two_stationary Experiment Report

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This is a summary of the data from the two_stationary 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.

```r
summary(continuous$x_error)
```

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -4.034e-05 -1.876e-05 -6.200e-06 -7.786e-06  2.829e-06  2.234e-05
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -2.660e-06 -1.329e-06 -1.248e-07 -5.564e-07  2.112e-07  9.982e-07
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -9.775e-05 -5.605e-05 -4.361e-05 -1.845e-05  1.954e-05  8.211e-05
```

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

```
##       Min.    1st Qu.    Median      Mean   3rd Qu.      Max.
## 2.880e-09 3.987e-06 1.013e-05 1.237e-05 1.919e-05 4.043e-05
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -4.2100 -0.8692 -0.1081 -0.1223  0.5265  5.6170
```

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

```
##      Min.   1st Qu.    Median      Mean  3rd Qu.      Max.
## -4.90200 -0.80700 -0.05649 -0.15030  0.55650  4.49400
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -1.239e-04  1.050e-06  2.440e-05  3.853e-05  5.448e-05  1.098e-02
```

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

```
##      Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000049 0.628700 1.267000 1.465000 2.083000 5.773000
```

```r
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")
```
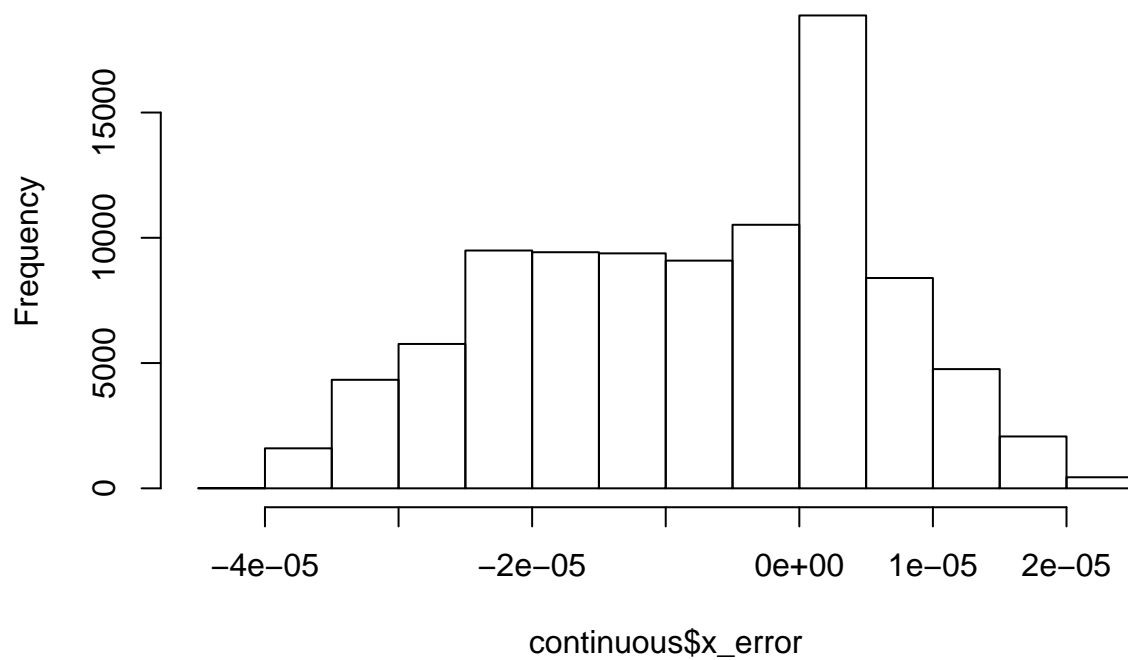
Ground truth visited locations of robots
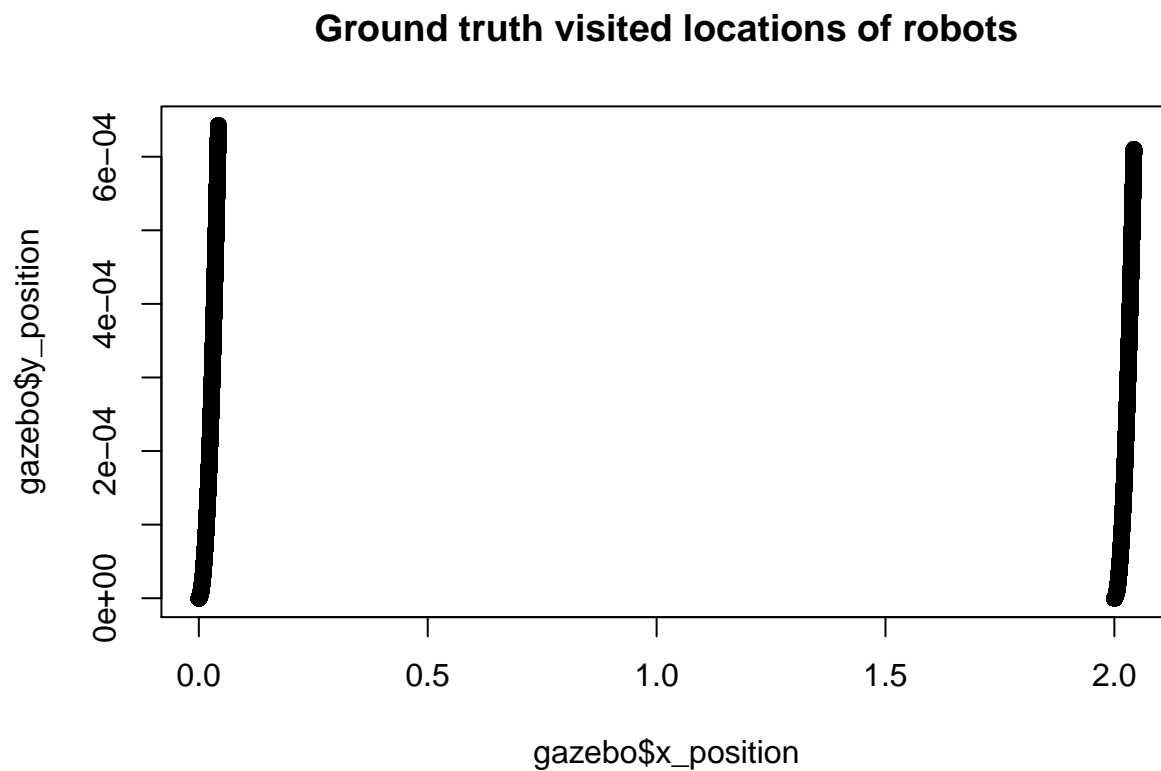

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

Distance from origin vs. time
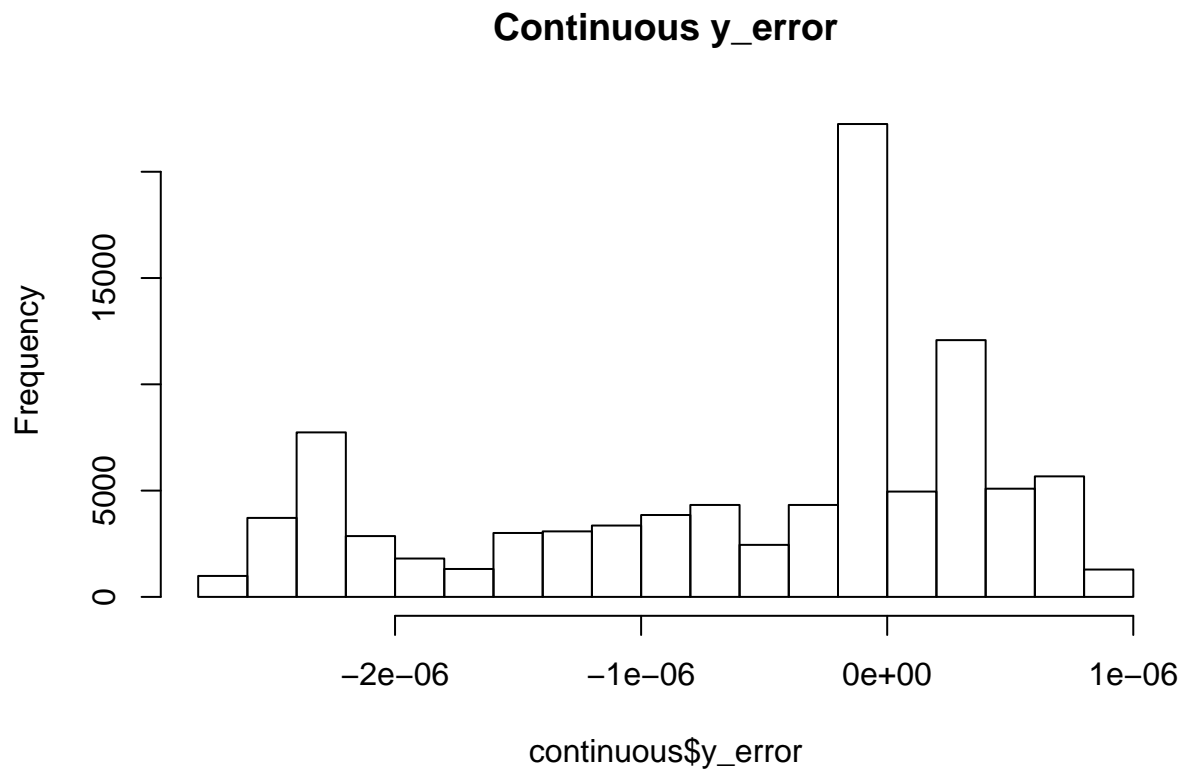

gazebo$dist_from_origin

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

Continuous x_error

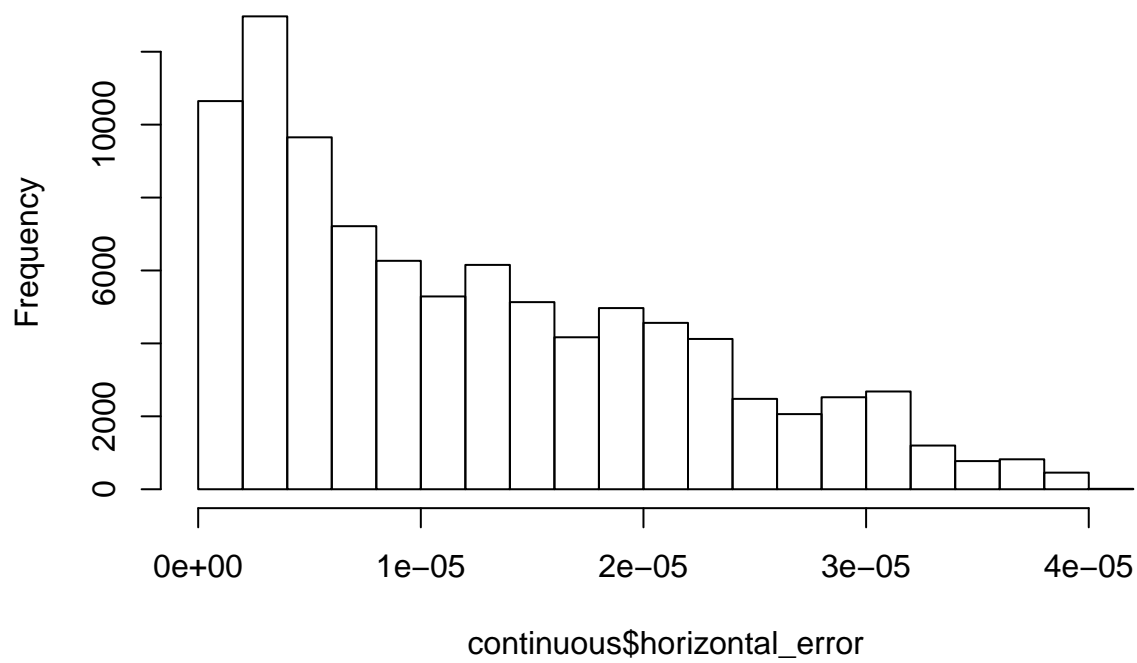continuous$x_error

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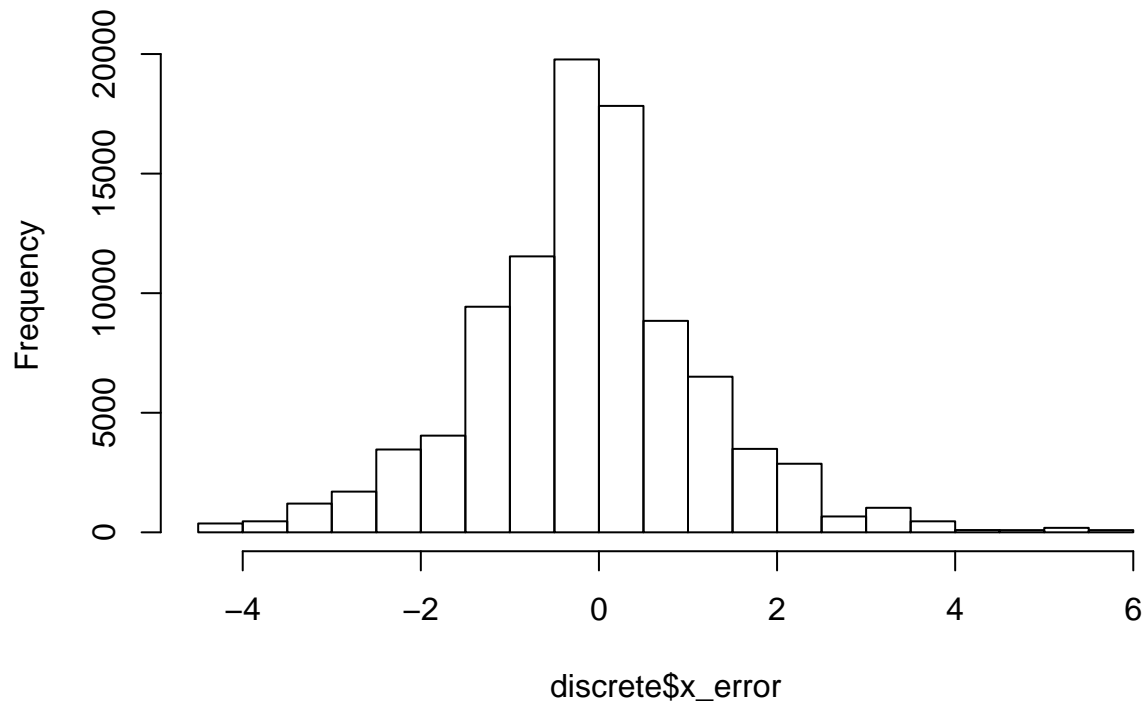
Continuous y_error


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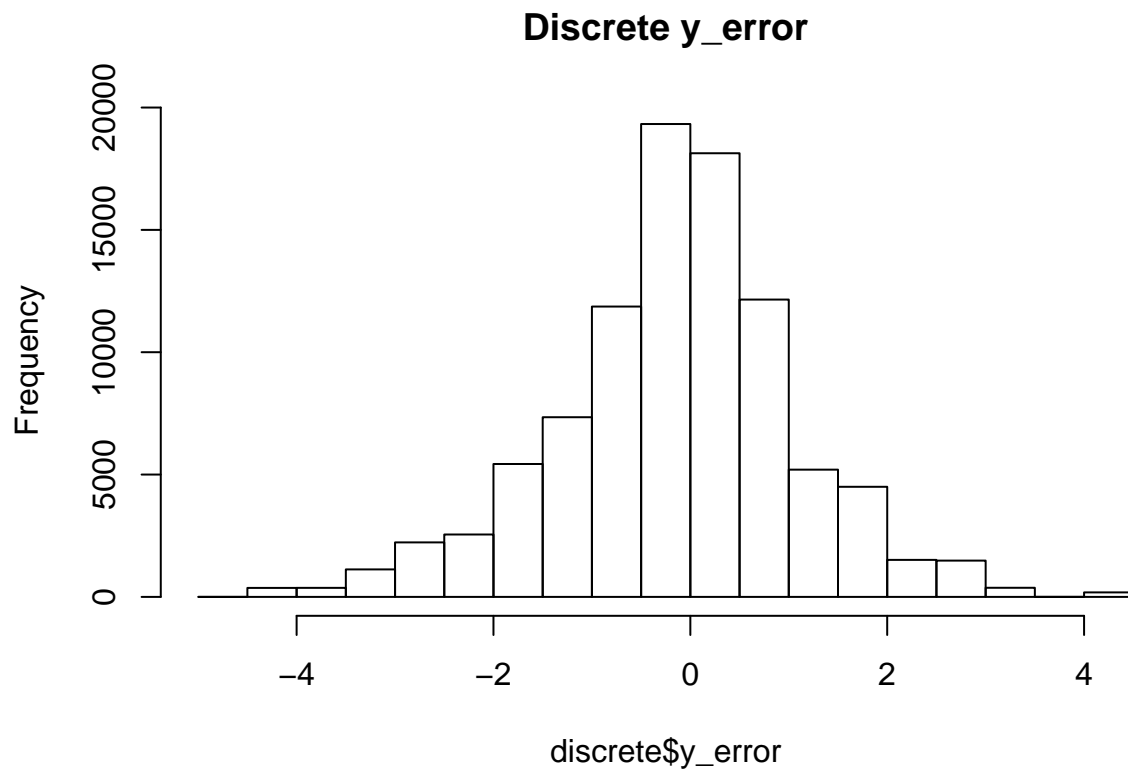
Continuous total distance error

continuous$horizontal_error

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

Discrete x_error

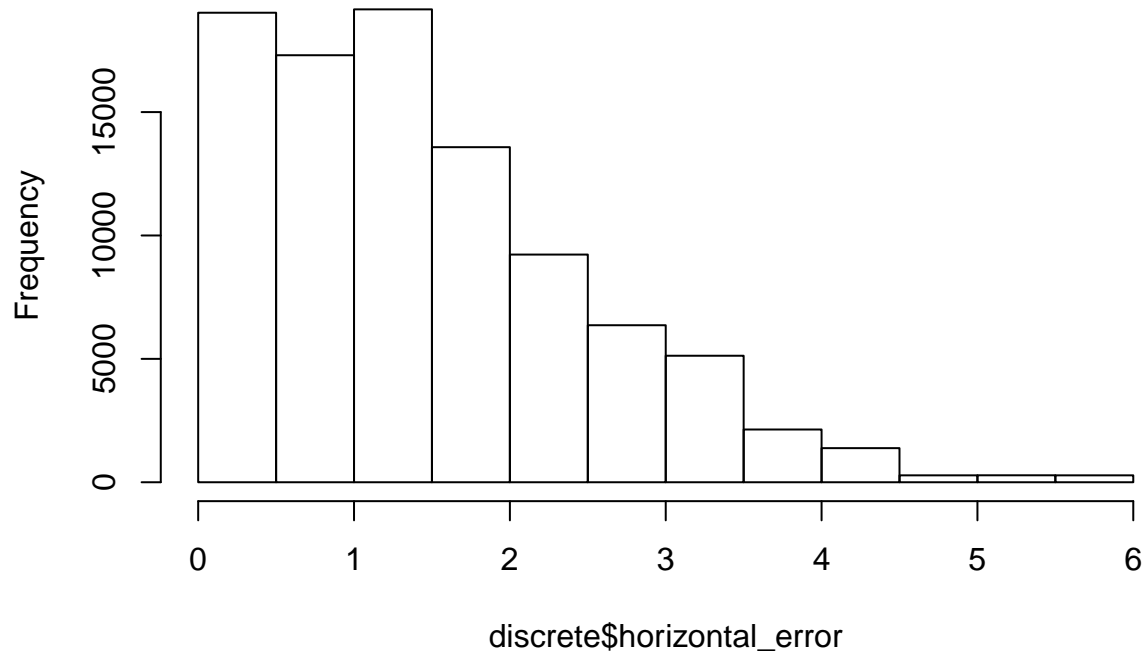discrete$x_error

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

Discrete y_error


```r
hist (discrete$horizontal_error,
      main = "Discrete total distance error")
```

Discrete total distance error


```r
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
```

```r
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
```

```r
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.harvard
## % Date and time: Tue, Aug 09, 2016 - 09:47:23 AM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for two-stationary Experiment}
##   \label{tab:two_stationary_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 & 94,147 & 1.031 & 1.000 & 0.00001 & 2.043 \\
## y\_position & 94,147 & 0.0002 & 0.0002 & $-$0.000 & 0.001 \\
## yaw & 94,147 & 0.015 & 0.008 & 0.0001 & 0.030 \\
## yaw\_error & 94,147 & $-$0.00002 & 0.00004 & $-$0.0001 & 0.0001 \\
## x\_error & 94,147 & $-$0.00001 & 0.00001 & $-$0.00004 & 0.00002 \\
## y\_error & 94,147 & $-$0.000001 & 0.000001 & $-$0.000003 & 0.000001 \\
## horizontal\_error & 94,147 & 0.00001 & 0.00001 & 0.000 & 0.00004 \\
## \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: Tue, Aug 09, 2016 - 09:47:24 AM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for two-stationary Experiment}
##   \label{tab:two_stationary_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 & 94,147 & 1.153 & 1.700 & $-$5.586 & 6.234 \\
## y\_position & 94,147 & 0.151 & 1.221 & $-$4.494 & 4.902 \\
## yaw & 94,147 & 0.015 & 0.008 & $-$0.011 & 0.030 \\
## x\_error & 94,147 & $-$0.122 & 1.314 & $-$4.210 & 5.617 \\
## y\_error & 94,147 & $-$0.150 & 1.221 & $-$4.902 & 4.494 \\
## horizontal\_error & 94,147 & 1.465 & 1.052 & 0.00005 & 5.773 \\
## yaw\_error & 94,147 & 0.00004 & 0.0003 & $-$0.0001 & 0.011 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```

```r
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)
}
```