one_mobile_noiseless Experiment Report

Matthew Swartwout

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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.
## -16.370 -10.140  -3.215  -5.710  -1.288   1.523
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -20.50  -12.82  -10.45  -10.22   -6.70    0.00
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1410 -1.7540 -0.2864 -0.1745  1.3860  3.1410
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000014  7.086000 10.970000 12.230000 16.350000 25.210000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -2.033000 -0.065590  0.000170  0.006988  0.023260  3.946000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.859700 -0.002047  0.002155  0.136700  0.134800  4.513000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1340 -1.2490 -0.1591 -0.1029  0.7936  3.1390
```

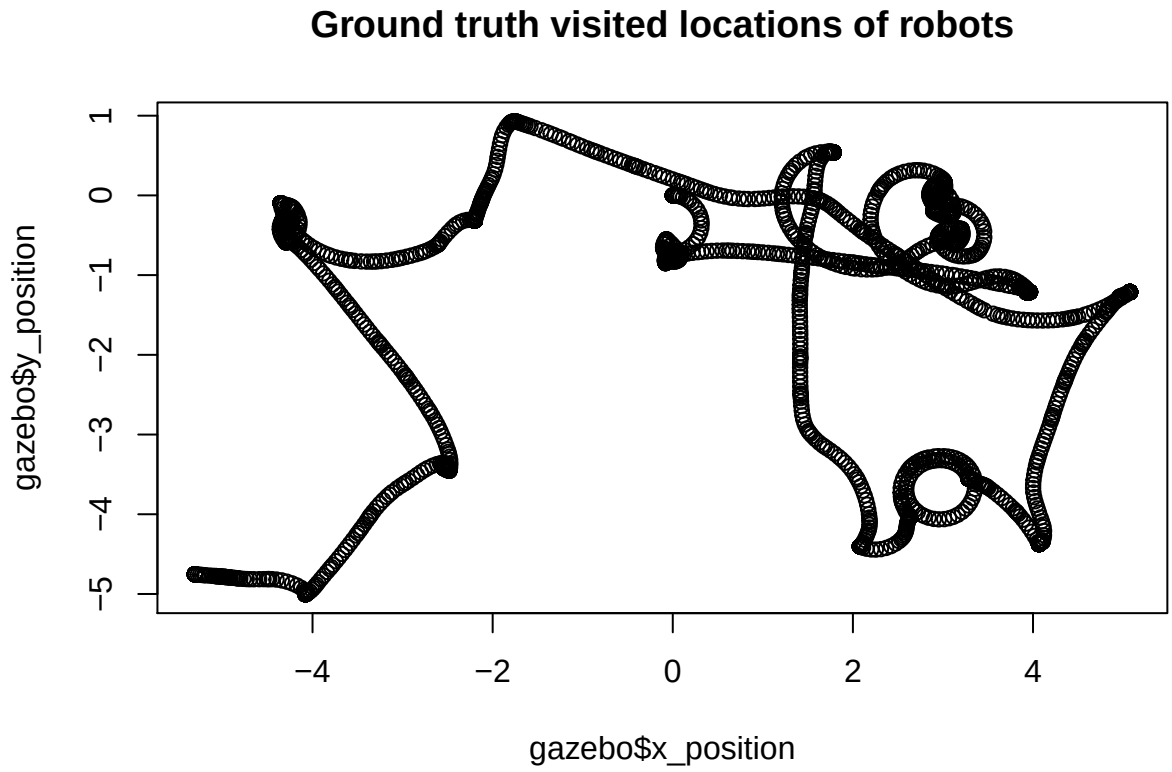
```
summary(discrete$horizontal_error)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000000 0.003496 0.088290 0.368900 0.389500 4.522000
```

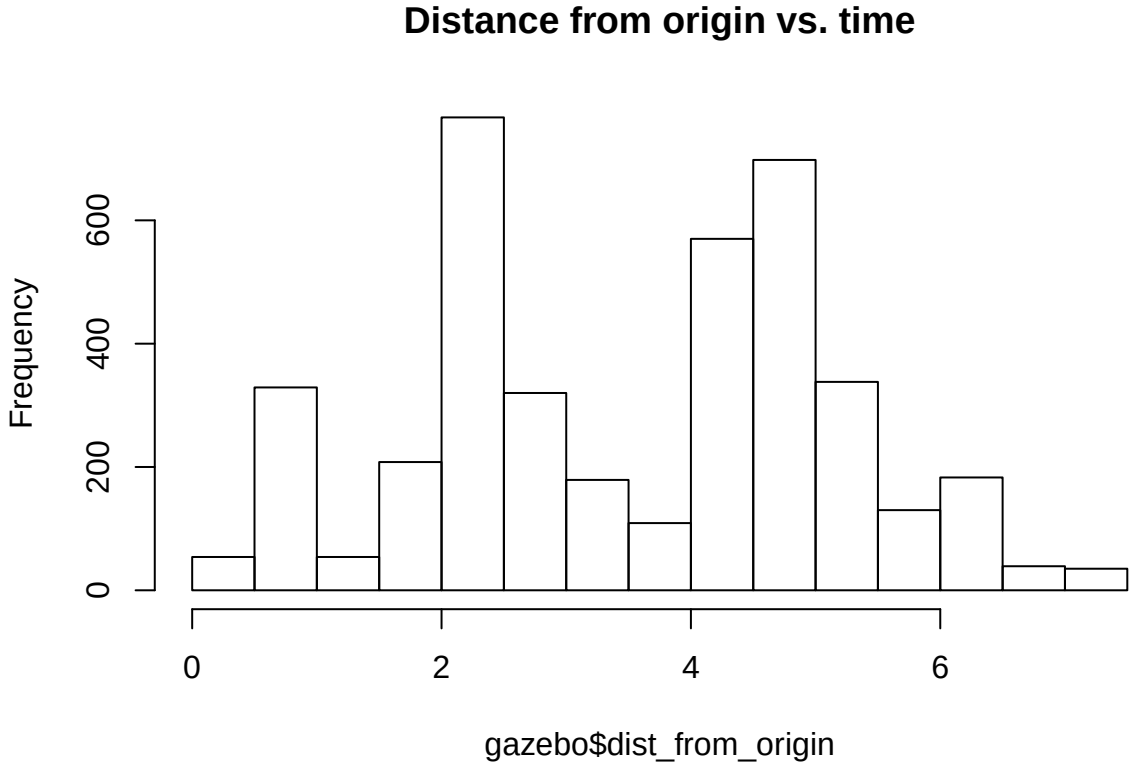
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

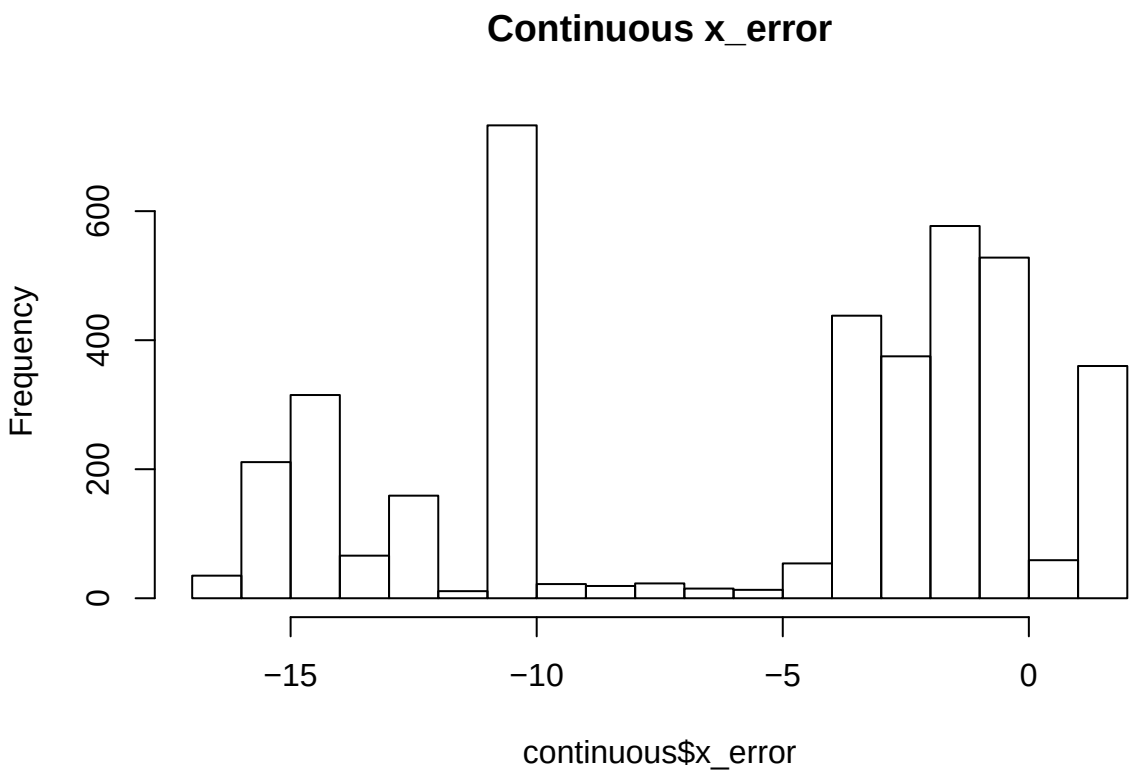
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



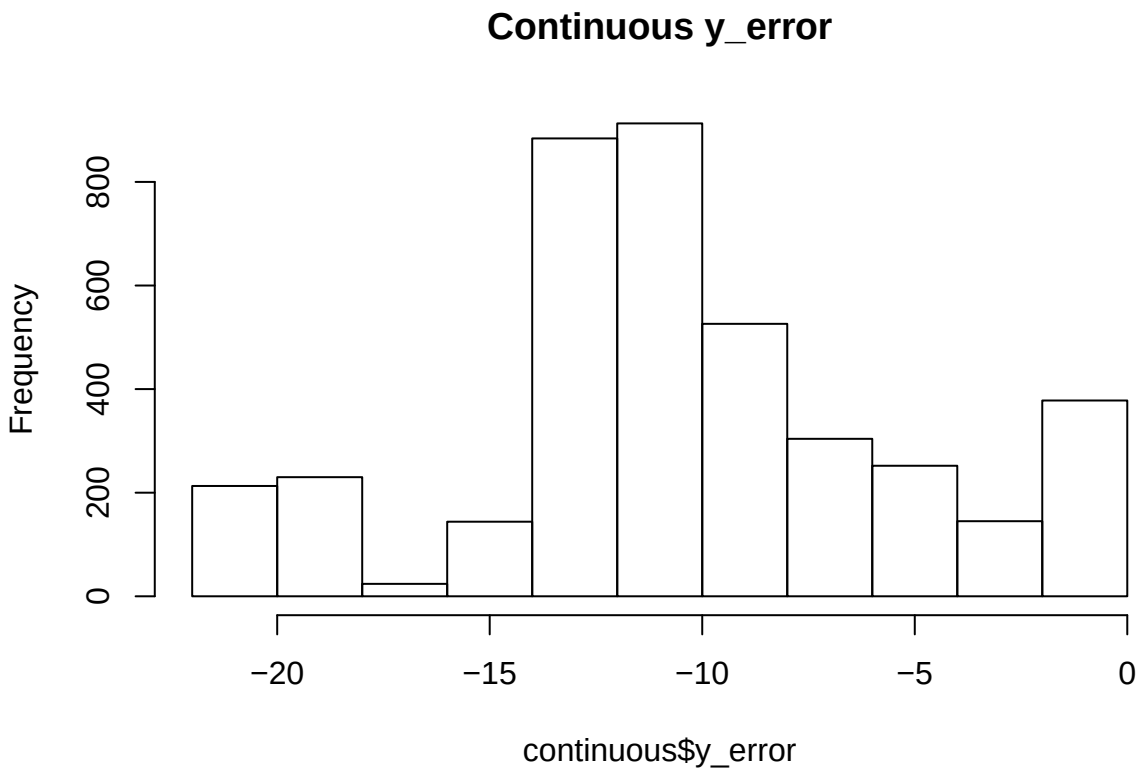

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```




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

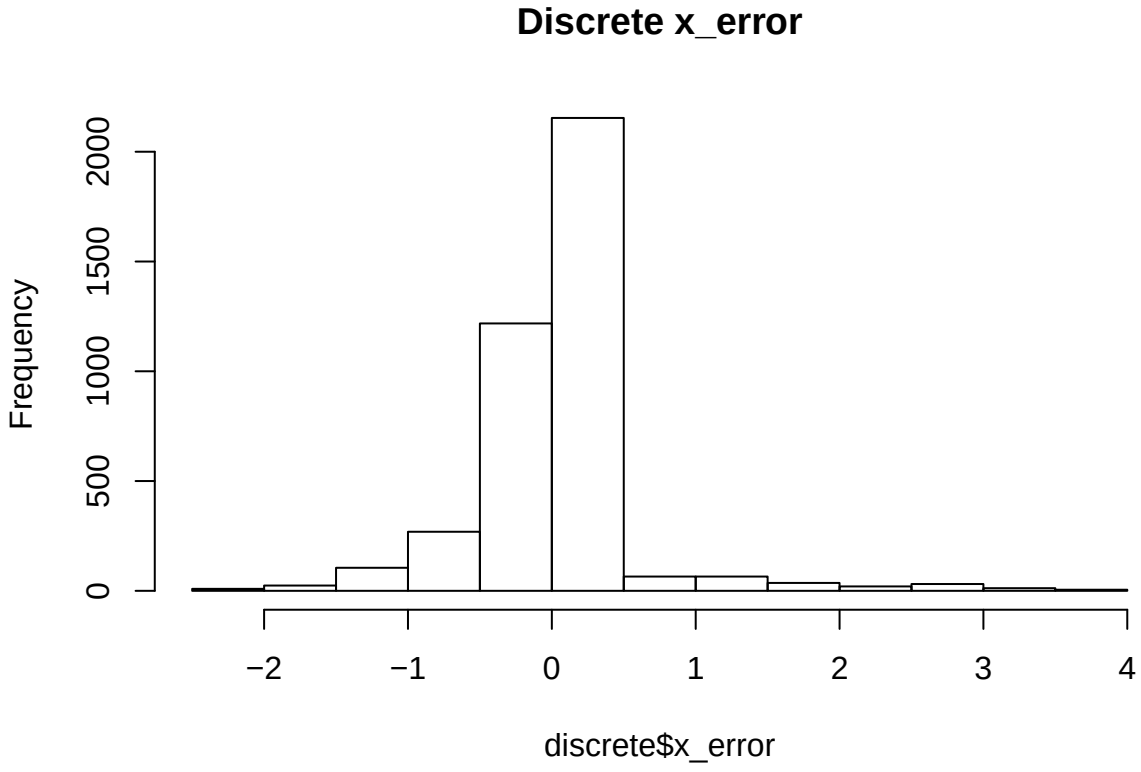



```
hist(continuous$y_error,
      main = "Continuous y_error")
```

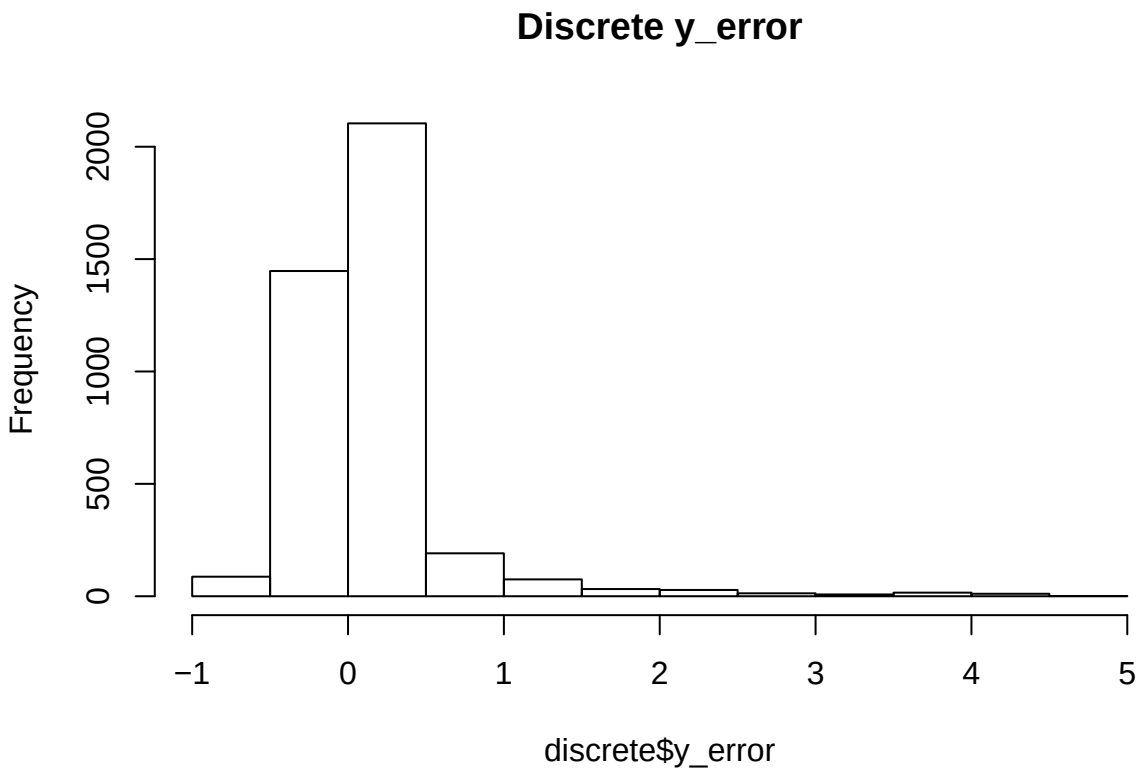



```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```

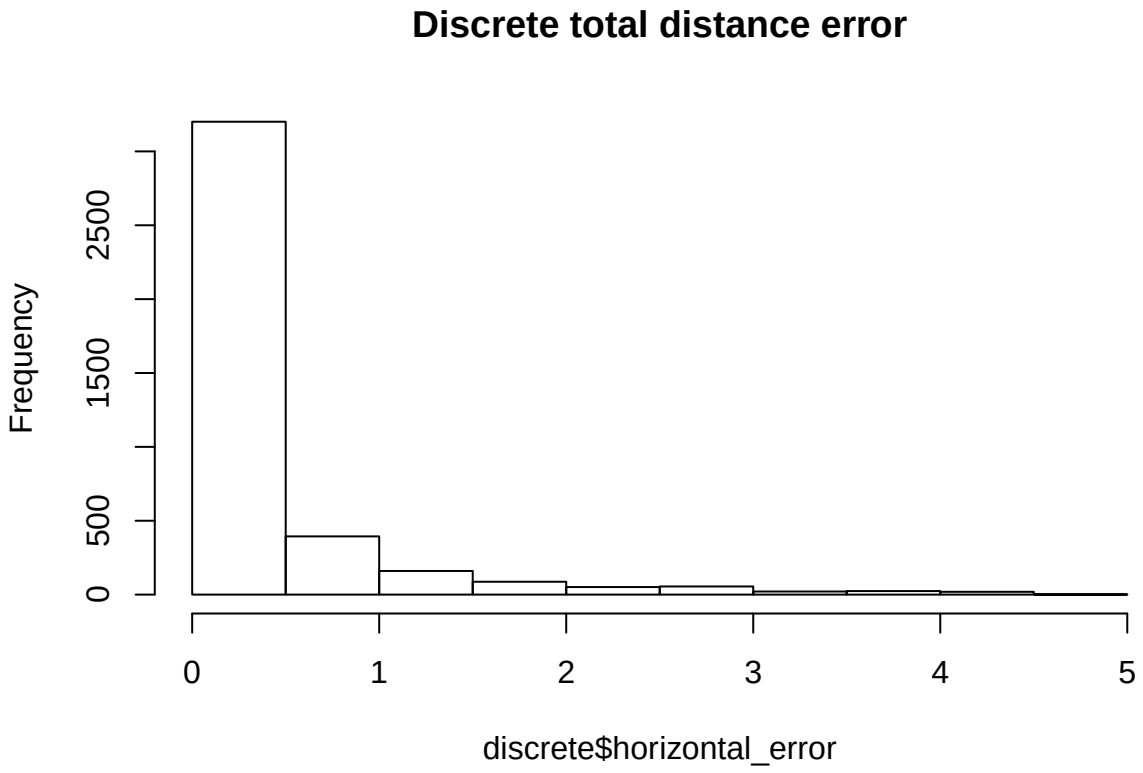

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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()
}
```

```
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 - 04:01:51 PM
## \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 & 4,013 & 6.187 & 2.983 & $-$0.000 & 11.502 \\
## y\_position & 4,013 & 8.551 & 4.635 & $-$0.000 & 17.120 \\
## yaw & 4,013 & 0.136 & 1.736 & $-$3.132 & 3.139 \\
## x\_variance & 4,013 & 22.321 & 12.764 & 0.123 & 44.359 \\
## y\_variance & 4,013 & 22.321 & 12.764 & 0.123 & 44.359 \\
## yaw\_variance & 4,013 & 20.333 & 11.680 & 0.111 & 40.550 \\
## yaw\_error & 4,013 & $-$0.174 & 1.847 & $-$3.141 & 3.141 \\
## x\_error & 4,013 & $-$5.710 & 5.602 & $-$16.373 & 1.523 \\
## y\_error & 4,013 & $-$10.221 & 5.136 & $-$20.501 & 0.000 \\
## horizontal\_error & 4,013 & 12.229 & 6.728 & 0.00001 & 25.210 \\
```

```
## \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 - 04:01:51 PM
## \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 & 4,013 & 0.470 & 3.043 & $-$5.255 & 5.076 \\
## y\_position & 4,013 & $-$1.806 & 1.685 & $-$5.029 & 0.831 \\
## yaw & 4,013 & $-$0.066 & 1.768 & $-$3.133 & 3.094 \\
## x\_variance & 4,013 & 0.616 & 0.266 & 0.123 & 1.107 \\
## y\_variance & 4,013 & 0.616 & 0.266 & 0.123 & 1.107 \\
## yaw\_variance & 4,013 & 0.503 & 0.243 & 0.091 & 0.931 \\
## x\_error & 4,013 & 0.007 & 0.550 & $-$2.033 & 3.946 \\
## y\_error & 4,013 & 0.137 & 0.531 & $-$0.860 & 4.513 \\
## horizontal\_error & 4,013 & 0.369 & 0.683 & 0.0000002 & 4.522 \\
## yaw\_error & 4,013 & $-$0.103 & 1.549 & $-$3.134 & 3.139 \\
## \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)
}
```