one_stationary_noiseless Experiment Report

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This is a summary of the data from the one_stationary_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.
## 7.713e-07 8.601e-07 8.711e-07 9.774e-07 8.838e-07 2.083e-06
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.037e-09 1.039e-08 1.950e-08 1.959e-08 2.864e-08 3.748e-08
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.350e-05 5.946e-05 7.101e-05 7.310e-05 8.627e-05 1.334e-04
```

```
summary(continuous$position_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.713e-07 8.604e-07 8.717e-07 9.777e-07 8.840e-07 2.084e-06
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -3.404e-08  2.811e-08  8.690e-07  6.500e-07  1.022e-06  2.144e-06
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -4.898e-10 -4.405e-11  1.749e-10  6.810e-10  3.609e-10  7.200e-09
```

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

```
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -8.325e-05 -1.455e-05 -7.150e-07  9.516e-06  1.641e-05  1.441e-04
```

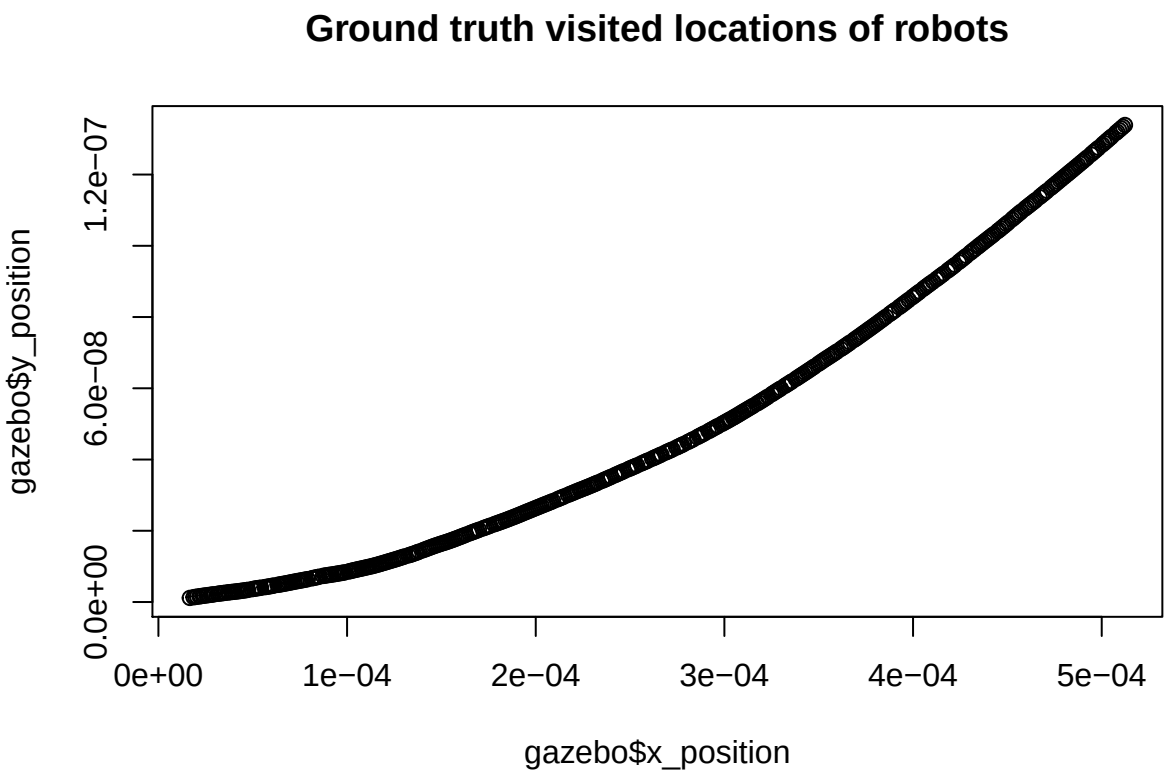
```r
summary(discrete$position_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.182e-10 2.961e-08 8.690e-07 6.534e-07 1.022e-06 2.144e-06
```

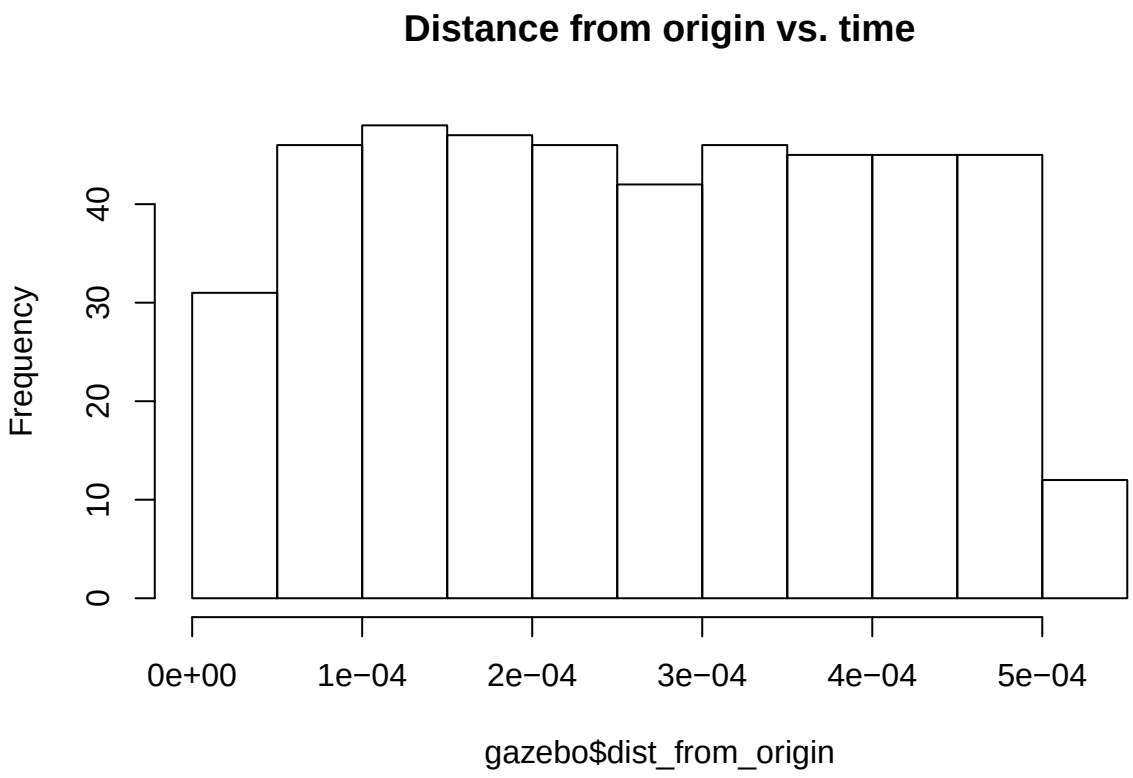
```r
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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

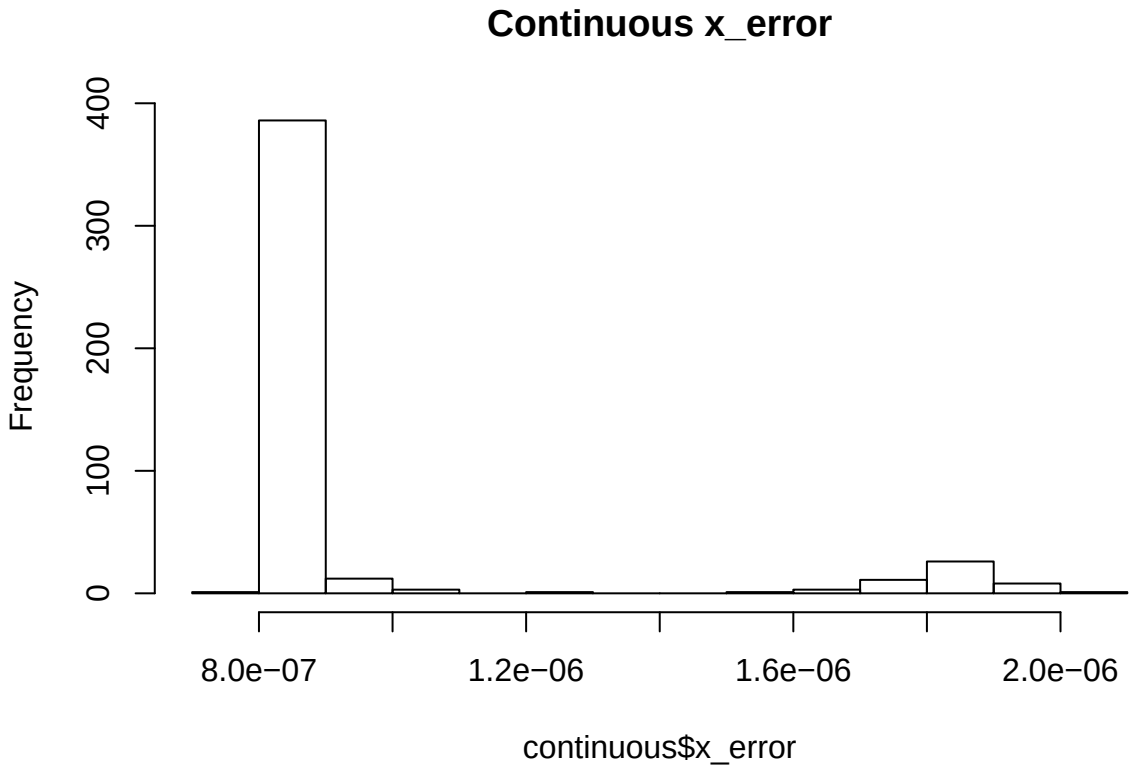
```r
plot(gazebo$x_position, gazebo$y_position,
     main = "Ground truth visited locations of robots")
```




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

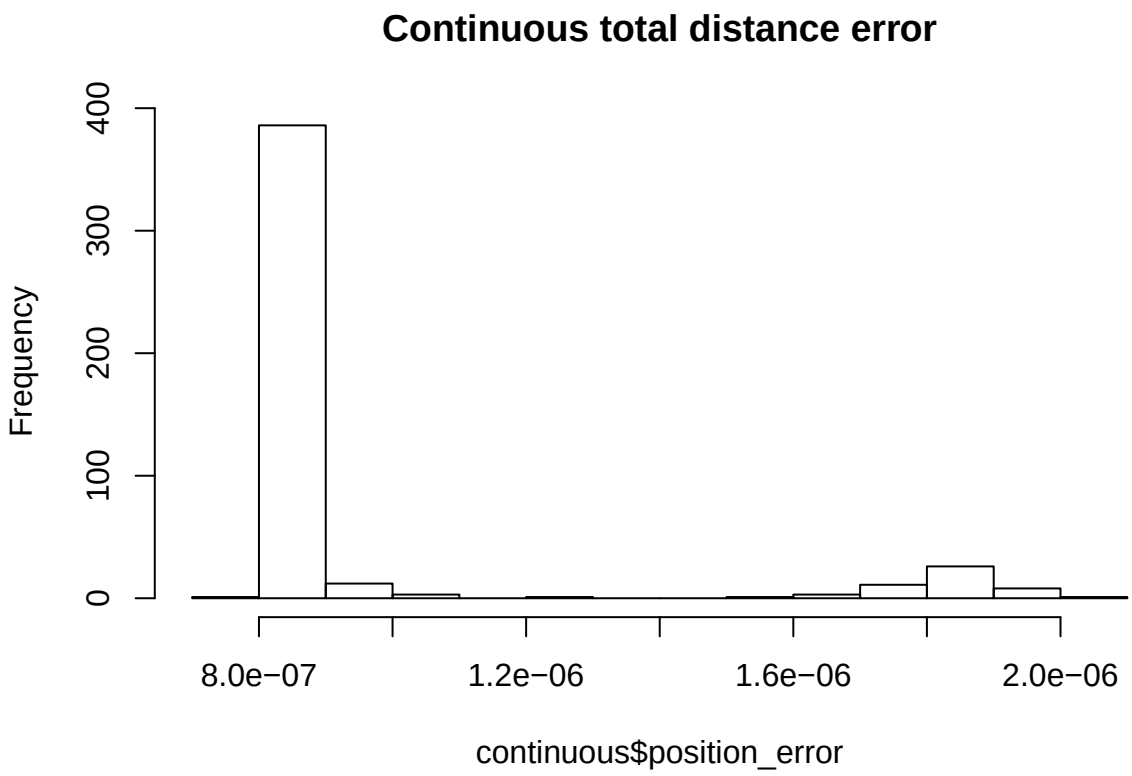



```
hist(continuous$x_error,
     main = "Continuous x_error")
```

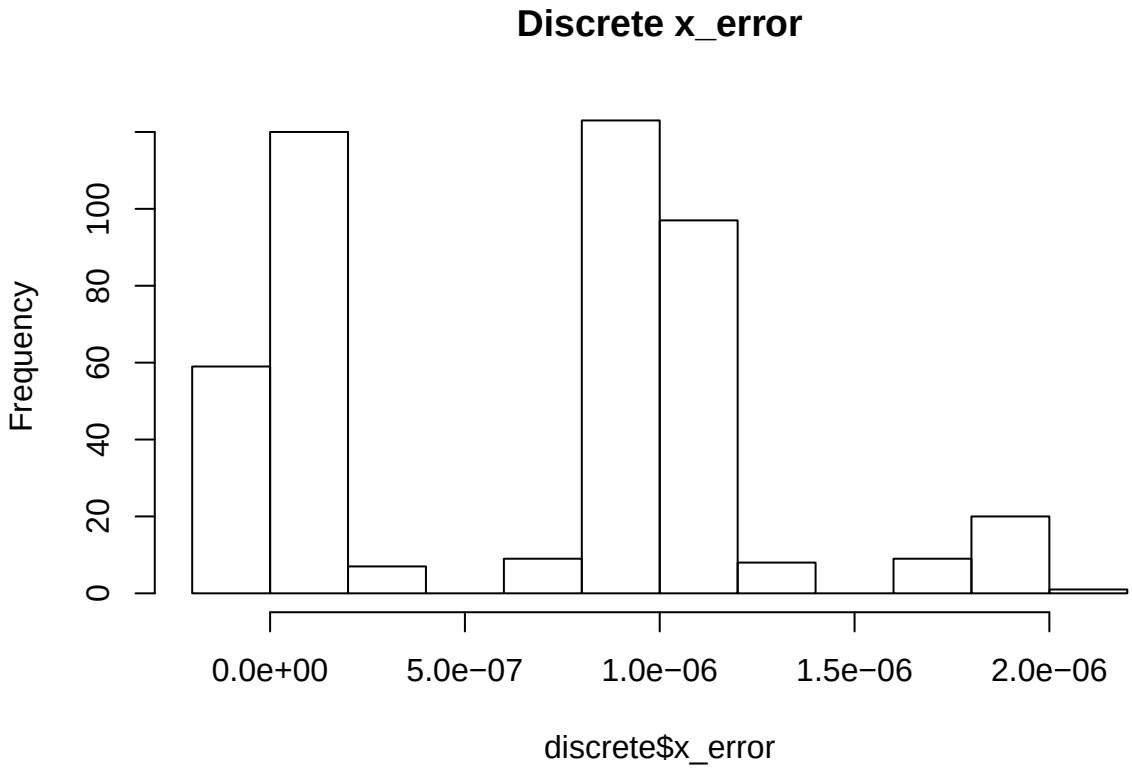


```r
hist(continuous$y_error,
     main = "Continuous y_error")
```

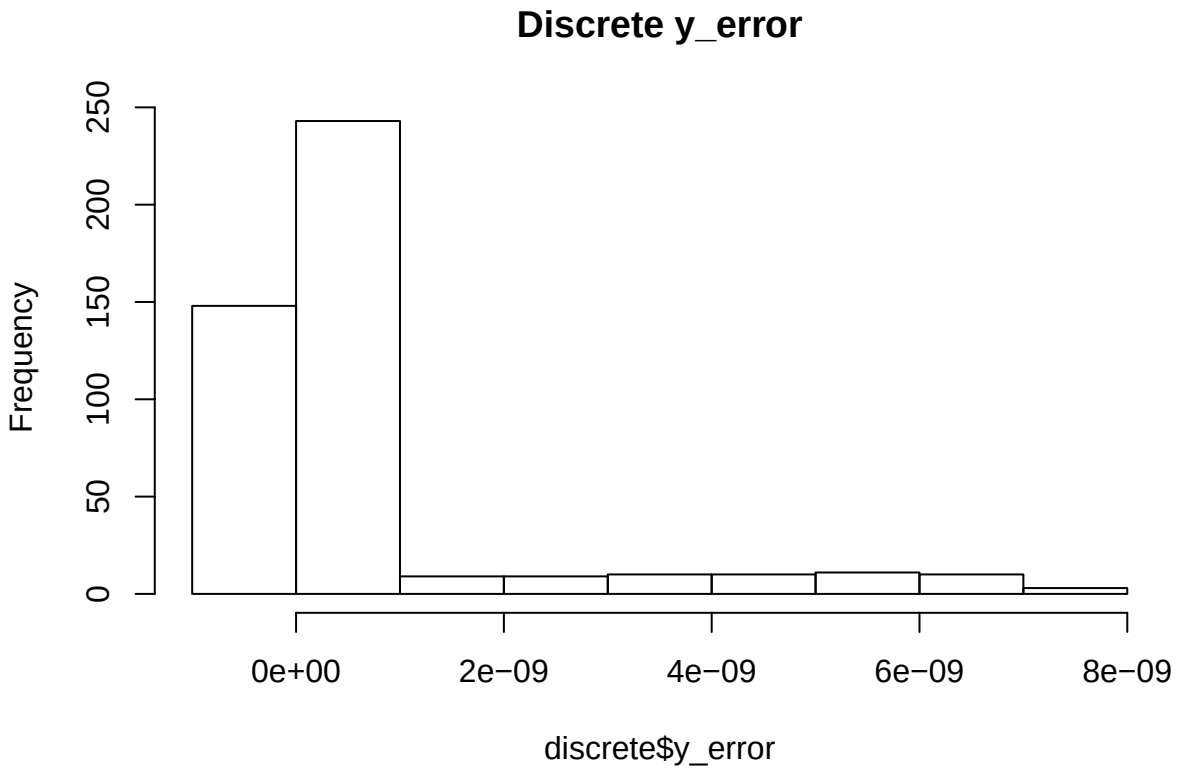

```r
hist(continuous$position_error,
     main = "Continuous total distance error")
```



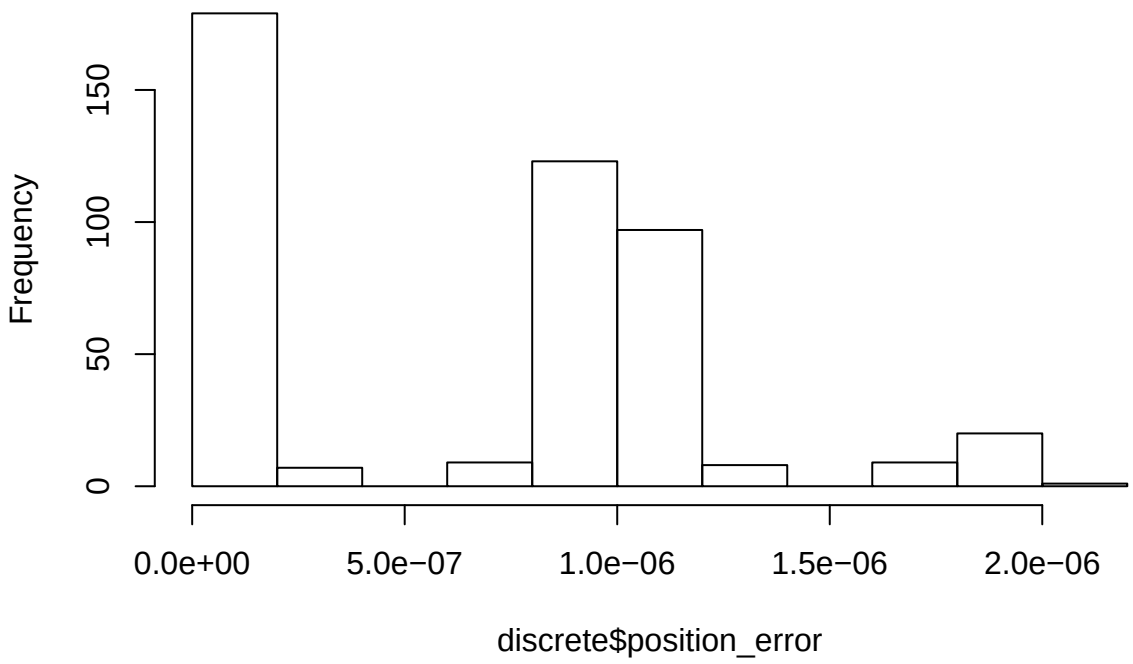

```
hist(discrete$x_error,
     main = "Discrete x_error")
```



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




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




```
figure_dir <- "/home/matt/thesis/writing/r_figures/"
filename = paste0(figure_dir, params$experiment, "_continuous_error.pdf")
pdf(filename)
plot(continuous$position_error, main="Continuous Filter Error", sub=paste0("For ", params$experiment, "

dev.off()
```

```
## pdf
##   2
```

```
filename = paste0(figure_dir, params$experiment, "_discrete_error.pdf")
pdf(filename)
plot(discrete$position_error, main="Discrete Filter Error", sub=paste0("For ", params$experiment, " Exp
dev.off()
```

```
## pdf
##   2
```

```
if (params$experiment == "one_stationary_noiseless") {
    gazebo$position_error <- sqrt(gazebo$x_position ^ 2 + gazebo$y_position ^ 2)
    pdf(paste0(figure_dir, "gazebo_odom_drift.pdf"))

    plot(gazebo$position_error, main="Gazebo Odometry Drift for Stationary Robot with Noiseless Odometry
    dev.off()
}
```

```
## pdf
##   2
```

```
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="htbp",
          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: Fri, Aug 19, 2016 - 02:44:05 PM
## \begin{table}[htbp] \centering
##   \caption{Continuous Filter Estimate for one-stationary-noiseless Experiment}
##   \label{tab:one_stationary_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 & 453 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_position & 453 & 0.00000003 & 0.00000003 & $-$0.000 & 0.0000001 \\
## yaw & 453 & 0.0002 & 0.0001 & $-$0.0001 & 0.0004 \\
## x\_variance & 453 & 2.846 & 1.571 & 0.161 & 5.569 \\
## y\_variance & 453 & 2.846 & 1.571 & 0.161 & 5.569 \\
## yaw\_variance & 453 & 2.561 & 1.416 & 0.145 & 5.016 \\
## x\_error & 453 & 0.000001 & 0.0000003 & 0.000001 & 0.000002 \\
## y\_error & 453 & 0.00000002 & 0.000 & 0.000 & 0.00000004 \\
## yaw\_error & 453 & 0.0001 & 0.00002 & 0.00001 & 0.0001 \\
## position\_error & 453 & 0.000001 & 0.0000003 & 0.000001 & 0.000002 \\
## \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="htbp",
          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: Fri, Aug 19, 2016 - 02:44:06 PM
## \begin{table}[htbp] \centering
##   \caption{Discrete Filter Estimate for one-stationary-noiseless Experiment}
##   \label{tab:one_stationary_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 & 453 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_position & 453 & 0.00000005 & 0.00000004 & $-$0.000 & 0.0000001 \\
## yaw & 453 & 0.0003 & 0.0001 & $-$0.0001 & 0.001 \\
## x\_variance & 453 & 0.610 & 0.262 & 0.153 & 1.093 \\
## y\_variance & 453 & 0.610 & 0.262 & 0.153 & 1.093 \\
## yaw\_variance & 453 & 0.495 & 0.235 & 0.091 & 0.922 \\
## x\_error & 453 & 0.000001 & 0.000001 & $-$0.00000003 & 0.000002 \\
## y\_error & 453 & 0.000 & 0.000 & $-$0 & 0 \\
## yaw\_error & 453 & 0.00001 & 0.00004 & $-$0.0001 & 0.0001 \\
## position\_error & 453 & 0.000001 & 0.000001 & 0.000 & 0.000002 \\
## \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="htbp",
              label="tab:gazebo_stationary_noiseless_summary",
              title="Ground Truth Noiseless Odometry for Stationary Robot located at Origin",
              digits.extra = 20)
}
```

```
##
## % Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvar
## % Date and time: Fri, Aug 19, 2016 - 02:44:06 PM
## \begin{table}[htbp] \centering
##   \caption{Ground Truth Noiseless Odometry for Stationary Robot located at Origin}
##   \label{tab:gazebo_stationary_noiseless_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 & 453 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## y\_position & 453 & 0.00000005 & 0.00000004 & 0.000 & 0.0000001 \\
## yaw & 453 & 0.0003 & 0.0001 & 0.00005 & 0.0005 \\
## x\_variance & 453 & 0.100 & 0.000 & 0.100 & 0.100 \\
## y\_variance & 453 & 0.100 & 0.000 & 0.100 & 0.100 \\
## yaw\_variance & 453 & 0.050 & 0.000 & 0.050 & 0.050 \\
## dist\_from\_origin & 453 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## position\_error & 453 & 0.0003 & 0.0001 & 0.00002 & 0.001 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```