two_mobile_no_gps Experiment Report

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This is a summary of the data from the two_mobile_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.
## -1.8400 -1.4940 -0.3848 -0.4541  0.4035  1.6810
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -6.2230 -6.0240 -5.1640 -4.4150 -3.4610  0.1179
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1370 -1.6170 -0.3155 -0.2809  1.1220  3.1380
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000014 3.653000 5.377000 4.569000 6.047000 6.337000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -1.8140 -0.8806 -0.3346 -0.3445  0.1109  1.9640
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -6.0020 -5.4890 -5.0470 -4.2440 -3.4530  0.1231
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1410 -1.6430 -0.3348 -0.3001  1.0840  3.1380
```

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

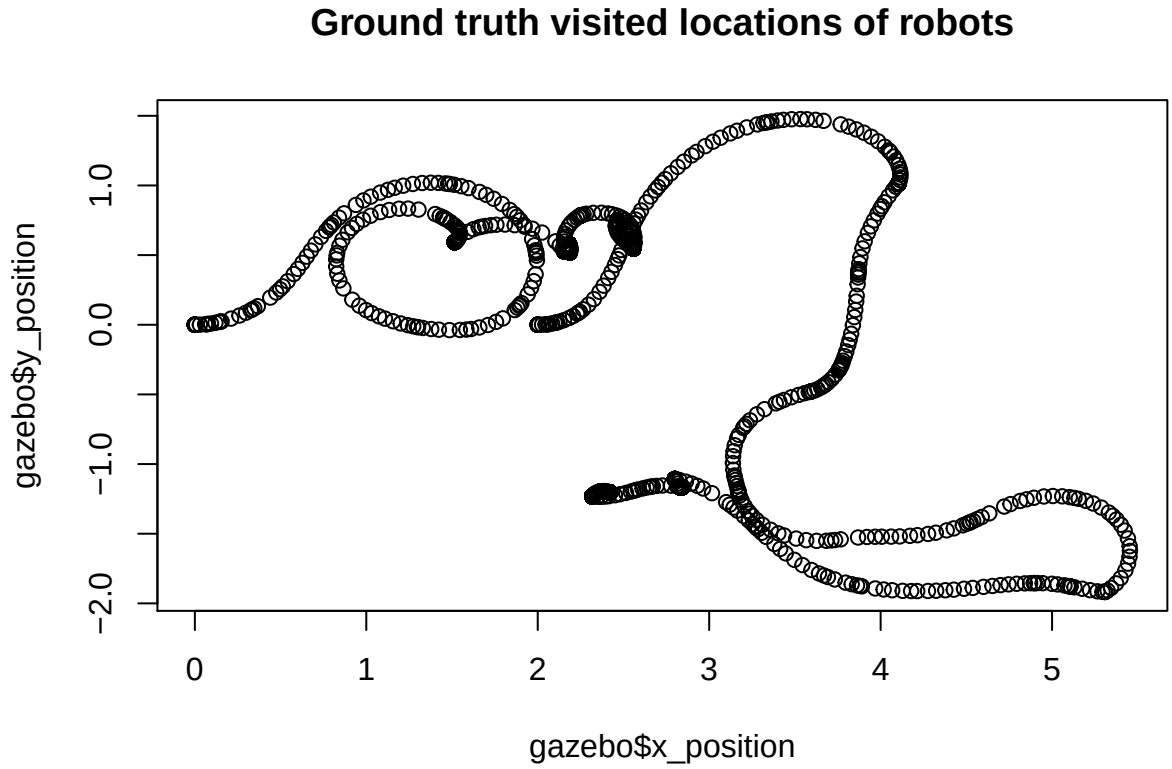
```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000014 3.472000 5.193000 4.302000 5.553000 6.061000
```

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

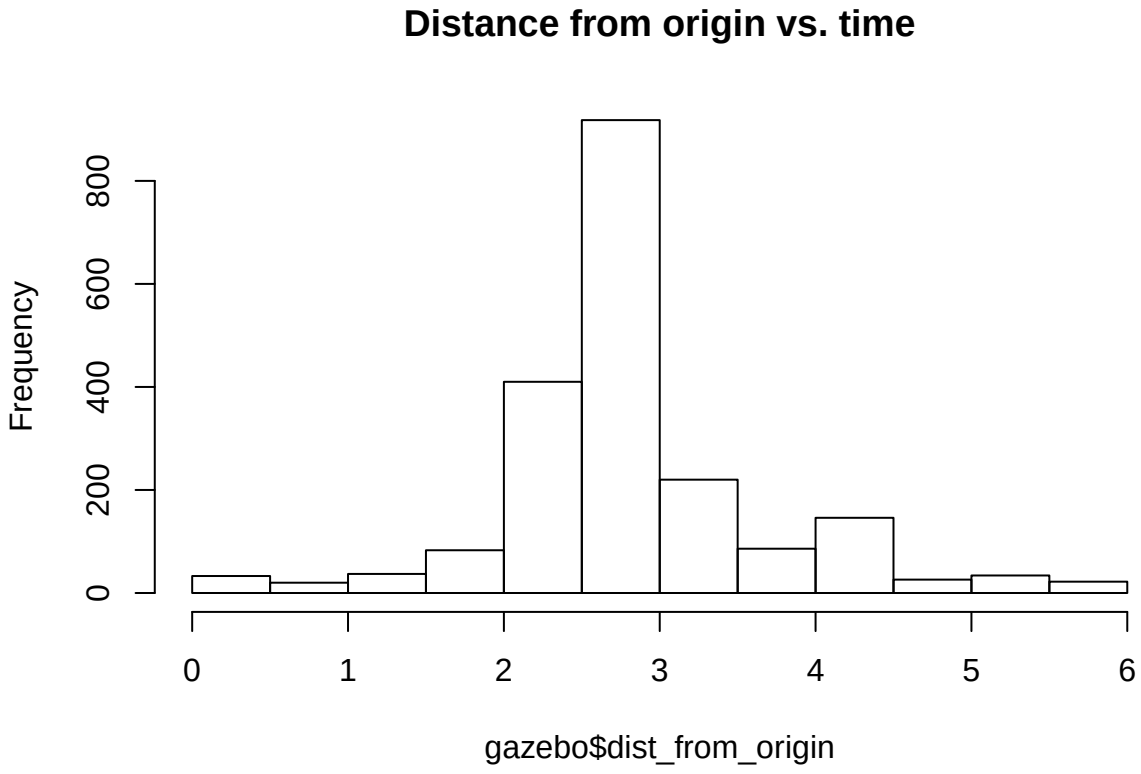
```
##      Length Class  Mode
## [1,] 1      -none- numeric
## [2,] 1      -none- numeric
```

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

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

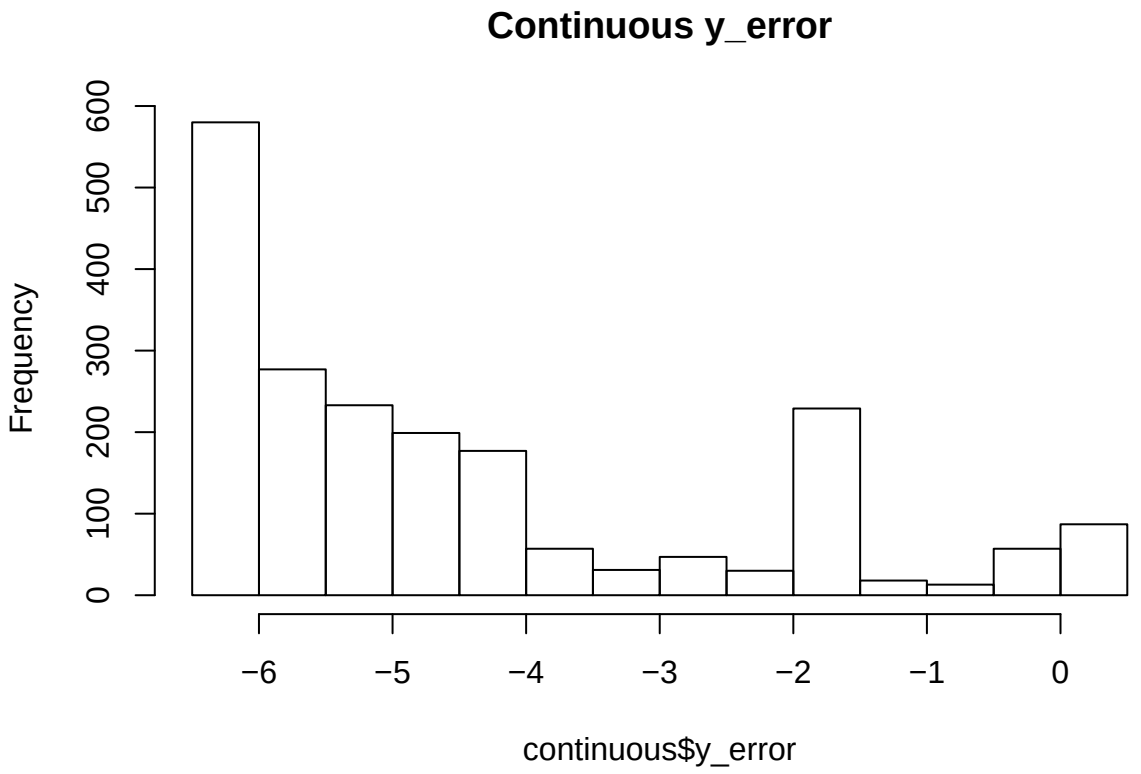



```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

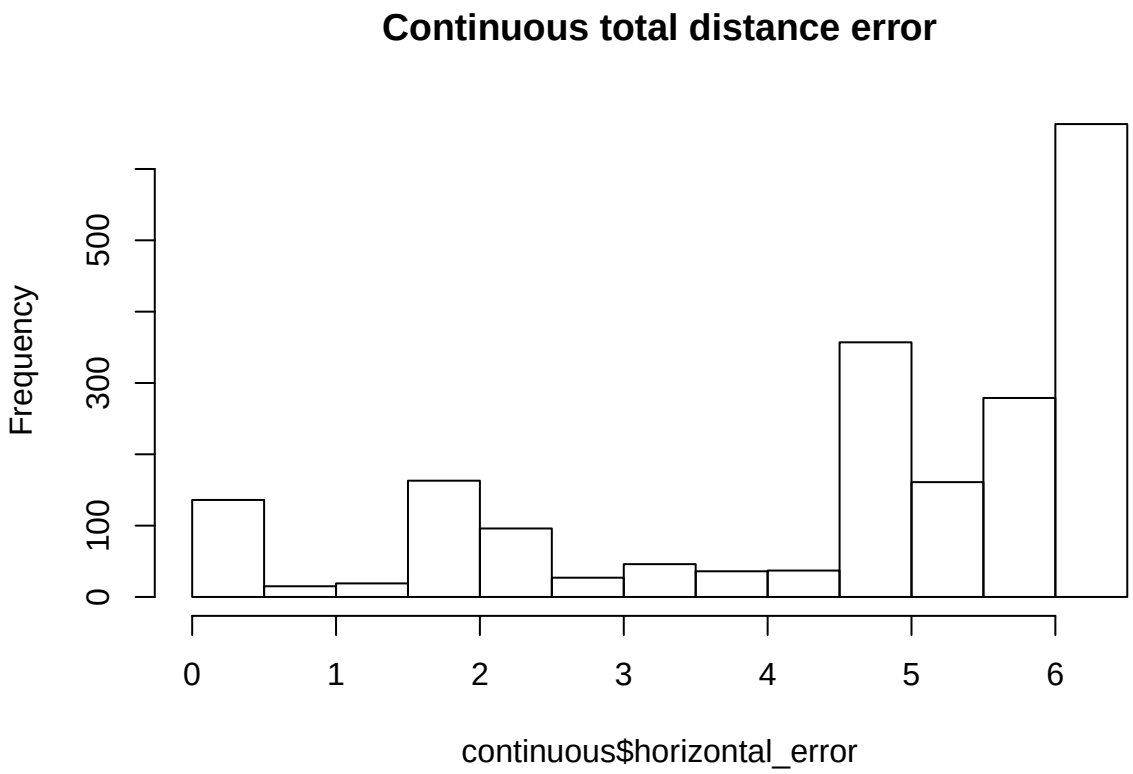


```r
hist(continuous$x_error,
     main = "Continuous x_error")
```

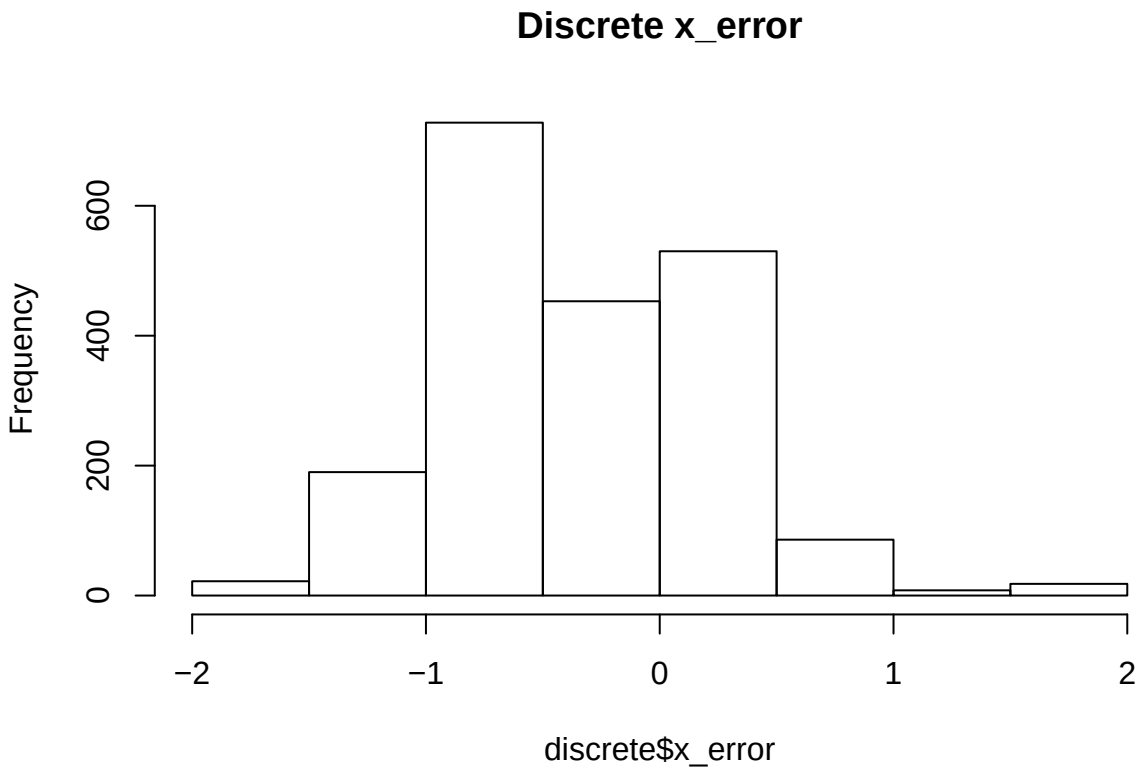

```r
hist(continuous$y_error,
      main = "Continuous y_error")
```



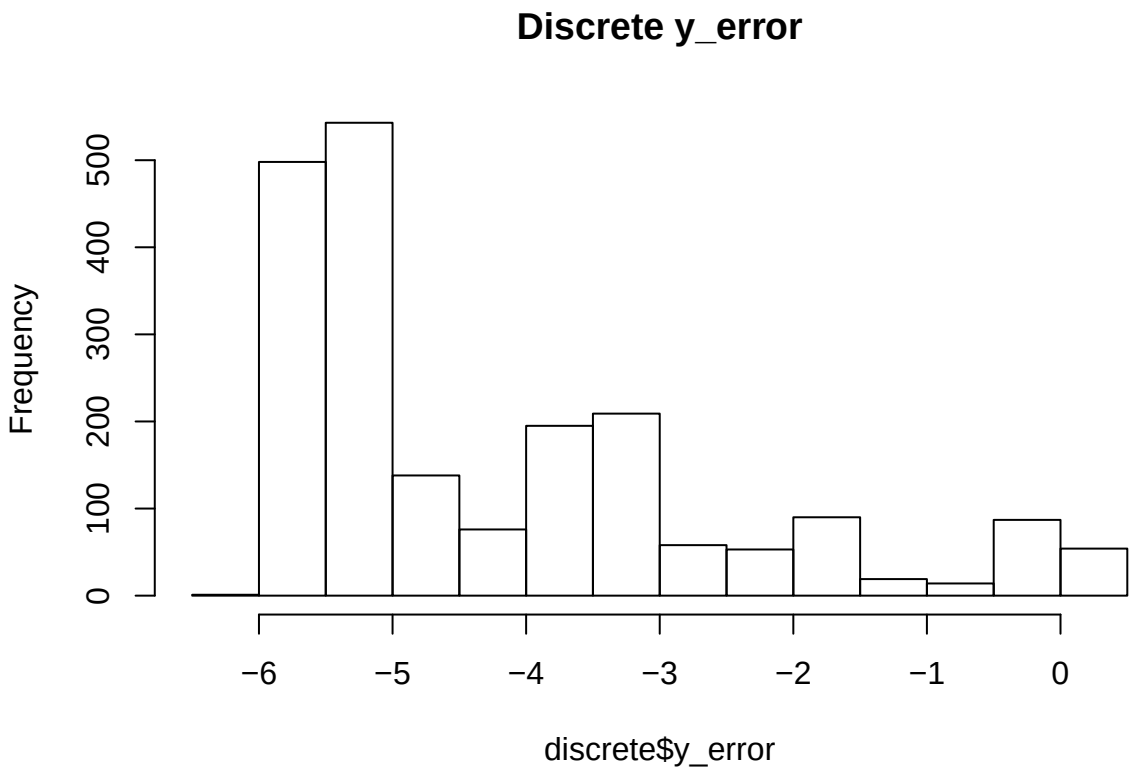
```r
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



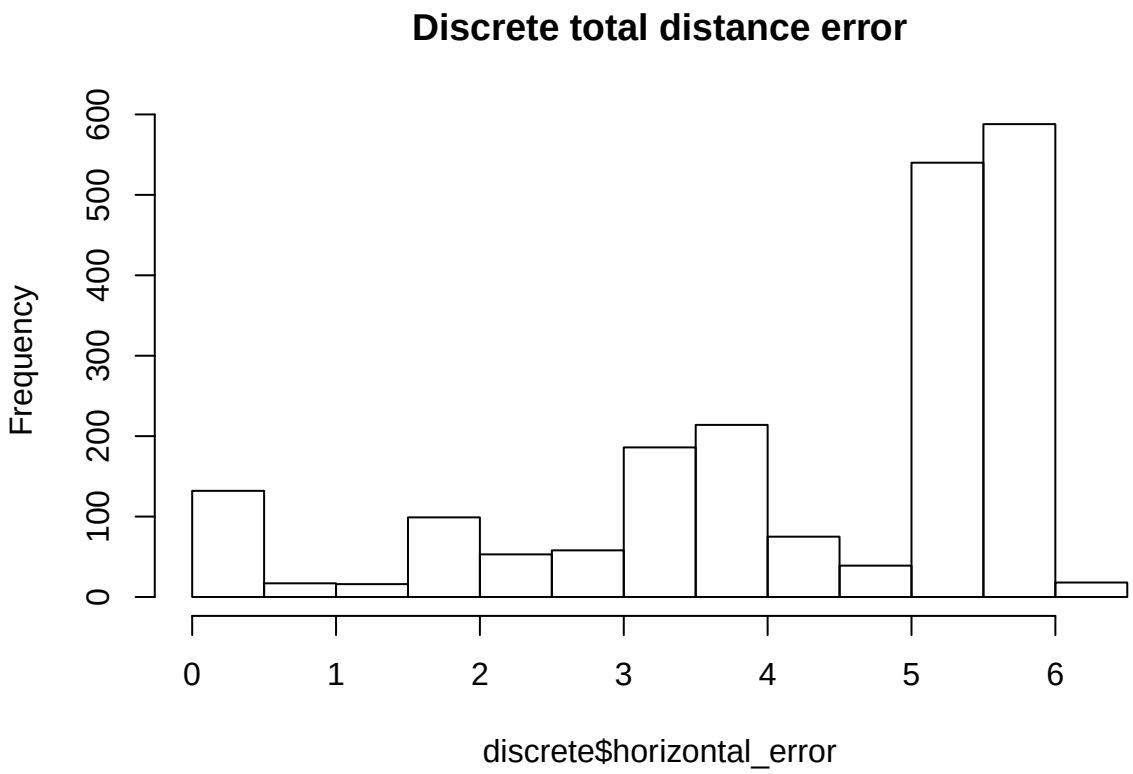

```r
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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: Mon, Aug 15, 2016 - 04:27:10 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-mobile-no-gps Experiment}
##   \label{tab:two_mobile_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 & 2,035 & 3.061 & 1.052 & 0.000 & 4.506 \\
## y\_position & 2,035 & 4.319 & 1.774 & $-$0.000 & 6.534 \\
## yaw & 2,035 & 0.695 & 1.066 & $-$3.126 & 3.138 \\
## x\_variance & 2,035 & 3.075 & 1.725 & 0.077 & 6.048 \\
## y\_variance & 2,035 & 3.113 & 1.734 & 0.077 & 6.115 \\
## yaw\_variance & 2,035 & 3.712 & 2.075 & 0.092 & 7.295 \\
## yaw\_error & 2,035 & $-$0.281 & 1.767 & $-$3.137 & 3.138 \\
## x\_error & 2,035 & $-$0.454 & 1.084 & $-$1.840 & 1.681 \\
```

```
## y\_error & 2,035 & $-$4.415 & 1.886 & $-$6.223 & 0.118 \\
## horizontal\_error & 2,035 & 4.569 & 1.884 & 0.00001 & 6.337 \\
## \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 - 04:27:10 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-mobile-no-gps Experiment}
##   \label{tab:two_mobile_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 & 2,035 & 2.952 & 0.933 & $-$0.000 & 5.435 \\
## y\_position & 2,035 & 4.148 & 1.624 & $-$0.074 & 6.493 \\
## yaw & 2,035 & 0.829 & 0.961 & $-$3.139 & 3.130 \\
## x\_variance & 2,035 & 0.187 & 0.235 & 0.0001 & 1.291 \\
## y\_variance & 2,035 & 0.189 & 0.237 & 0.0001 & 1.293 \\
## yaw\_variance & 2,035 & 3.714 & 2.075 & 0.092 & 7.295 \\
## x\_error & 2,035 & $-$0.345 & 0.614 & $-$1.814 & 1.964 \\
## y\_error & 2,035 & $-$4.244 & 1.686 & $-$6.002 & 0.123 \\
## horizontal\_error & 2,035 & 4.302 & 1.687 & 0.00001 & 6.061 \\
## yaw\_error & 2,035 & $-$0.300 & 1.758 & $-$3.141 & 3.138 \\
## \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)
}
```