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.
## -0.8041  5.1880 14.8000 10.6500 14.8000 15.3500
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -17.74000 -15.03000 -15.03000 -11.68000  -7.97600   0.03901
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.1410000 -1.5900000  0.0526800 -0.0005787  1.5560000  3.1410000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##  0.000008 10.190000 21.090000 16.030000 21.100000 21.120000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -4.044000 -0.000032  0.000002 -0.021520  0.000724  5.084000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.833000 -0.000036  0.000000 -0.007175  0.000487  2.940000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1400 -1.1940  0.1835  0.1155  1.5310  3.1390
```

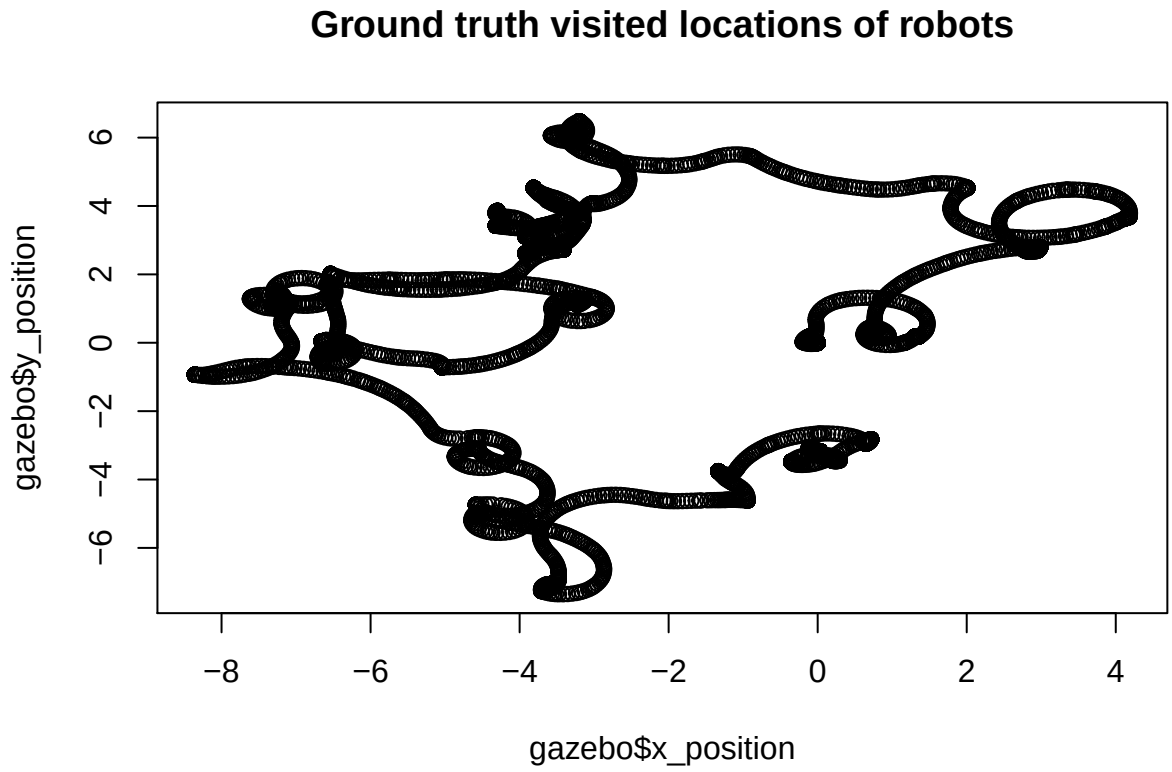
```
summary(discrete$horizontal_error)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000001 0.000028 0.000055 0.241100 0.196900 5.122000
```

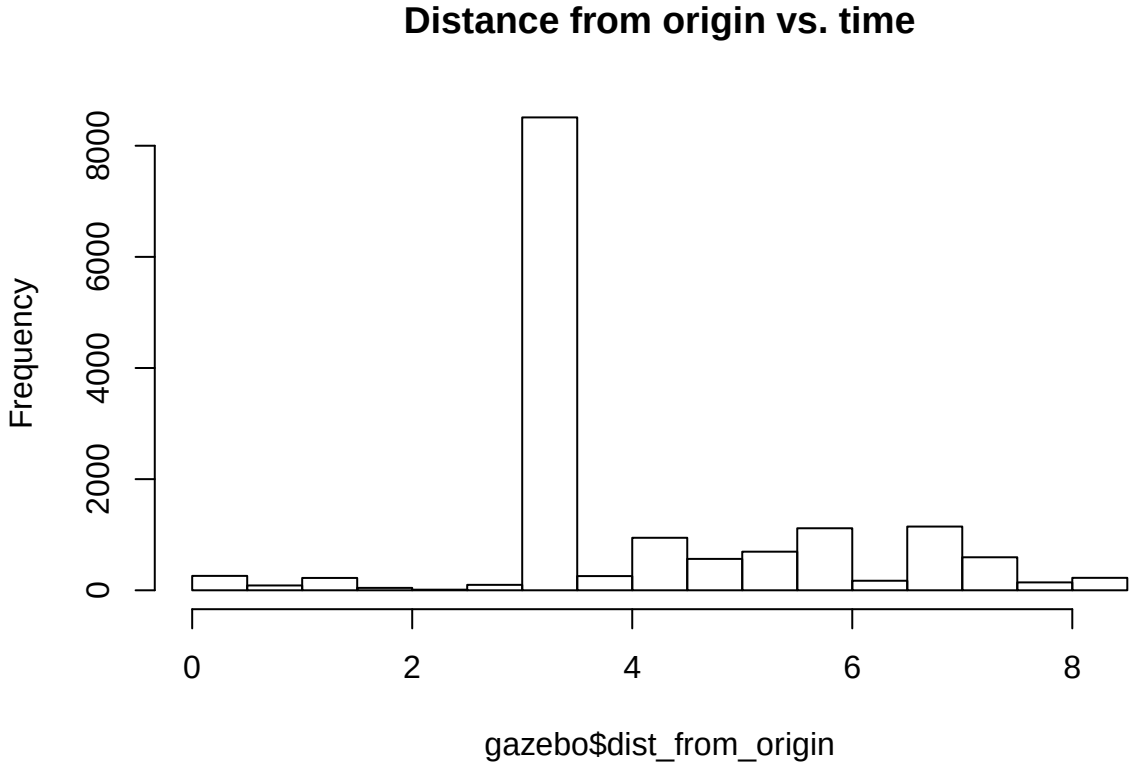
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

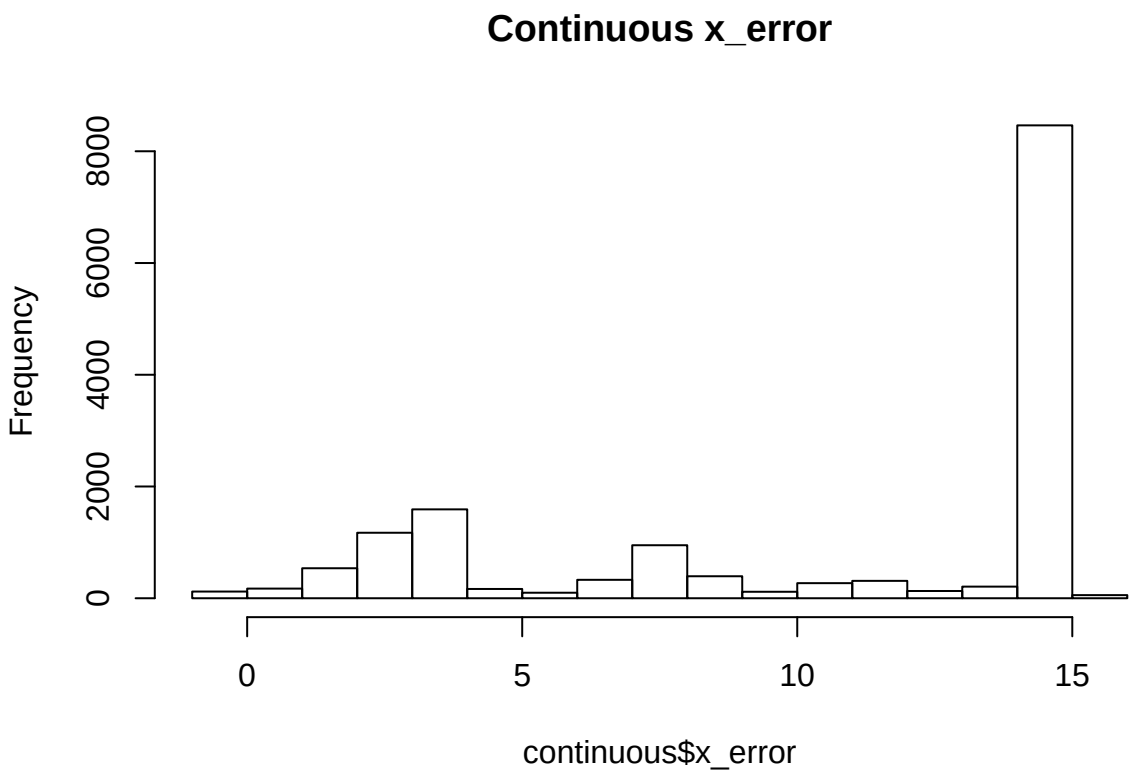
```
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```



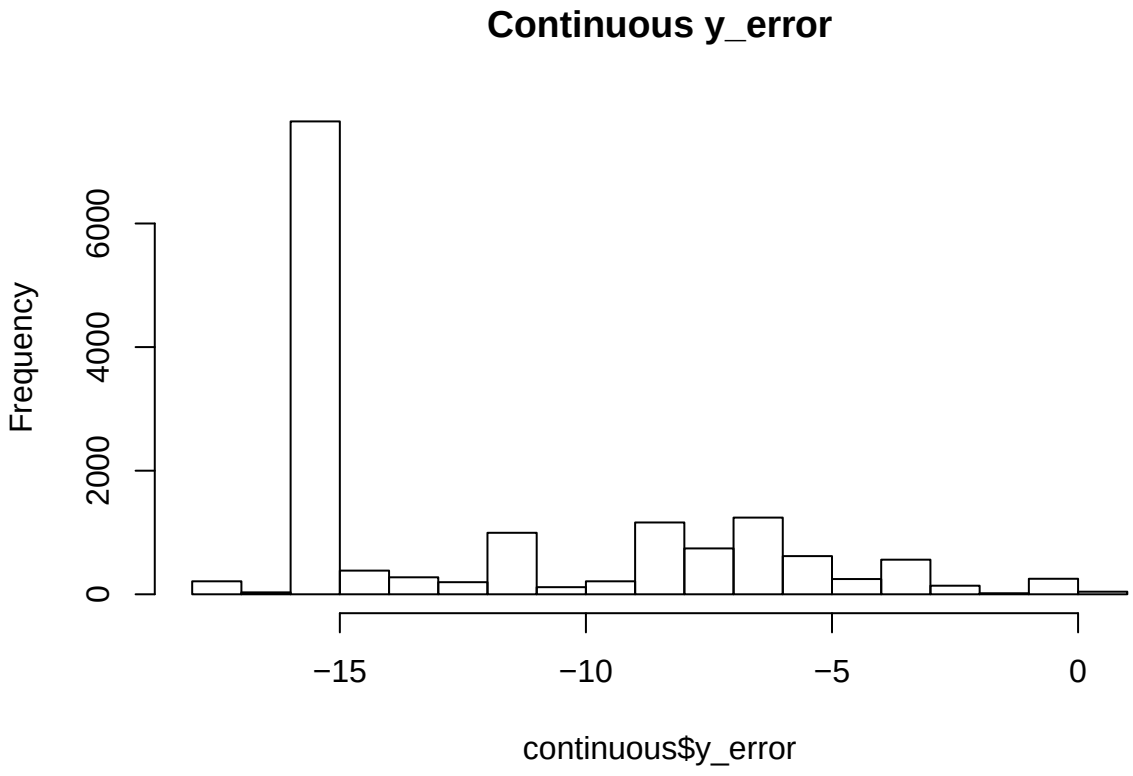

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```




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

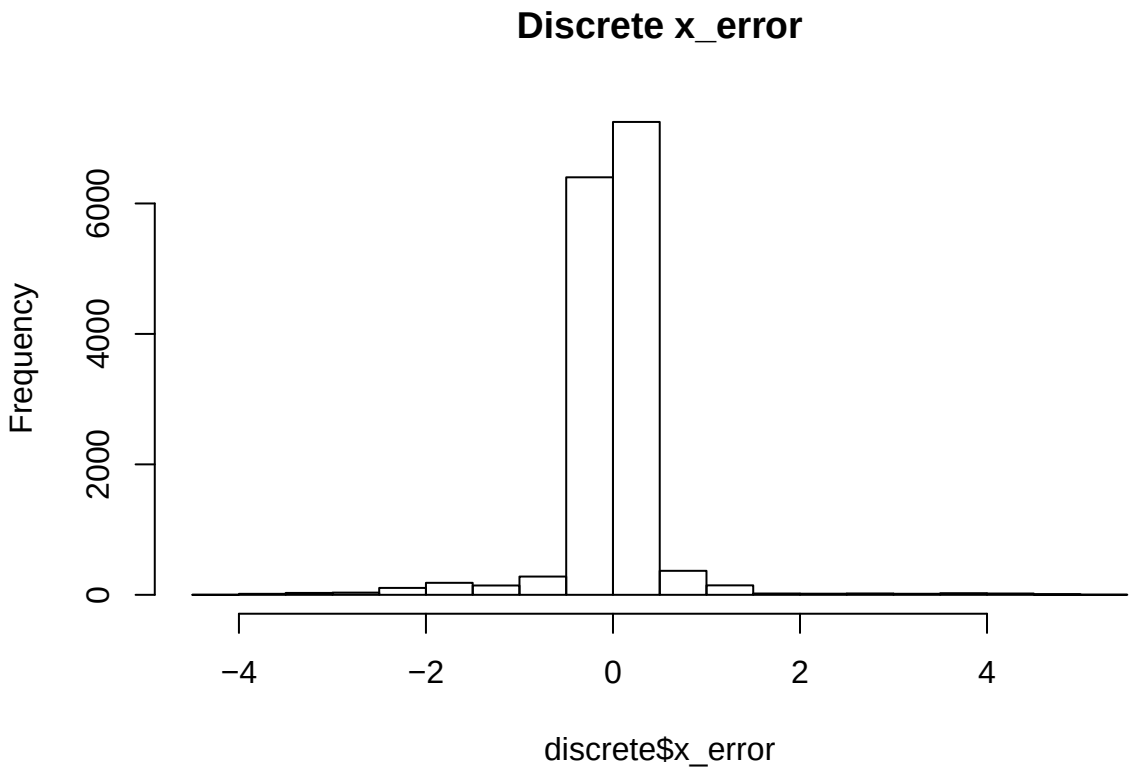



```
hist(continuous$y_error,
      main = "Continuous y_error")
```

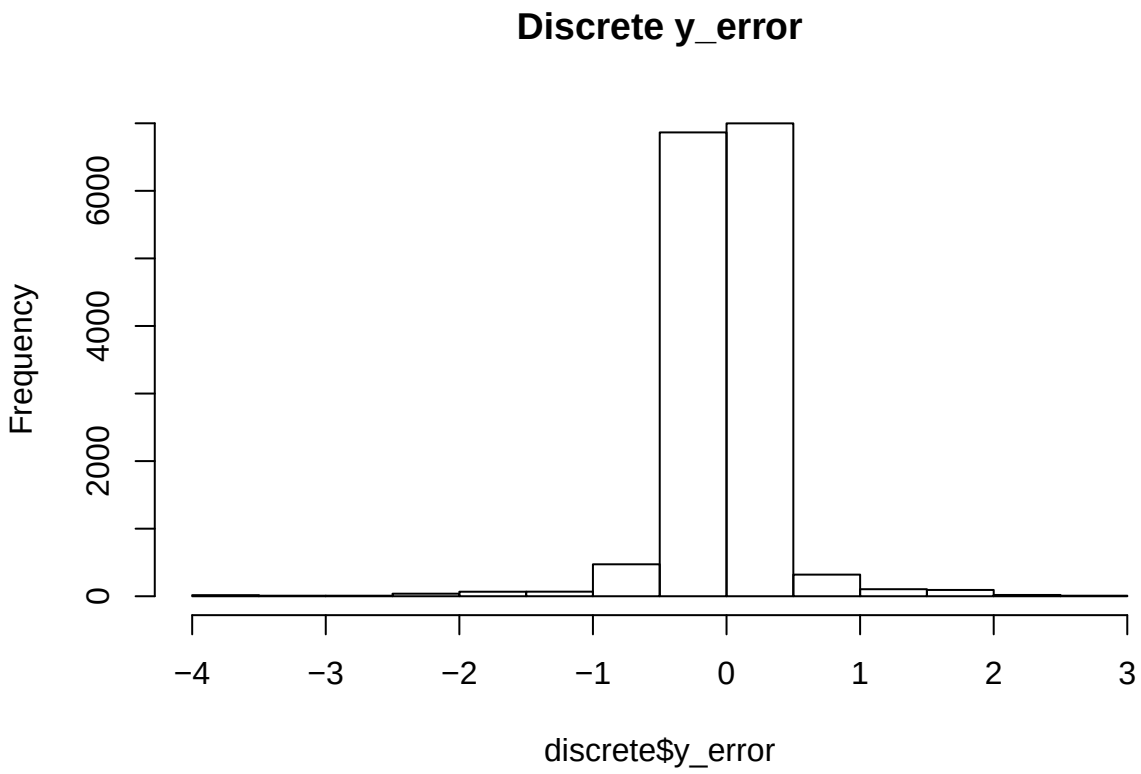



```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```

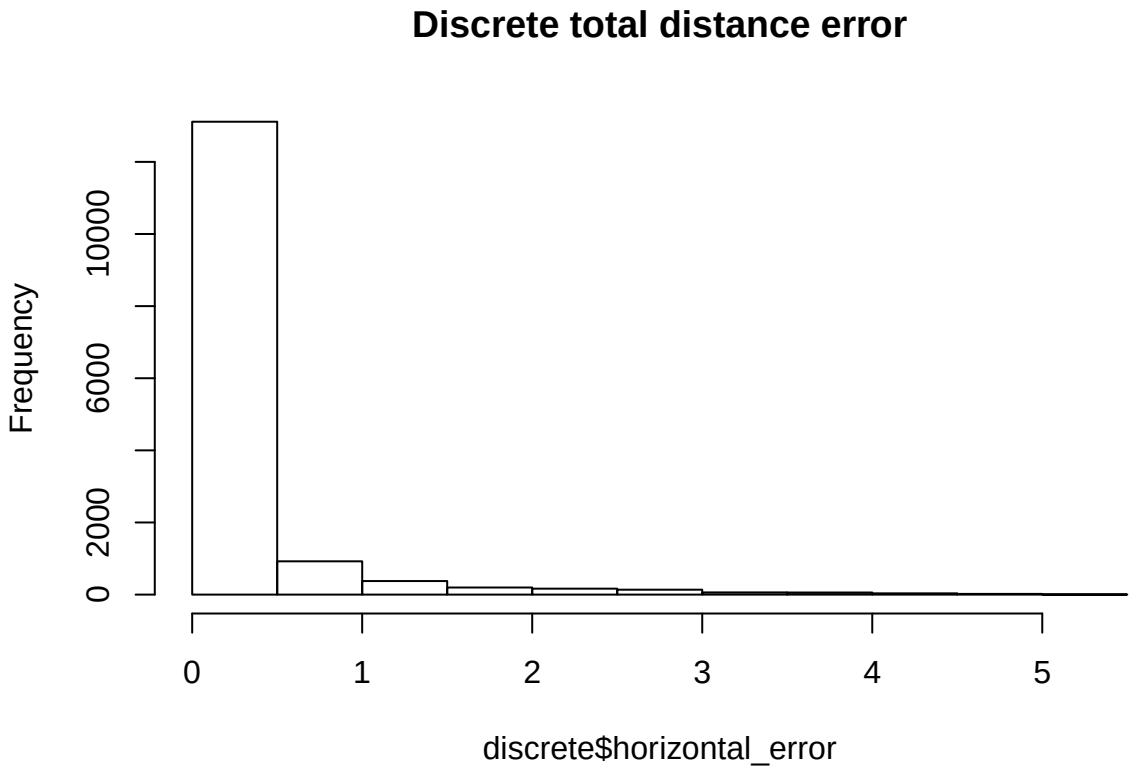

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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 - 10:03:13 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 & 15,086 & $-$11.986 & 4.331 & $-$18.628 & 0.728 \\
## y\_position & 15,086 & 10.403 & 2.594 & $-$0.000 & 14.888 \\
## yaw & 15,086 & 1.345 & 1.682 & $-$3.130 & 3.139 \\
## x\_variance & 15,086 & 84.093 & 48.589 & 0.131 & 168.431 \\
## y\_variance & 15,086 & 84.093 & 48.589 & 0.131 & 168.431 \\
## yaw\_variance & 15,086 & 76.173 & 43.904 & 0.118 & 152.167 \\
## yaw\_error & 15,086 & $-$0.001 & 1.808 & $-$3.141 & 3.141 \\
## x\_error & 15,086 & 10.652 & 5.266 & $-$0.804 & 15.350 \\
## y\_error & 15,086 & $-$11.681 & 4.345 & $-$17.740 & 0.039 \\
## horizontal\_error & 15,086 & 16.031 & 6.286 & 0.00001 & 21.120 \\
```

```
## \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 - 10:03:13 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 & 15,086 & $-$1.312 & 2.338 & $-$8.340 & 4.133 \\
## y\_position & 15,086 & $-$1.270 & 3.032 & $-$7.185 & 6.467 \\
## yaw & 15,086 & 0.064 & 1.854 & $-$3.142 & 3.141 \\
## x\_variance & 15,086 & 0.622 & 0.268 & 0.131 & 1.102 \\
## y\_variance & 15,086 & 0.622 & 0.268 & 0.131 & 1.102 \\
## yaw\_variance & 15,086 & 0.505 & 0.243 & 0.091 & 0.933 \\
## x\_error & 15,086 & $-$0.022 & 0.533 & $-$4.044 & 5.084 \\
## y\_error & 15,086 & $-$0.007 & 0.365 & $-$3.833 & 2.940 \\
## horizontal\_error & 15,086 & 0.241 & 0.599 & 0.000001 & 5.122 \\
## yaw\_error & 15,086 & 0.116 & 1.728 & $-$3.140 & 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)
}
```