one_mobile_noiseless Experiment Report

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This is a summary of the data from the one_mobile_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.
## -0.1148000 -0.0096100  0.0006825  0.0001338  0.0087420  0.1094000
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.1067000 -0.0096240 -0.0011610 -0.0005484  0.0102700  0.1121000
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.4988000 -0.0320900 -0.0007393 -0.0020160  0.0329800  0.5272000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.300e-07 6.540e-03 2.016e-02 2.924e-02 5.154e-02 1.157e-01
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -2.92500 -0.64370  0.05619  0.04873  0.73180  3.51100
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.04700 -0.90800 -0.04793 -0.19920  0.34570  3.84900
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.216200 -0.017800  0.001058  0.002960  0.025320  0.230600
```

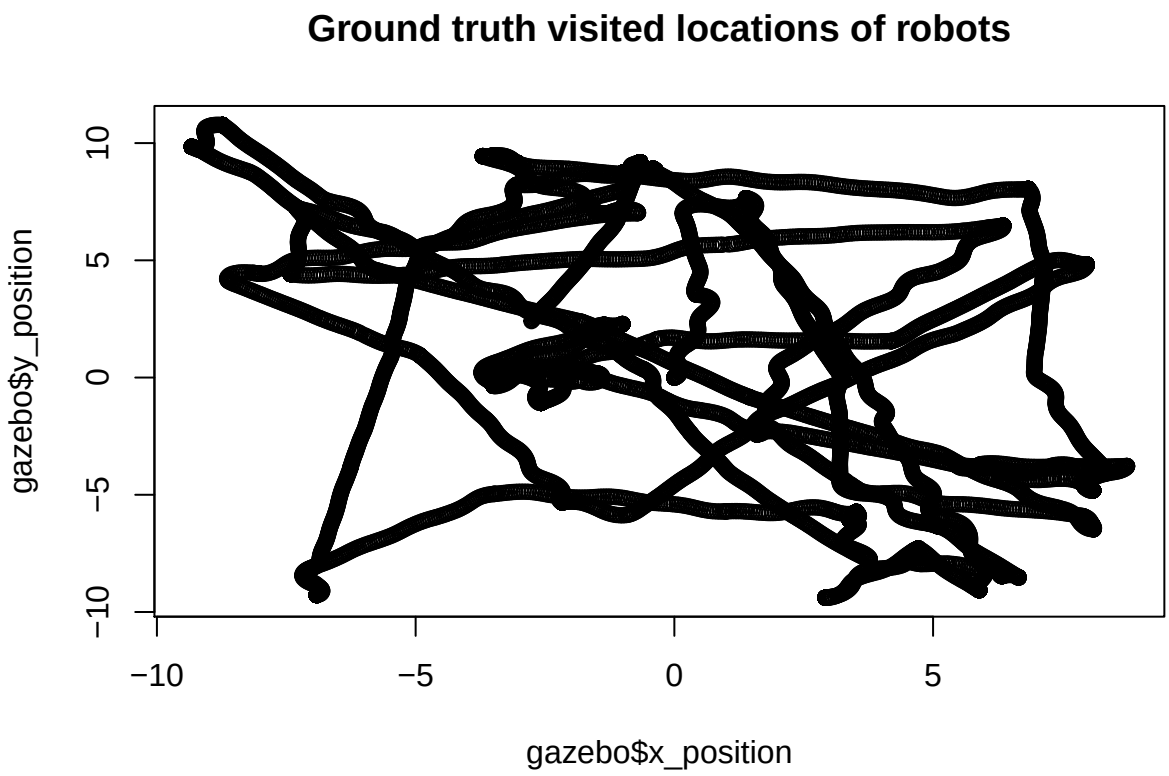
```
summary(discrete$horizontal_error)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.554   1.205   1.412   2.120   4.206
```

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

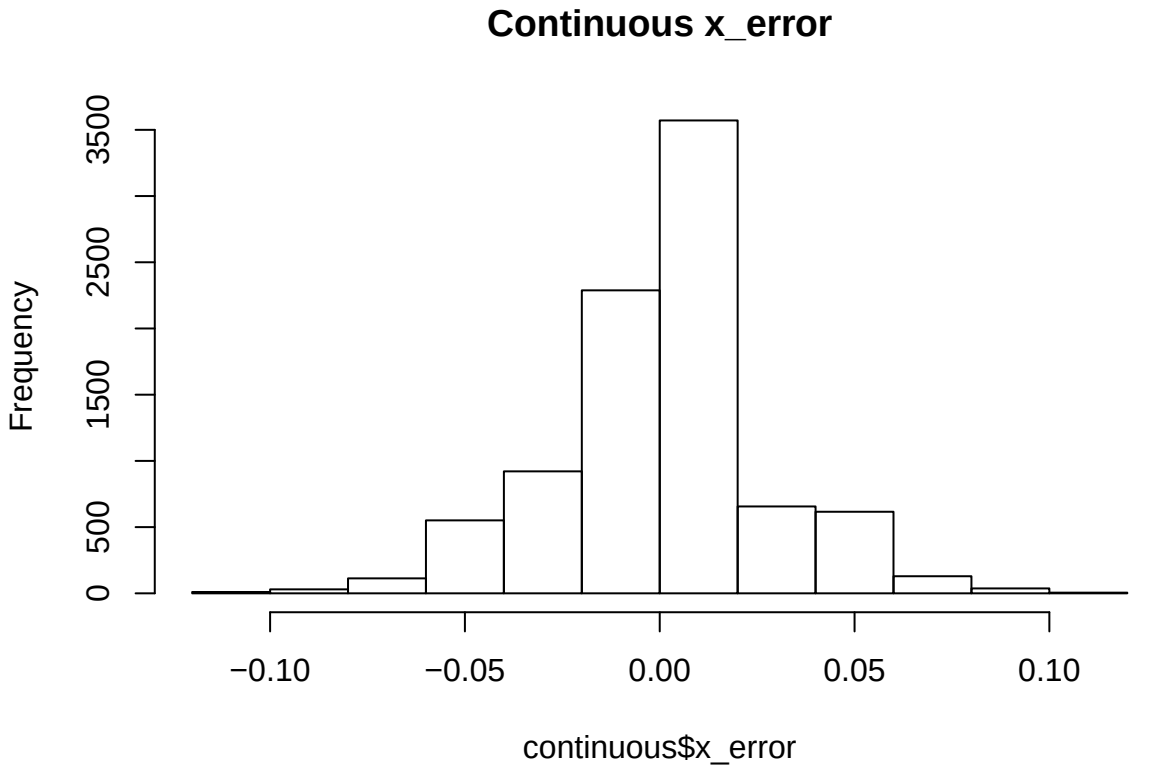
Shown below are plots representing the robot's motion and error over time.

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

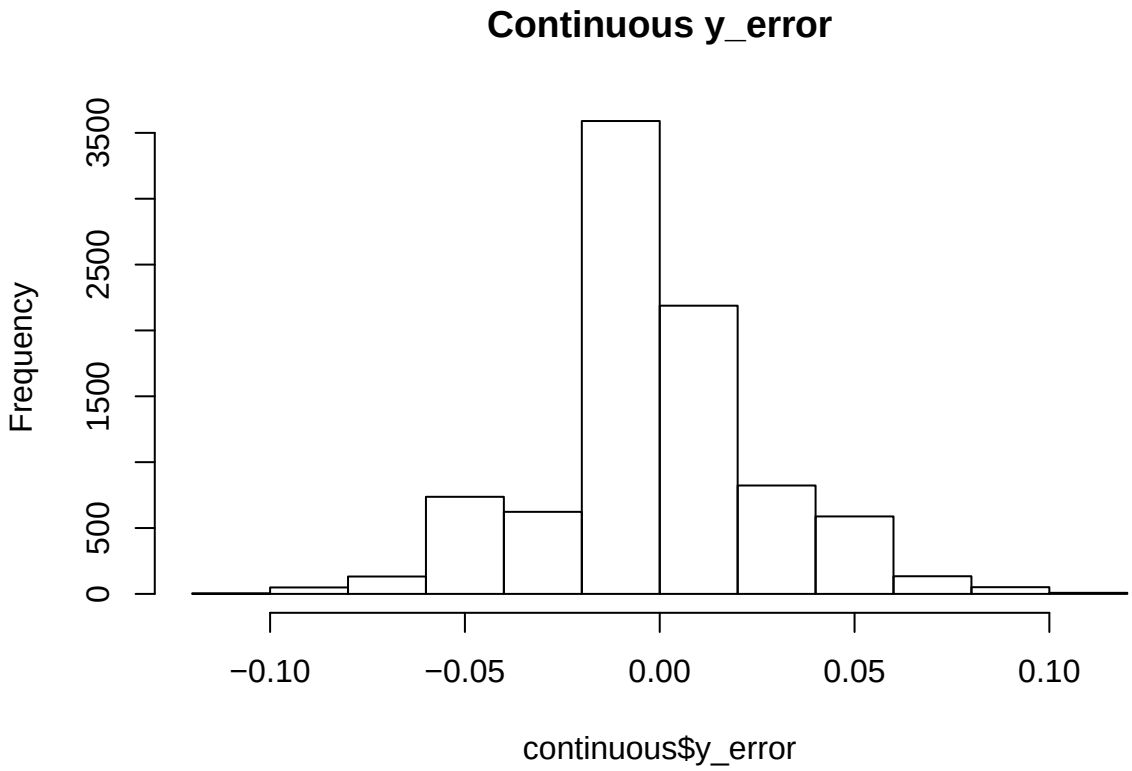



```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

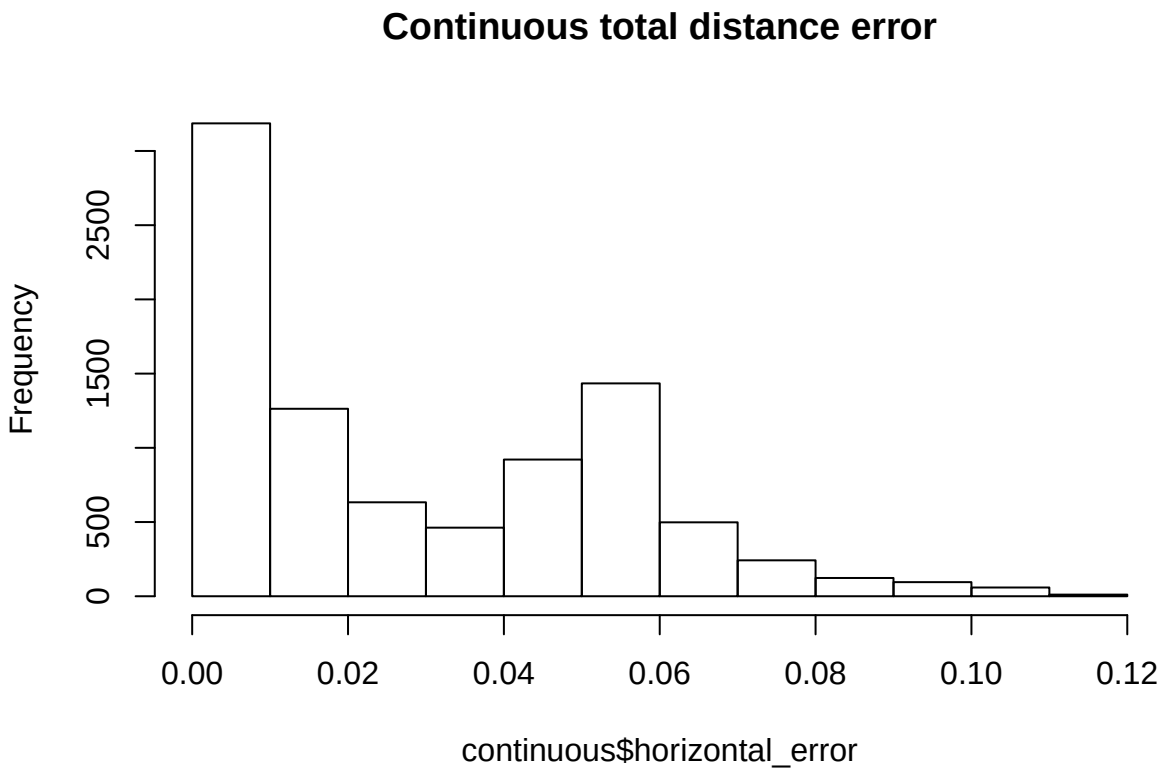

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



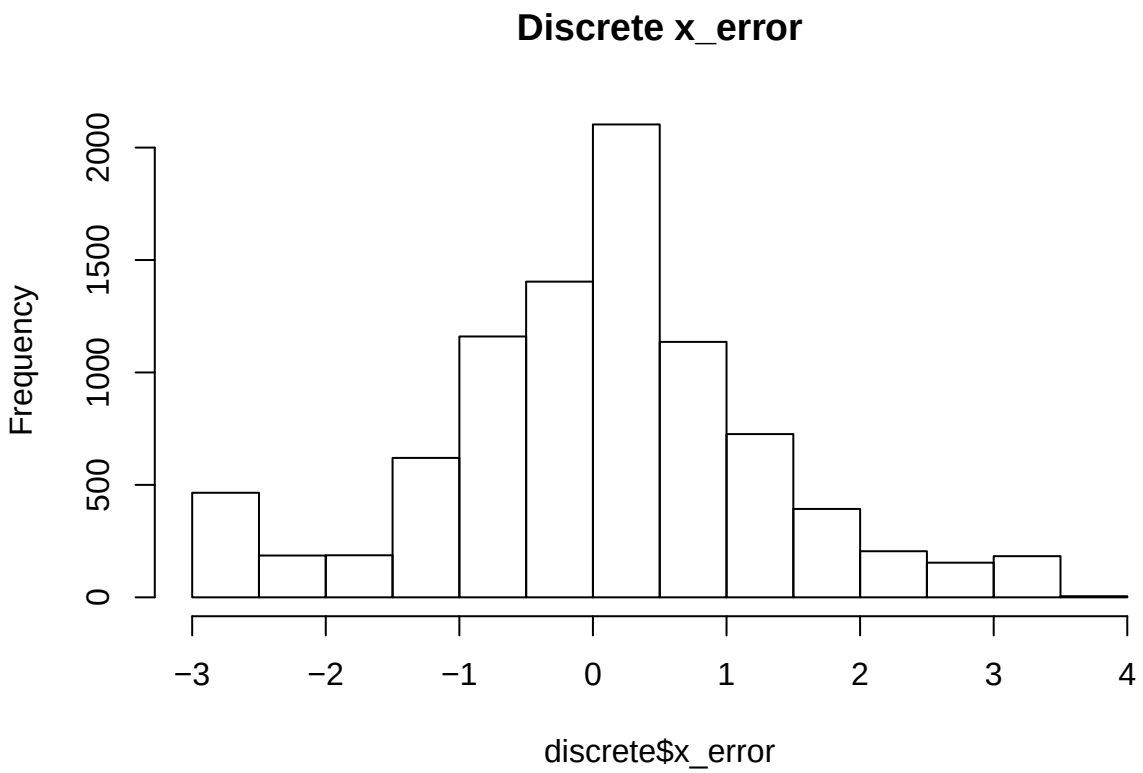
```r
hist(continuous$y_error,
     main = "Continuous y_error")
```



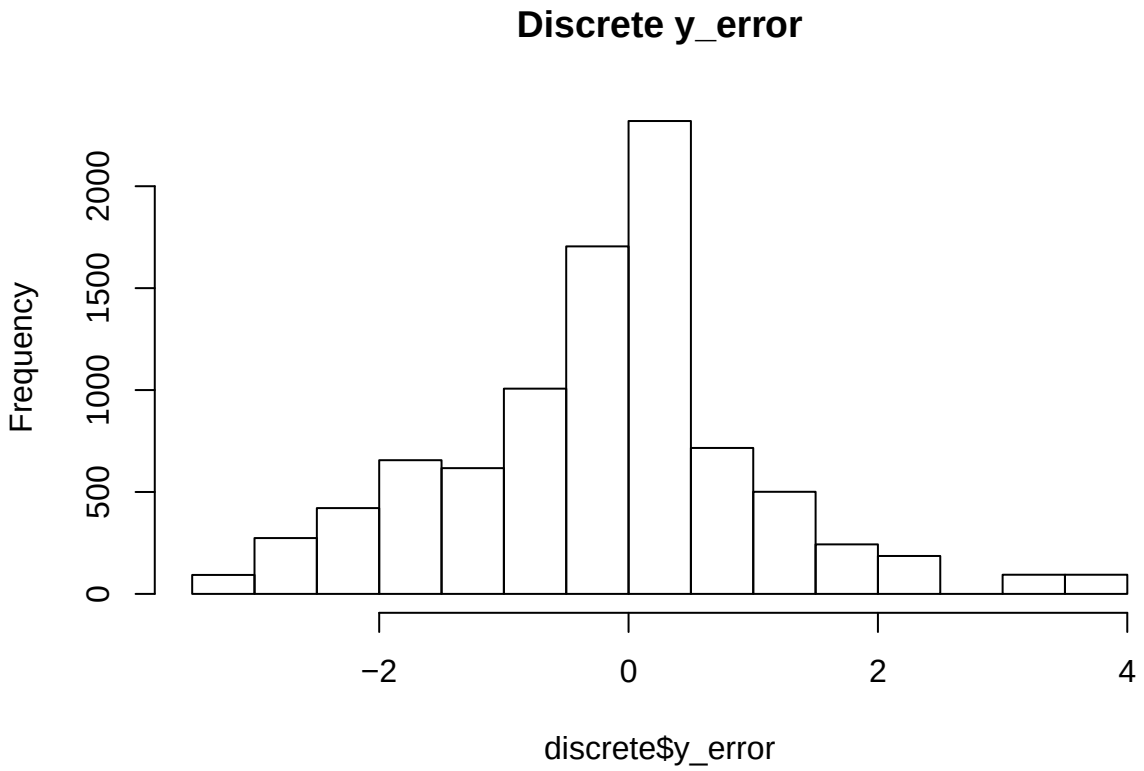

```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



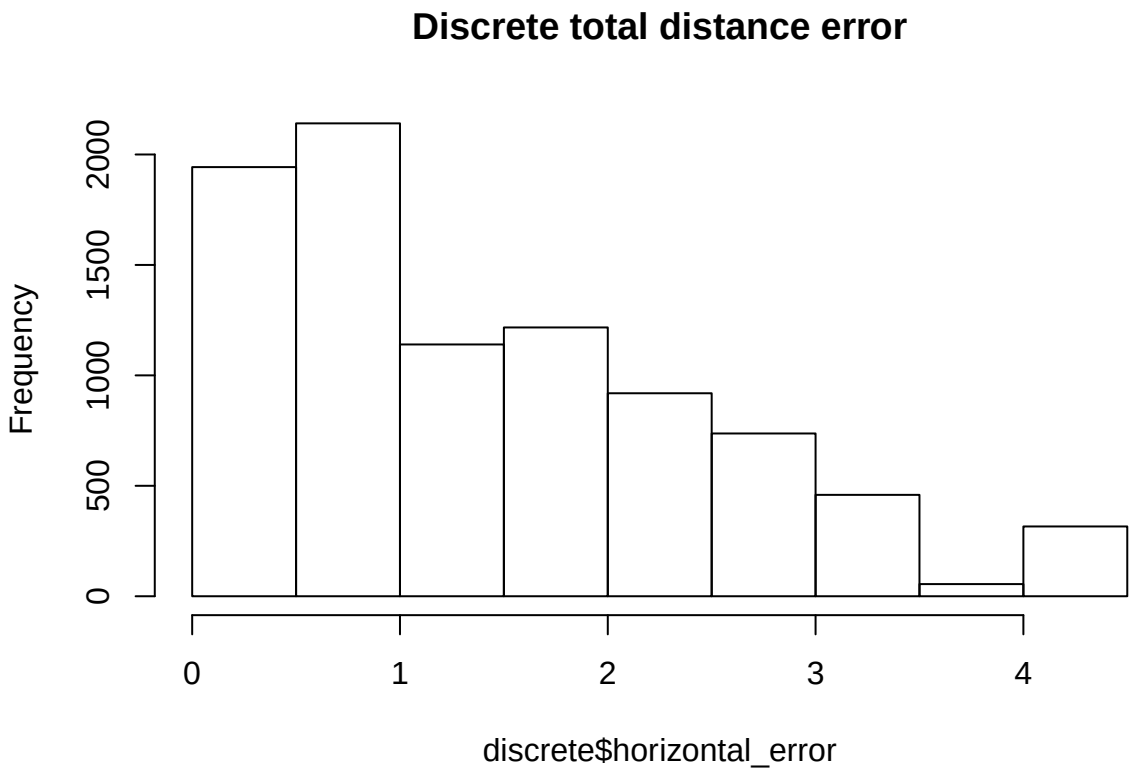

```
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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, " 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: Tue, Aug 09, 2016 - 09:46:19 AM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-mobile-noiseless Experiment}
##   \label{tab:one_mobile_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 & 8,927 & 0.321 & 4.792 & $-$9.346 & 8.797 \\
## y\_position & 8,927 & 0.813 & 5.684 & $-$9.411 & 10.788 \\
## yaw & 8,927 & $-$0.041 & 1.672 & $-$3.138 & 3.140 \\
## yaw\_error & 8,927 & $-$0.002 & 0.110 & $-$0.499 & 0.527 \\
## x\_error & 8,927 & 0.0001 & 0.027 & $-$0.115 & 0.109 \\
## y\_error & 8,927 & $-$0.001 & 0.028 & $-$0.107 & 0.112 \\
## horizontal\_error & 8,927 & 0.029 & 0.025 & 0.0000001 & 0.116 \\
## \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 - 09:46:19 AM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-mobile-noiseless Experiment}
##   \label{tab:one_mobile_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 & 8,927 & 0.273 & 5.004 & $-$10.145 & 11.282 \\
## y\_position & 8,927 & 1.012 & 5.706 & $-$9.673 & 11.820 \\
## yaw & 8,927 & $-$0.042 & 1.672 & $-$3.141 & 3.141 \\
## x\_error & 8,927 & 0.049 & 1.251 & $-$2.925 & 3.511 \\
## y\_error & 8,927 & $-$0.199 & 1.223 & $-$3.047 & 3.849 \\
## horizontal\_error & 8,927 & 1.412 & 1.053 & 0.0000003 & 4.206 \\
## yaw\_error & 8,927 & 0.003 & 0.045 & $-$0.216 & 0.231 \\
## \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)
}
```