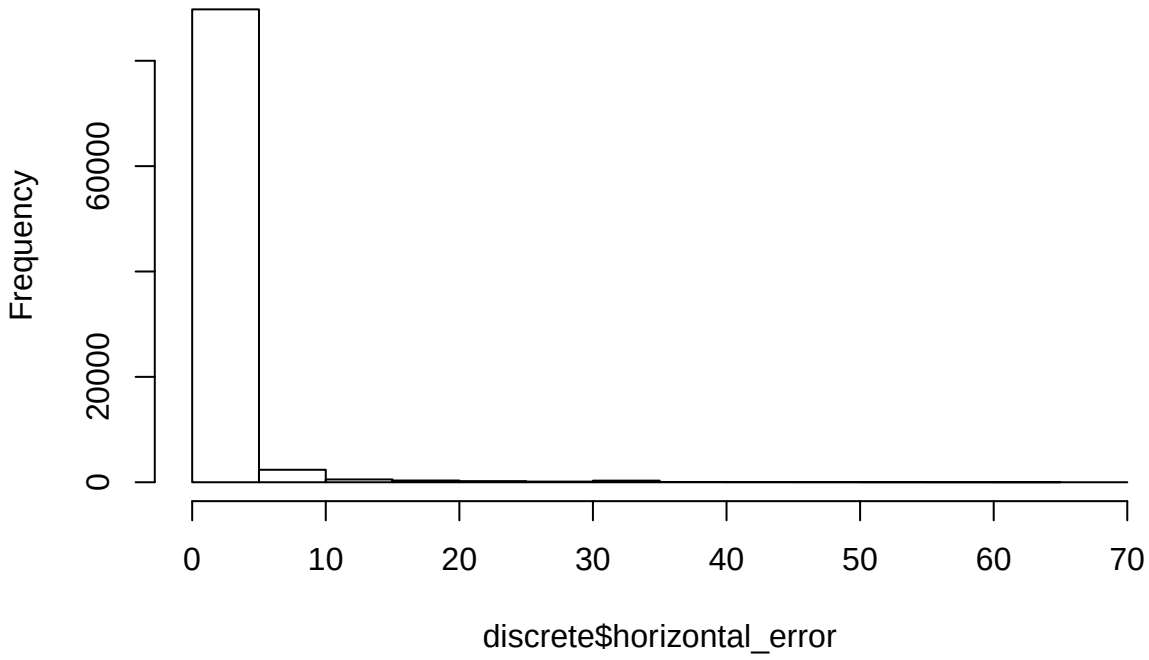

```
hist(discrete$x_error,
     main = "Discrete x_error")
```



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




```r
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, " 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: Tue, Aug 09, 2016 - 09:47:06 AM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-mobile-restricted Experiment}
##   \label{tab:two_mobile_restricted_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 & 93,797 & 9.567 & 9.008 & $-$8.285 & 27.866 \\
## y\_position & 93,797 & $-$6.124 & 21.858 & $-$62.293 & 20.003 \\
## yaw & 93,797 & $-$0.070 & 1.793 & $-$3.142 & 3.142 \\
## yaw\_error & 93,797 & 0.086 & 1.698 & $-$3.142 & 3.141 \\
## x\_error & 93,797 & $-$16.826 & 17.532 & $-$45.019 & 15.690 \\
## y\_error & 93,797 & 6.989 & 22.685 & $-$20.002 & 65.584 \\
## horizontal\_error & 93,797 & 28.333 & 18.740 & 0.00001 & 69.104 \\
## \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: Tue, Aug 09, 2016 - 09:47:06 AM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-mobile-restricted Experiment}
##   \label{tab:two_mobile_restricted_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 & 93,797 & $-$7.461 & 11.437 & $-$59.781 & 15.809 \\
## y\_position & 93,797 & 0.756 & 3.941 & $-$27.260 & 16.565 \\
## yaw & 93,797 & 0.028 & 1.840 & $-$3.141 & 3.141 \\
## x\_error & 93,797 & 0.202 & 3.317 & $-$15.285 & 60.469 \\
## y\_error & 93,797 & 0.109 & 2.078 & $-$16.028 & 28.646 \\
## horizontal\_error & 93,797 & 1.989 & 3.380 & 0.001 & 65.610 \\
## yaw\_error & 93,797 & 0.039 & 1.683 & $-$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)
}
```