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.
## -0.004862  3.783000  5.338000  6.154000  7.521000 13.650000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.7707 15.8300 17.0600 15.9000 18.4500 20.7100
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14000 -1.48000  0.11110  0.08775  1.76300  3.14100
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000015 16.170000 17.630000 17.320000 20.180000 24.380000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -2.88300 -0.21160  0.01741  0.14800  0.49280  3.20800
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -4.52400 -0.41990 -0.08207 -0.13470  0.11050  3.90600
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1360 -1.3890 -0.7281 -0.4204  0.2492  3.1400
```

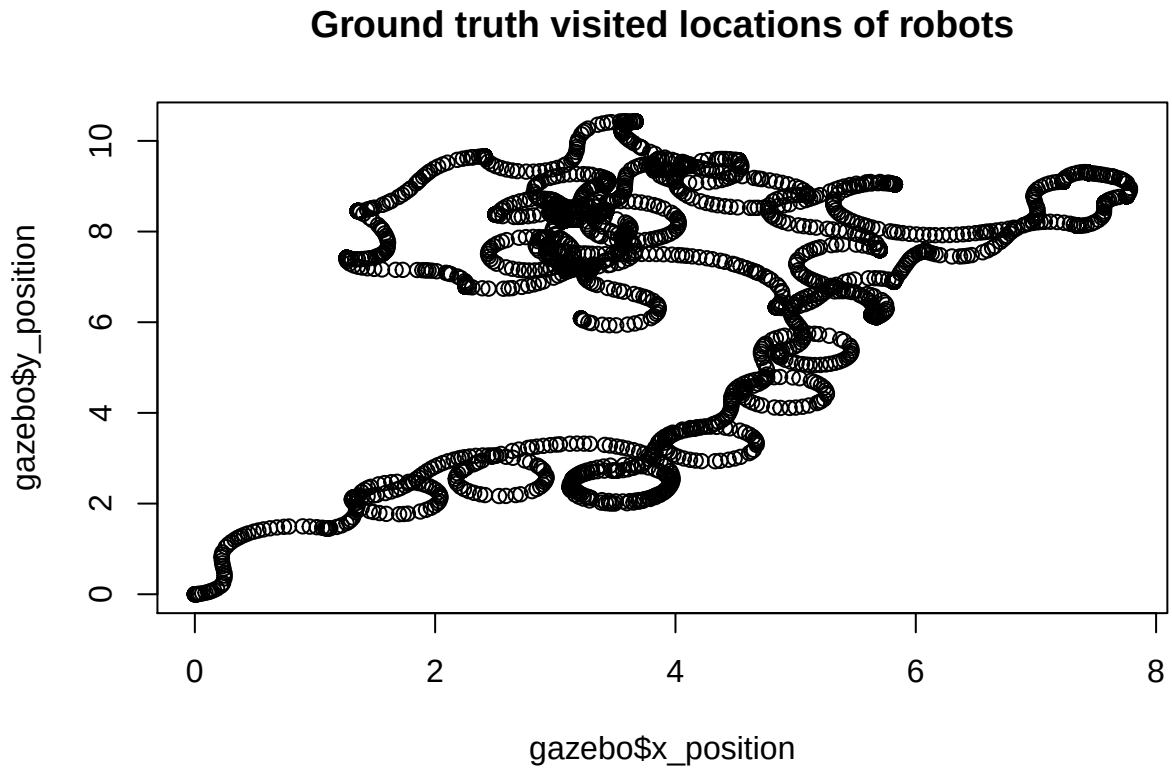
```
summary(discrete$horizontal_error)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000015 0.225800 0.541400 0.922200 1.325000 4.846000
```

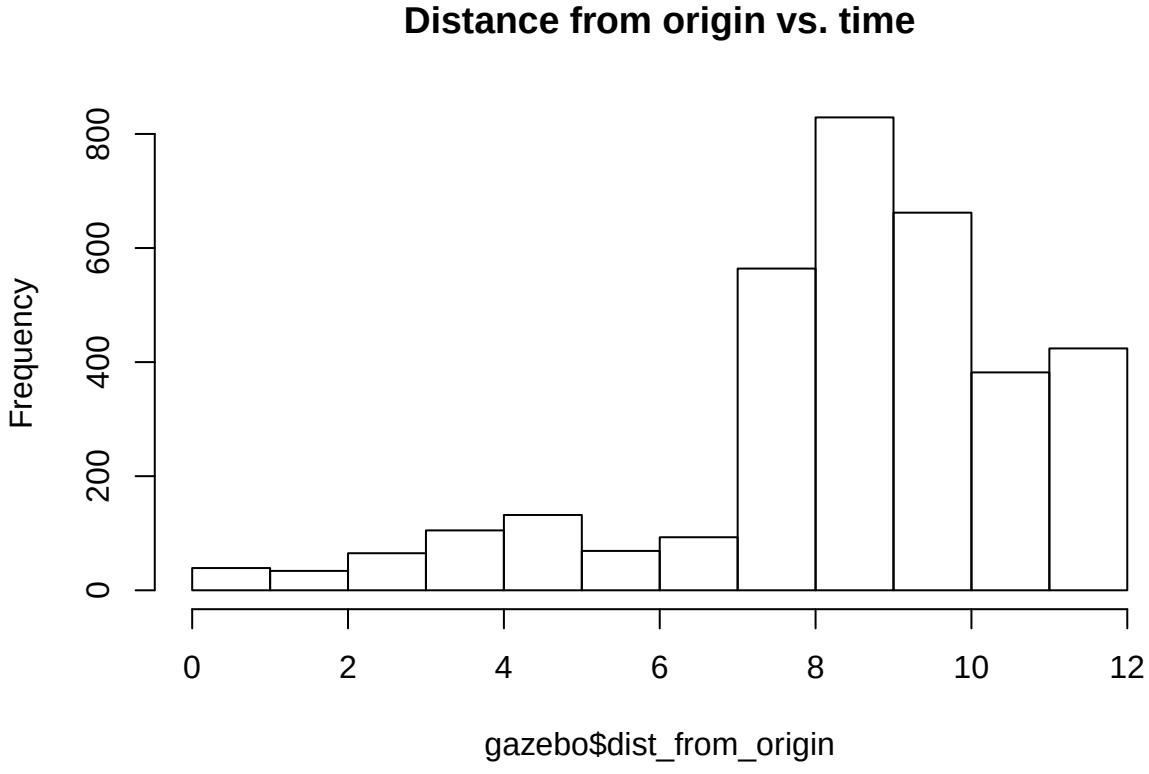
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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")
```

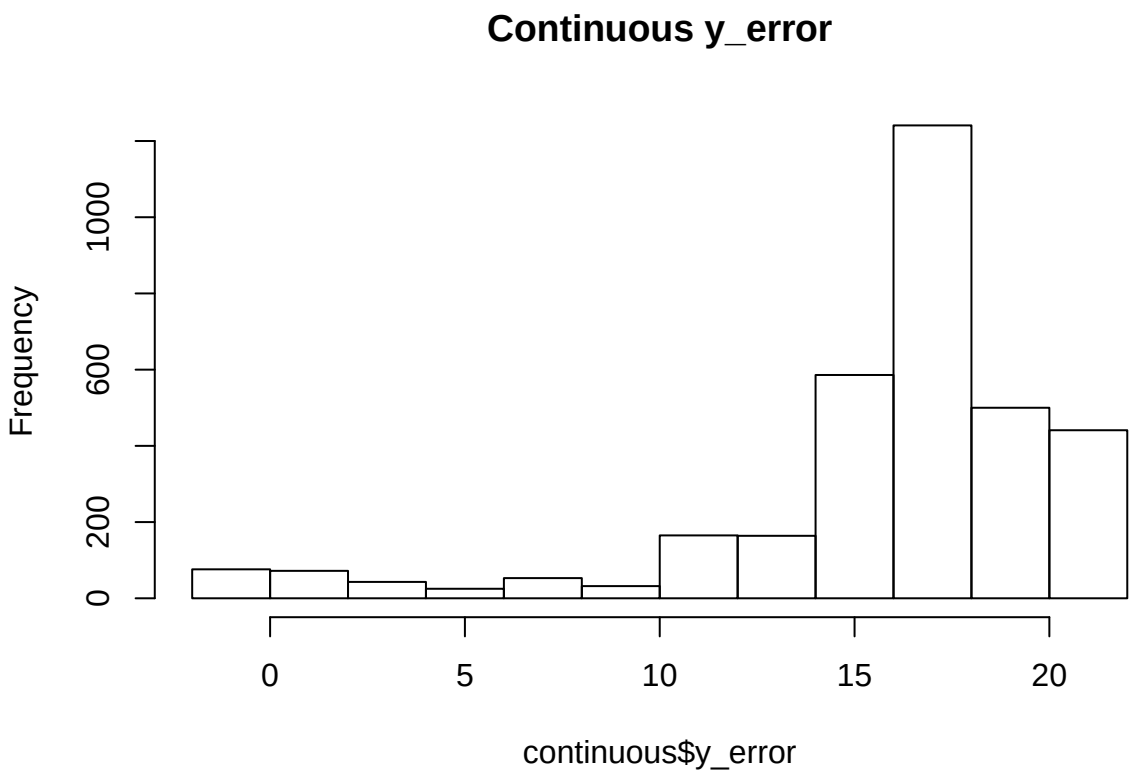



```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

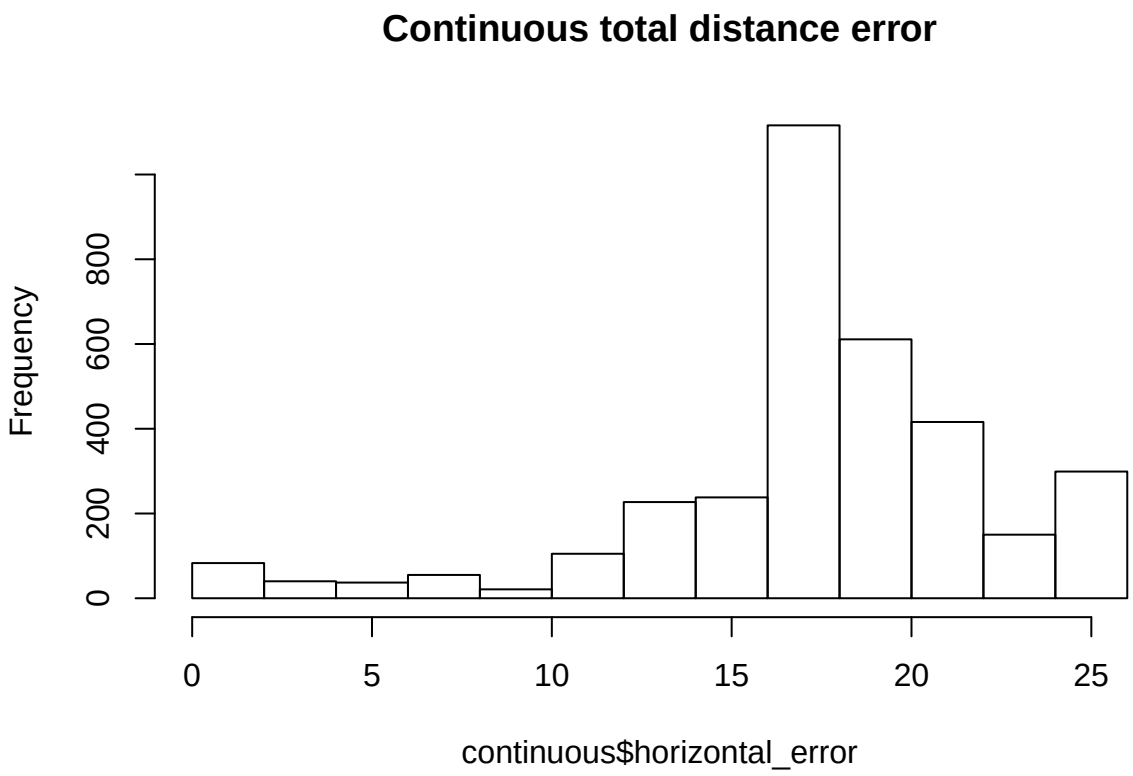



```
hist(continuous$x_error,
     main = "Continuous x_error")
```

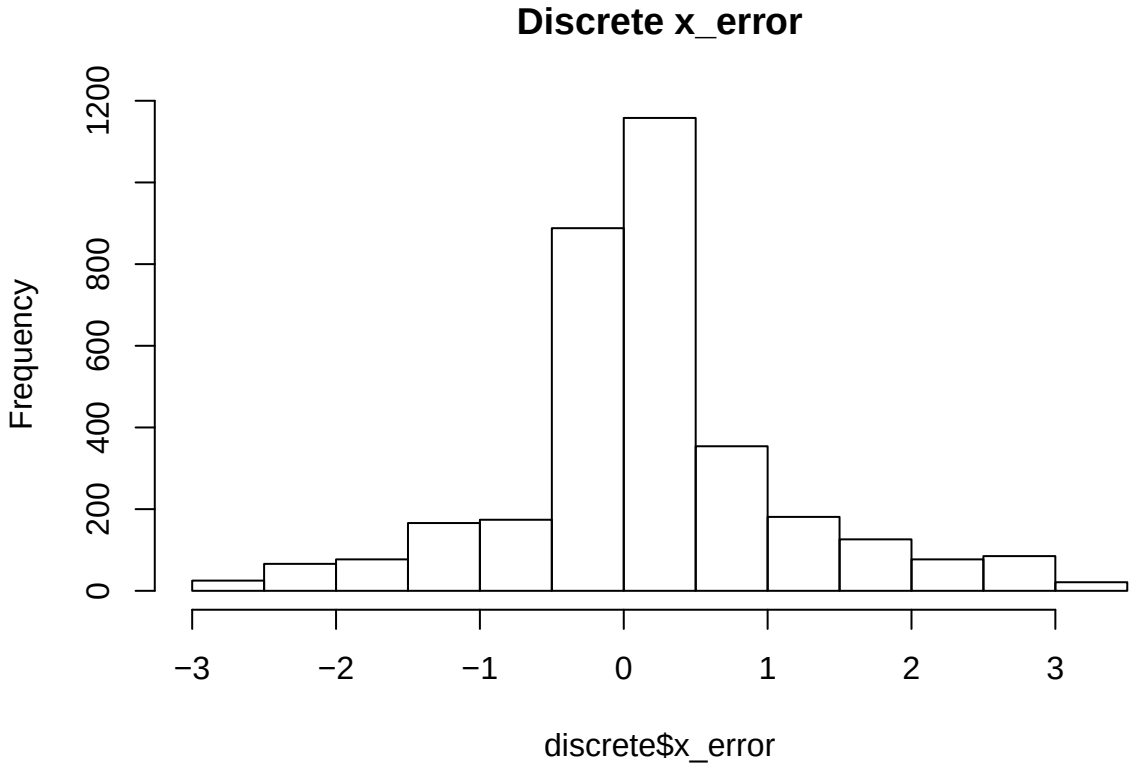

```
hist(continuous$y_error,
      main = "Continuous y_error")
```



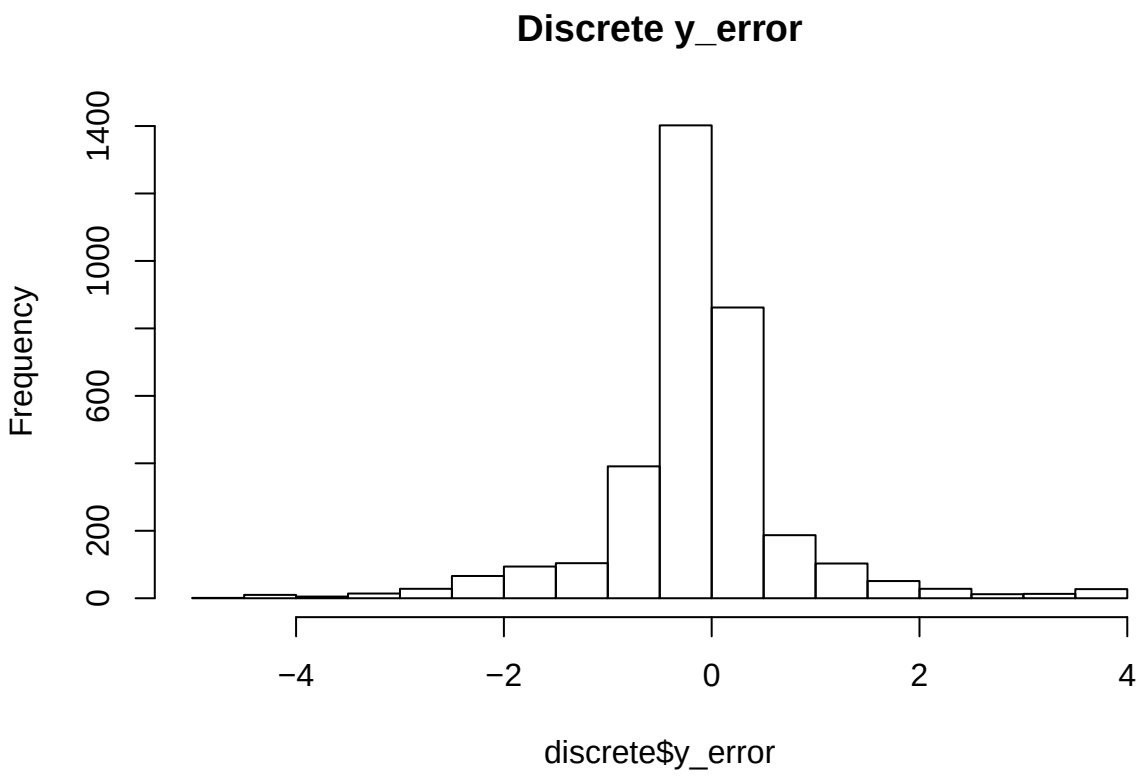

```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```



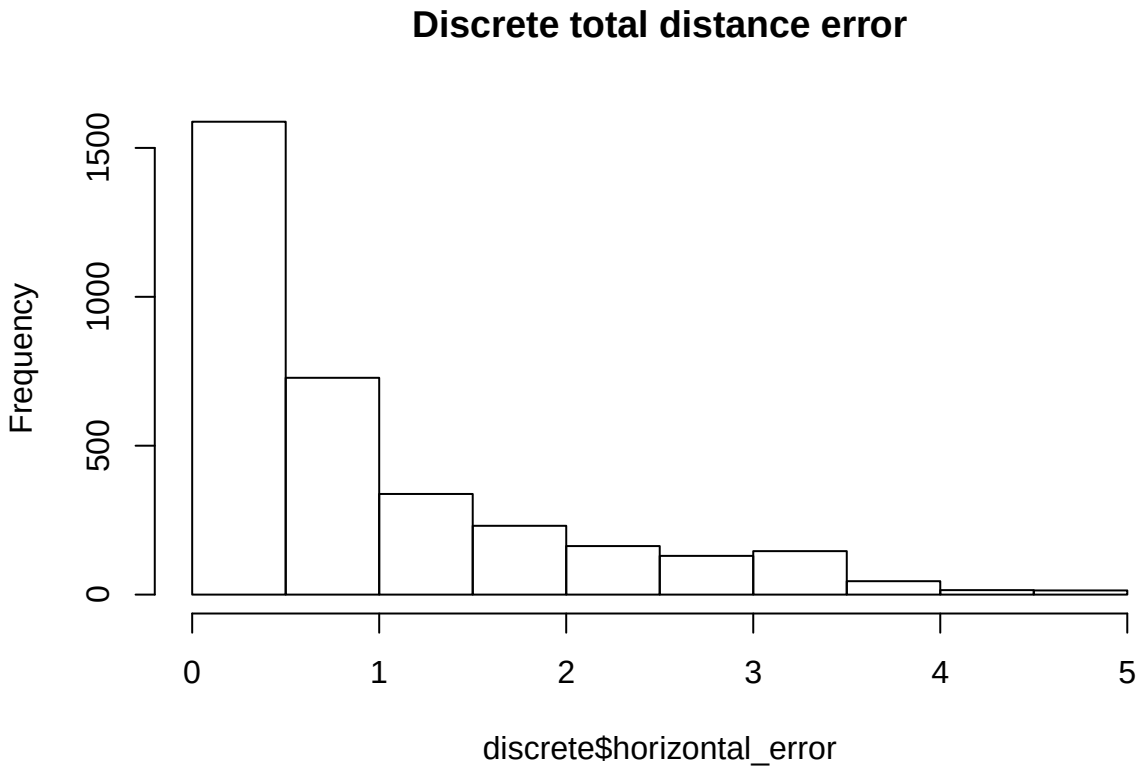

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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: Wed, Aug 10, 2016 - 04:37:11 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 & 3,398 & $-$2.178 & 2.131 & $-$6.093 & 1.237 \\
## y\_position & 3,398 & $-$8.585 & 2.895 & $-$12.603 & 2.296 \\
## yaw & 3,398 & 0.046 & 1.856 & $-$3.138 & 3.129 \\
## x\_variance & 3,398 & 11.981 & 6.926 & 0.084 & 24.015 \\
## y\_variance & 3,398 & 11.981 & 6.926 & 0.084 & 24.015 \\
## yaw\_variance & 3,398 & 14.361 & 8.302 & 0.101 & 28.787 \\
## yaw\_error & 3,398 & 0.088 & 1.823 & $-$3.140 & 3.141 \\
## x\_error & 3,398 & 6.154 & 3.350 & $-$0.005 & 13.649 \\
## y\_error & 3,398 & 15.903 & 4.644 & $-$0.771 & 20.706 \\
## horizontal\_error & 3,398 & 17.317 & 4.866 & 0.00002 & 24.378 \\
```

```
## \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: Wed, Aug 10, 2016 - 04:37:12 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 & 3,398 & 3.829 & 1.770 & $-$0.151 & 7.644 \\
## y\_position & 3,398 & 7.453 & 1.902 & $-$0.000 & 10.382 \\
## yaw & 3,398 & 0.488 & 1.769 & $-$3.132 & 3.118 \\
## x\_variance & 3,398 & 0.411 & 0.145 & 0.084 & 0.666 \\
## y\_variance & 3,398 & 0.411 & 0.145 & 0.084 & 0.666 \\
## yaw\_variance & 3,398 & 0.391 & 0.173 & 0.090 & 0.694 \\
## x\_error & 3,398 & 0.148 & 0.978 & $-$2.883 & 3.208 \\
## y\_error & 3,398 & $-$0.135 & 0.911 & $-$4.524 & 3.906 \\
## horizontal\_error & 3,398 & 0.922 & 0.988 & 0.00002 & 4.846 \\
## yaw\_error & 3,398 & $-$0.420 & 1.534 & $-$3.136 & 3.140 \\
## \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)
}
```