

two_mobile_noiseless Experiment Report

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This is a summary of the data from the two_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.
## -25.580 -14.540  -1.604  -4.277   6.518  11.910
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -19.200  -3.850   1.032  -1.006   5.759  16.460
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.141000 -1.518000 -0.089190 -0.007038  1.576000  3.141000
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.000014  6.303000 12.290000 12.230000 17.200000 26.030000
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -7.50200 -0.04046  0.01582  0.07045  0.34260  5.20200
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.835000 -0.131800  0.000033  0.115300  0.240900  3.771000
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.14100 -1.27000 -0.18890 -0.09549  1.11200  3.14200
```

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

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.00000  0.07297  0.38430  0.78680  0.99780  8.30100
```

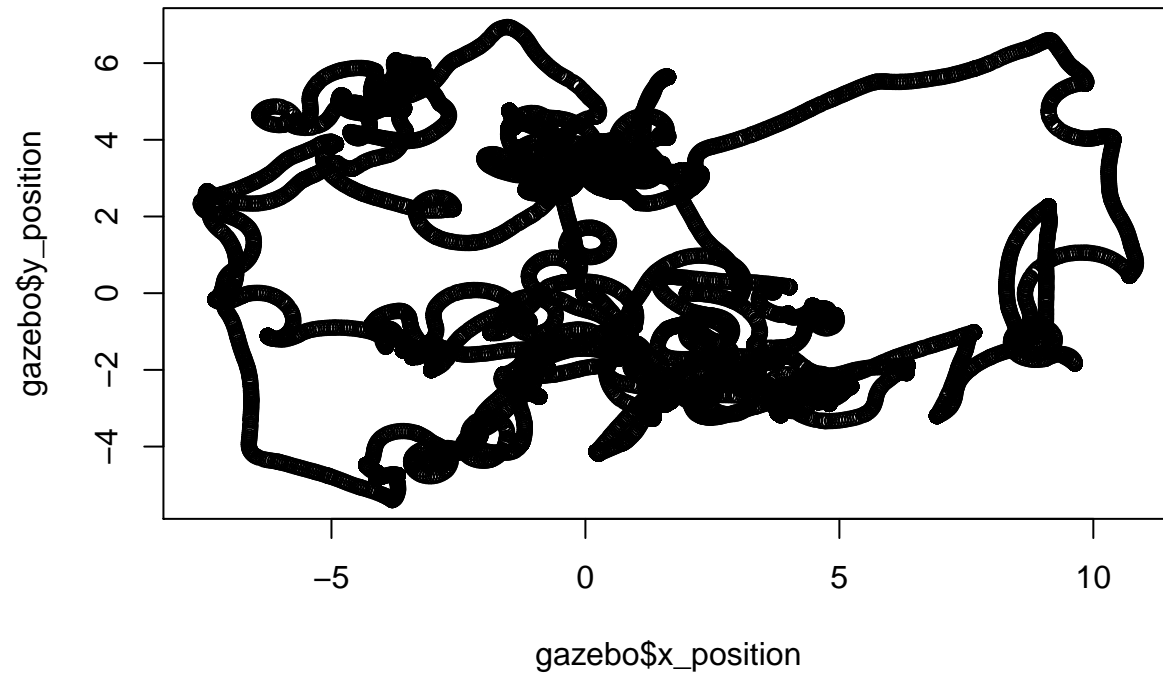
```
if (params$robot >= 2) {
  summary(external_data_averages)
}
```

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

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

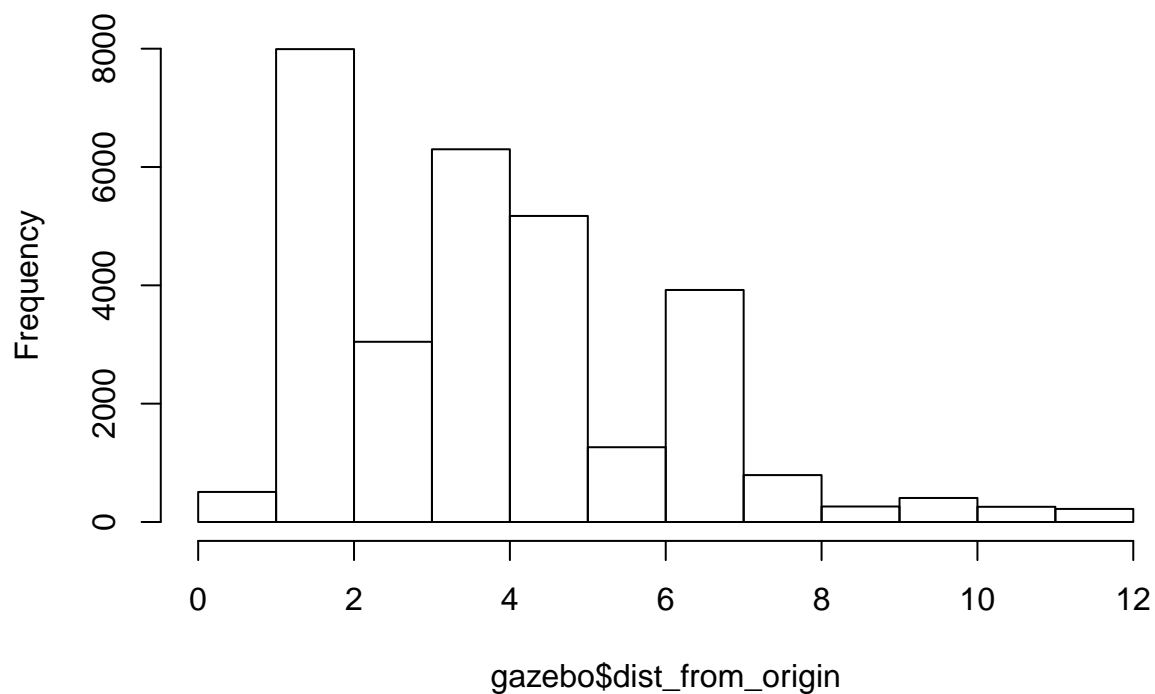
```
plot(gazebo$x_position, gazebo$y_position,  
     main = "Ground truth visited locations of robots")
```

Ground truth visited locations of robots



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

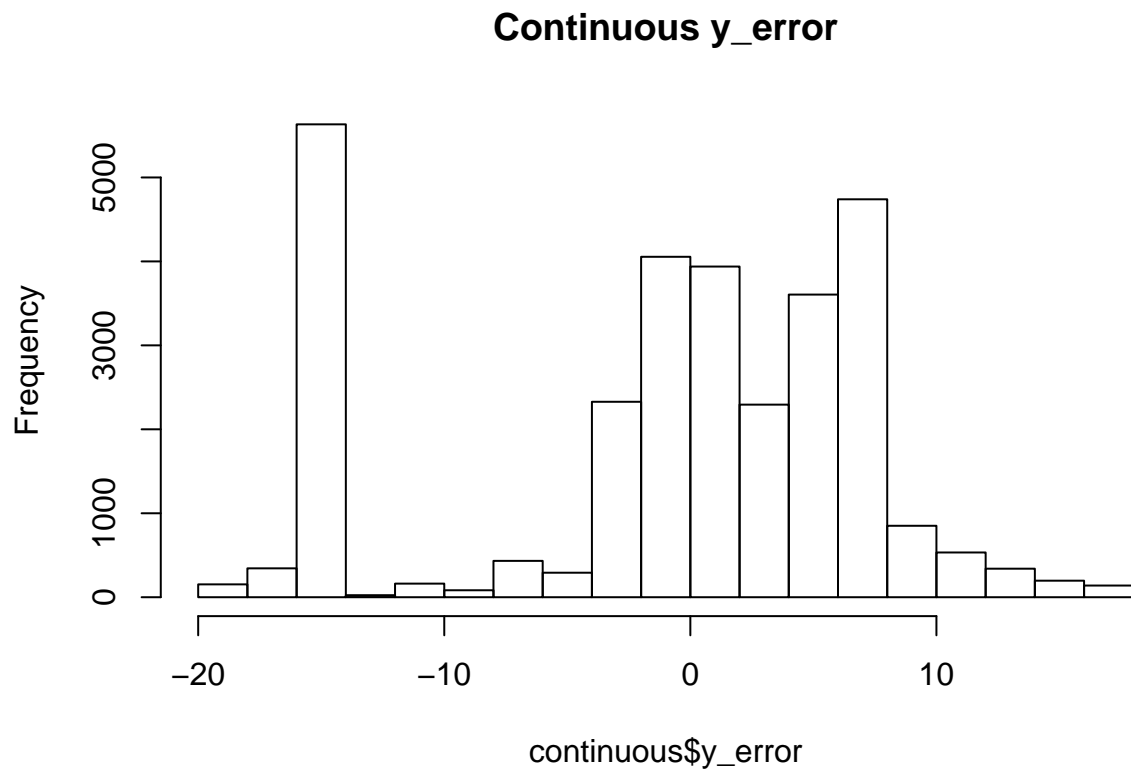
Distance from origin vs. time



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

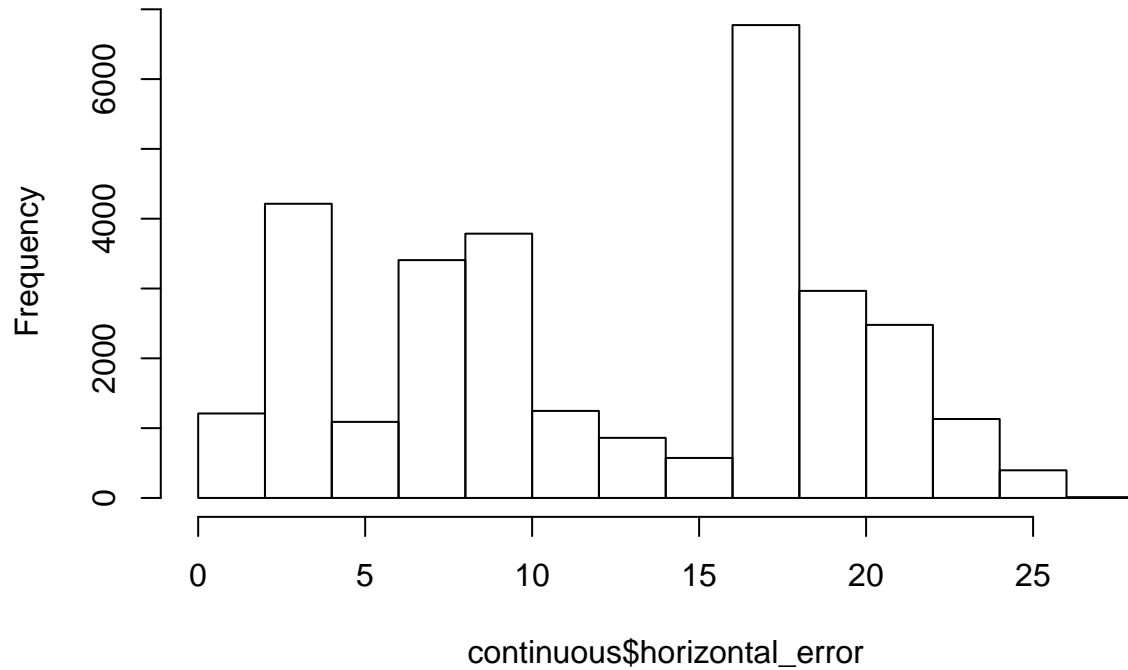


```
hist(continuous$y_error,
     main = "Continuous y_error")
```



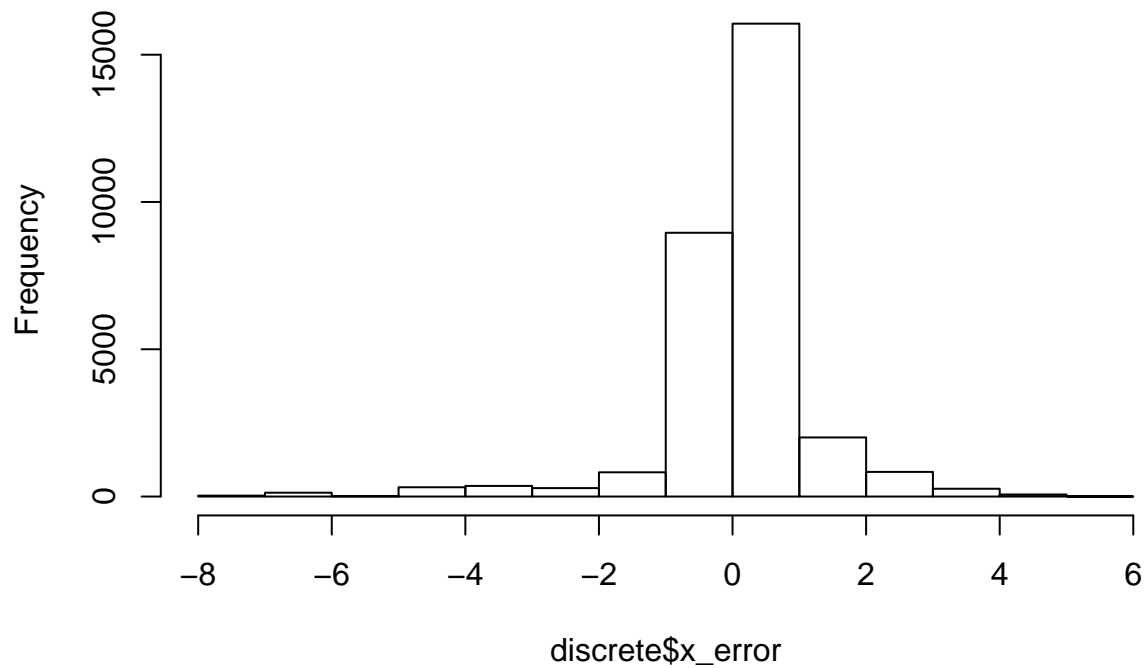
```
hist(continuous$horizontal_error,  
     main = "Continuous total distance error")
```

Continuous total distance error

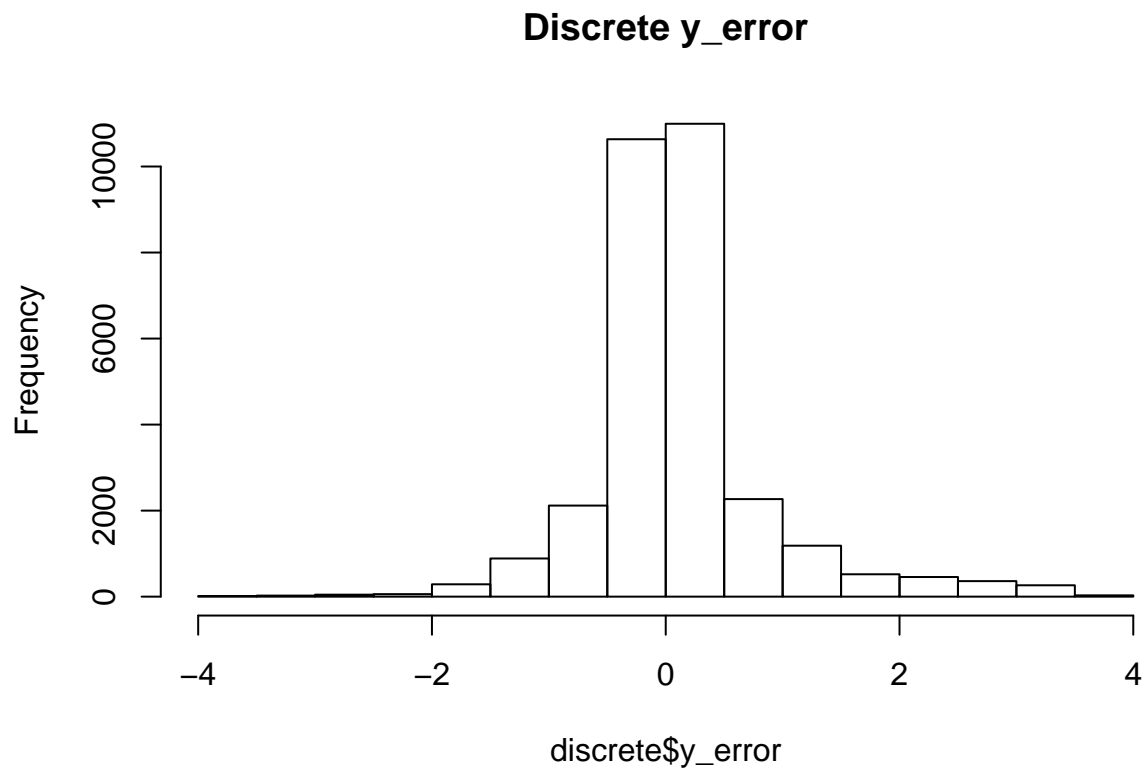


```
hist(discrete$x_error,  
     main = "Discrete x_error")
```

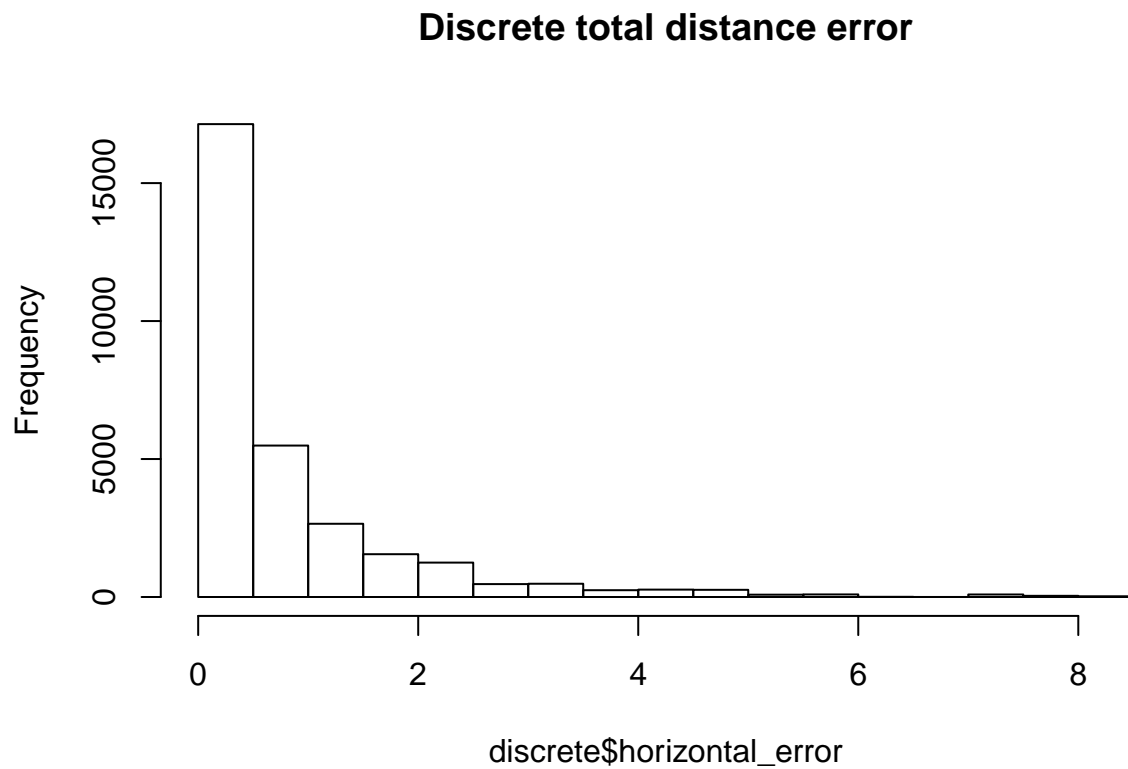
Discrete x_error



```
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, " 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 - 10:06:36 PM
## \begin{table}[h] \centering
## \caption{Continuous Filter Estimate for two-mobile-noiseless Experiment}
## \label{tab:two_mobile_noiseless_continuous_summary}
## \begin{tabular}{@{\extracolsep{5pt}}lcccc}
## \ll[-1.8ex]\hline
## \hline \ll[-1.8ex]
## Statistic & \multicolumn{1}{c}{N} & \multicolumn{1}{c}{Mean} & \multicolumn{1}{c}{St. Dev.} & \multi
## \hline \ll[-1.8ex]
## x\_position & 30,145 & 4.221 & 10.419 & $-10.925 & 26.735 \ll
## y\_position & 30,145 & 1.362 & 7.947 & $-12.236 & 17.234 \ll
## yaw & 30,145 & $-0.463 & 1.878 & $-3.140 & 3.139 \ll
## x\_variance & 30,145 & 82.322 & 47.534 & 0.119 & 165.806 \ll
## y\_variance & 30,145 & 82.322 & 47.534 & 0.119 & 165.806 \ll
## yaw\_variance & 30,145 & 75.696 & 43.623 & 0.109 & 151.301 \ll
## yaw\_error & 30,145 & $-0.007 & 1.800 & $-3.141 & 3.141 \ll
## x\_error & 30,145 & $-4.277 & 10.226 & $-25.583 & 11.908 \ll

```

```

## y\_error & 30,145 & $-1.006 & 8.526 & $-19.204 & 16.459 \\
## horizontal\_error & 30,145 & 12.227 & 6.860 & 0.00001 & 26.029 \\
## \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.harvard
## % Date and time: Mon, Aug 15, 2016 - 10:06:36 PM
## \begin{table}[h] \centering
## \caption{Discrete Filter Estimate for two-mobile-noiseless Experiment}
## \label{tab:two_mobile_noiseless_discrete_summary}
## \begin{tabular}{@{\extracolsep{5pt}}lcccc}
## \\[-1.8ex]\hline
## \hline \\[-1.8ex]
## Statistic & \multicolumn{1}{c}{N} & \multicolumn{1}{c}{Mean} & \multicolumn{1}{c}{St. Dev.} & \multicolumn{1}{c}{St. Dev.} \\
## \hline \\[-1.8ex]
## x\_position & 30,145 & $-0.126 & 3.259 & $-7.223 & 10.667 \\
## y\_position & 30,145 & 0.241 & 2.848 & $-5.441 & 6.511 \\
## yaw & 30,145 & $-0.096 & 1.903 & $-3.142 & 3.140 \\
## x\_variance & 30,145 & 0.390 & 0.295 & 0.000 & 1.099 \\
## y\_variance & 30,145 & 0.390 & 0.295 & 0.000 & 1.099 \\
## yaw\_variance & 30,145 & 0.502 & 0.242 & 0.091 & 0.929 \\
## x\_error & 30,145 & 0.070 & 1.129 & $-7.502 & 5.202 \\
## y\_error & 30,145 & 0.115 & 0.758 & $-3.835 & 3.771 \\
## horizontal\_error & 30,145 & 0.787 & 1.118 & 0.0000005 & 8.301 \\
## yaw\_error & 30,145 & $-0.095 & 1.653 & $-3.141 & 3.142 \\
## \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)
}

```