one_mobile_no_gps Experiment Report

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This is a summary of the data from the one_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.
## -15.3800  -0.2537   1.6410   0.4261   2.7250   4.1320
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -1.400   3.767   5.909   7.252   7.104  33.820
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.13900 -1.55400 -0.08289 -0.02886  1.55200  3.13700
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00002  3.92800  6.40600  7.80900  7.78100 37.16000
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -13.7400  -0.2386   1.8450   0.7307   2.9650   4.5060
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -1.414   3.692   5.783   7.209   6.948  34.540
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14000 -1.55400 -0.08535 -0.02772  1.55500  3.14000
```

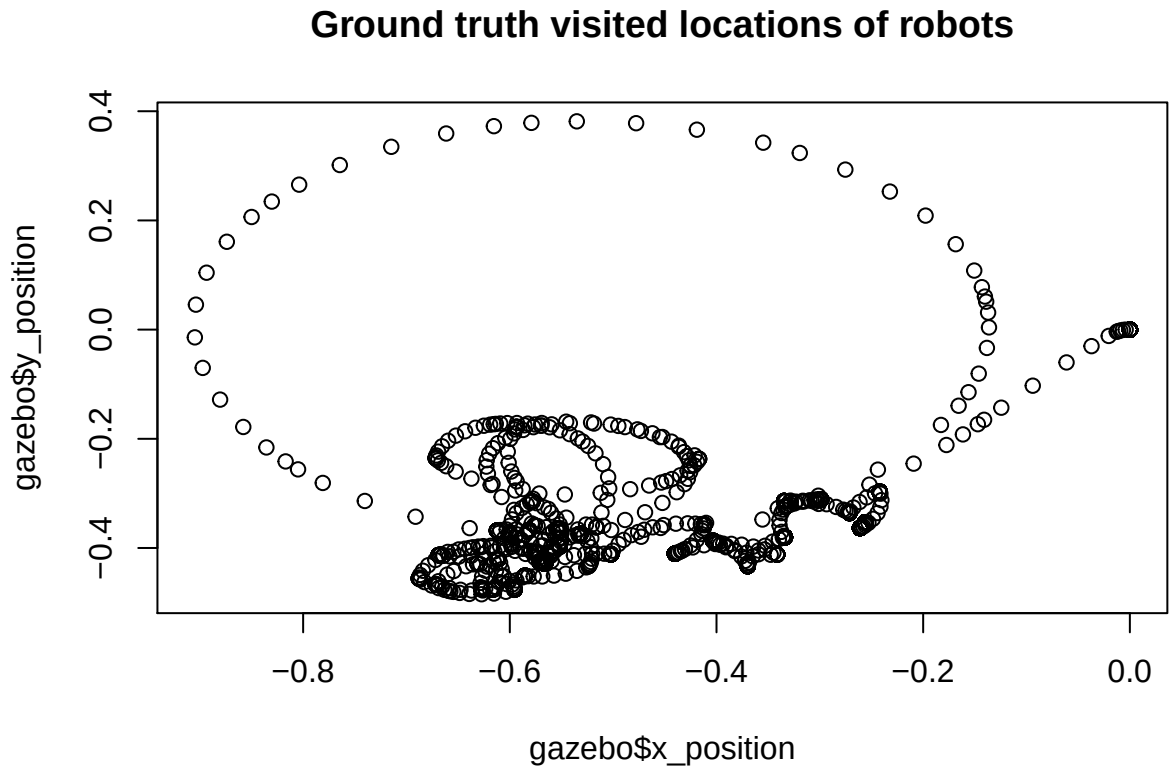
```
summary(discrete$horizontal_error)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  0.00002  3.90500  6.38400  7.78300  7.75200 37.17000
```

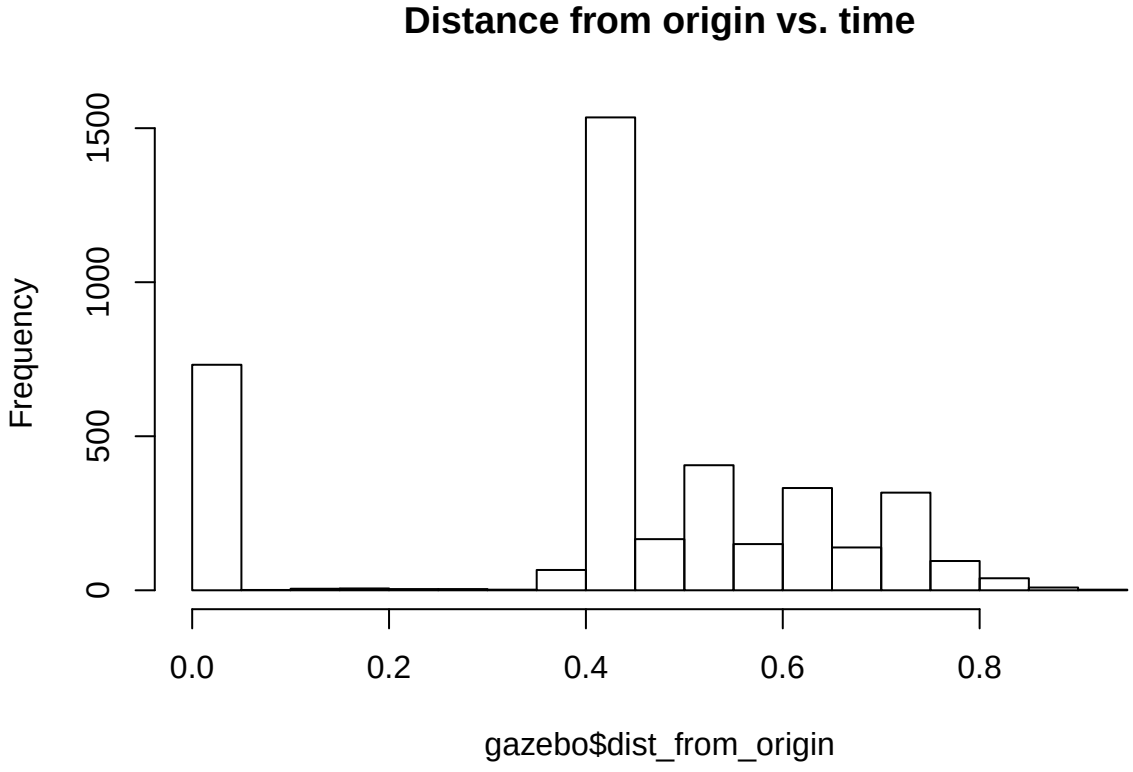
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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")
```

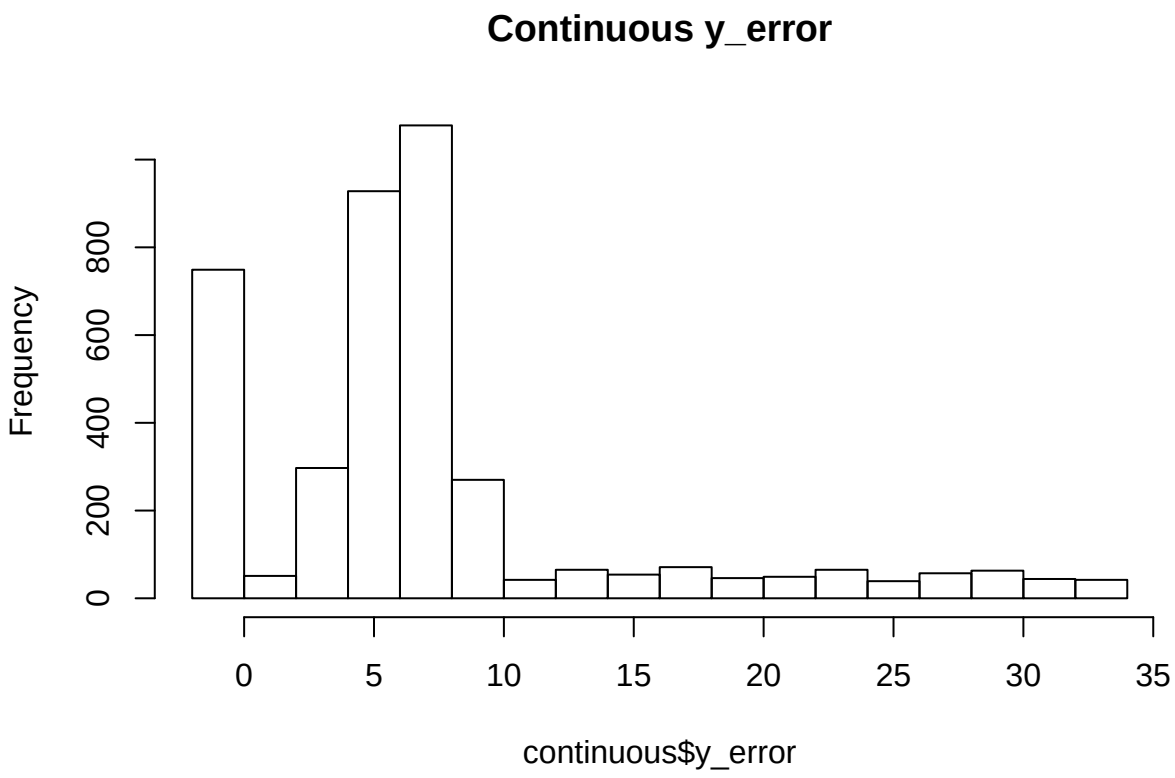



```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



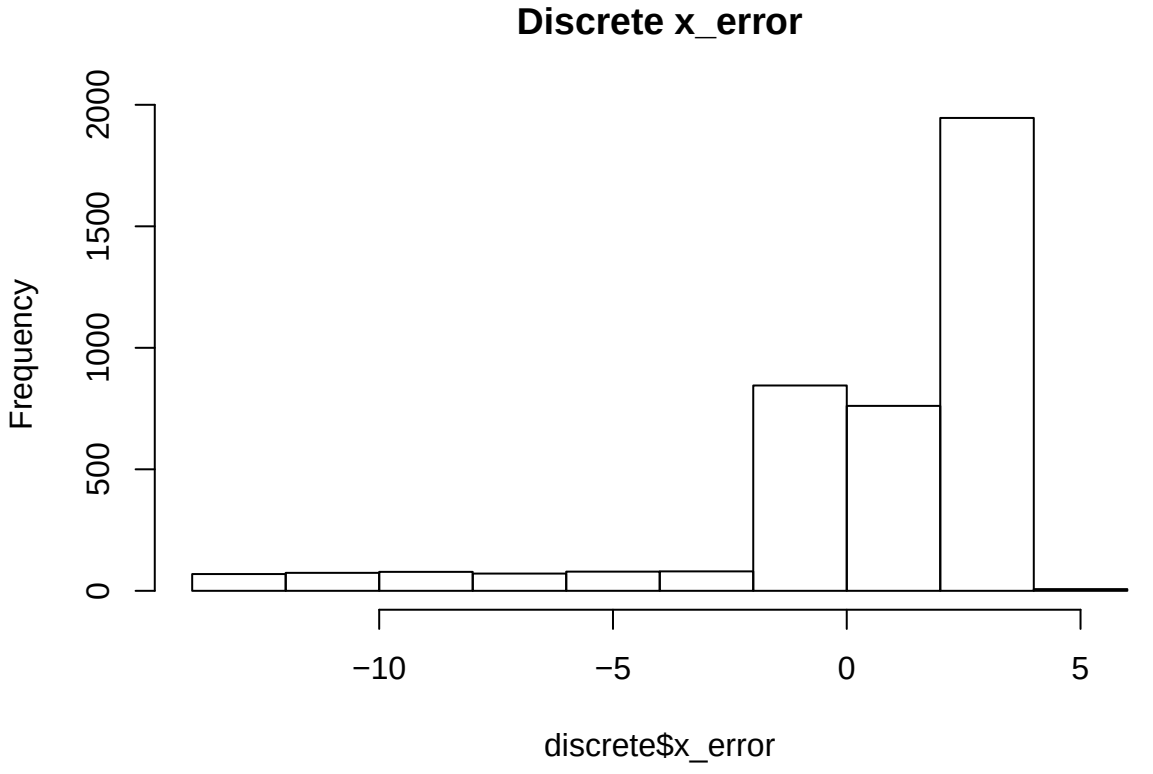

```
hist(continuous$x_error,
     main = "Continuous x_error")
```


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

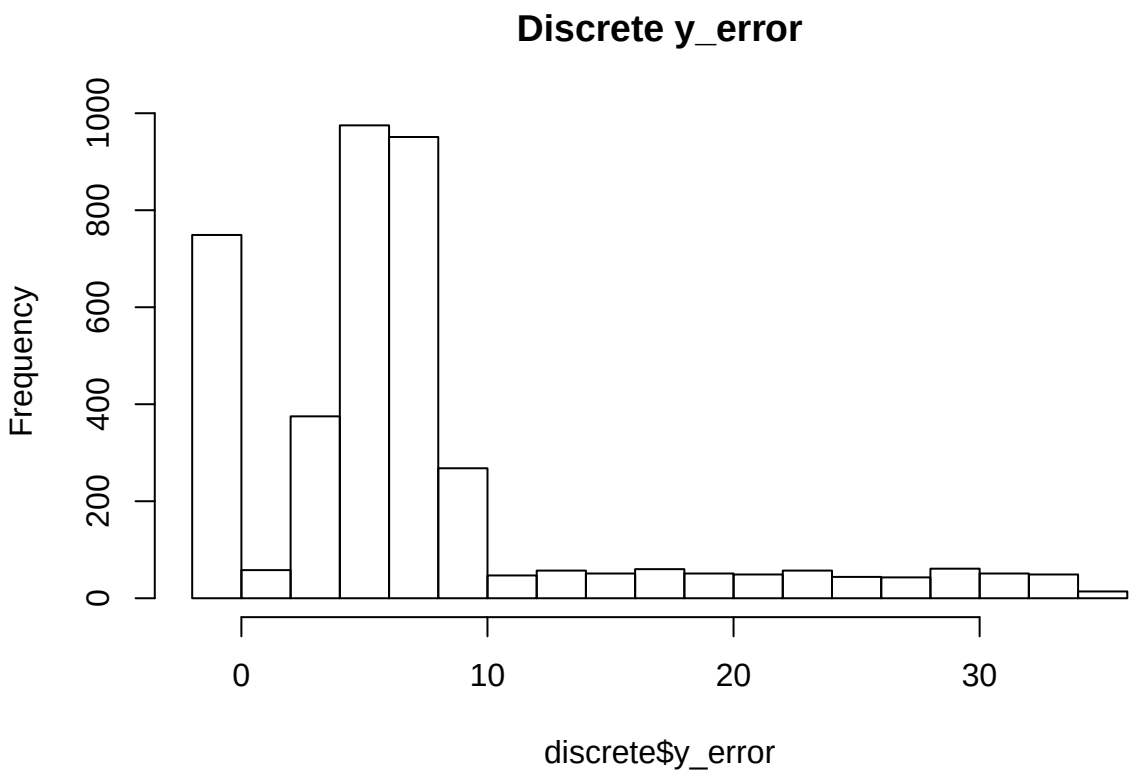



```
hist(continuous$horizontal_error,
     main = "Continuous total distance error")
```

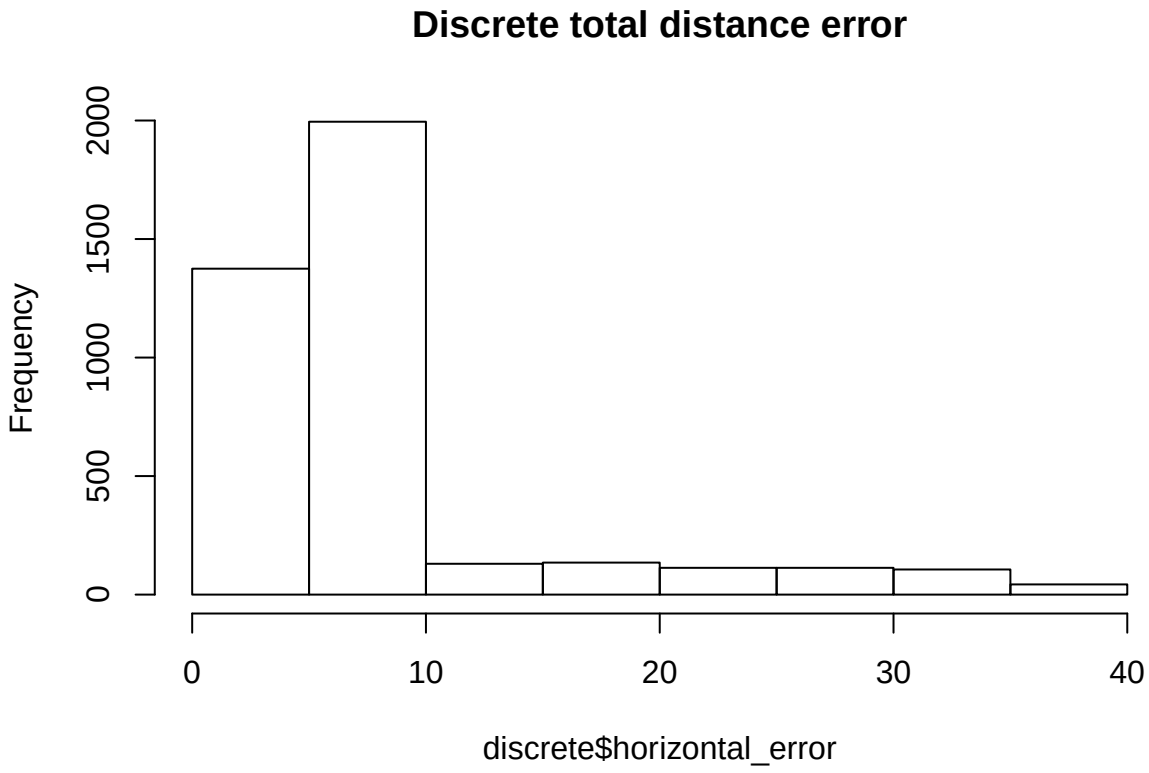

```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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 - 04:36:57 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-mobile-no-gps Experiment}
##   \label{tab:one_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 & 4,010 & $-$0.728 & 3.847 & $-$4.393 & 15.122 \\
## y\_position & 4,010 & $-$7.547 & 7.400 & $-$34.177 & 1.400 \\
## yaw & 4,010 & $-$1.412 & 0.873 & $-$2.996 & 1.248 \\
## x\_variance & 4,010 & 13.616 & 9.812 & 0.082 & 42.116 \\
## y\_variance & 4,010 & 15.026 & 12.828 & 0.082 & 57.480 \\
## yaw\_variance & 4,010 & 17.586 & 14.567 & 0.099 & 65.667 \\
## yaw\_error & 4,010 & $-$0.029 & 1.816 & $-$3.139 & 3.137 \\
## x\_error & 4,010 & 0.426 & 3.806 & $-$15.379 & 4.132 \\
## y\_error & 4,010 & 7.252 & 7.334 & $-$1.400 & 33.824 \\
## horizontal\_error & 4,010 & 7.809 & 7.750 & 0.00002 & 37.156 \\
```

```
## \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 - 04:36:57 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-mobile-no-gps Experiment}
##   \label{tab:one_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 & 4,010 & $-$1.032 & 3.573 & $-$4.768 & 13.482 \\
## y\_position & 4,010 & $-$7.504 & 7.530 & $-$34.890 & 1.414 \\
## yaw & 4,010 & $-$1.444 & 0.881 & $-$3.031 & 1.218 \\
## x\_variance & 4,010 & 13.415 & 9.376 & 0.082 & 39.654 \\
## y\_variance & 4,010 & 15.226 & 13.309 & 0.082 & 59.924 \\
## yaw\_variance & 4,010 & 17.588 & 14.569 & 0.099 & 65.668 \\
## x\_error & 4,010 & 0.731 & 3.529 & $-$13.739 & 4.506 \\
## y\_error & 4,010 & 7.209 & 7.465 & $-$1.414 & 34.537 \\
## horizontal\_error & 4,010 & 7.783 & 7.753 & 0.00002 & 37.169 \\
## yaw\_error & 4,010 & $-$0.028 & 1.816 & $-$3.140 & 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)
}
```