one_stationary_noiseless_no_gps Experiment Report

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This is a summary of the data from the one_stationary_noiseless_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.
## 1.044e-06 1.145e-06 1.162e-06 1.387e-06 1.337e-06 2.433e-06
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.524e-10 1.324e-08 2.506e-08 2.557e-08 3.776e-08 5.149e-08
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 3.325e-05 8.997e-05 1.026e-04 1.025e-04 1.160e-04 1.714e-04
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.044e-06 1.145e-06 1.162e-06 1.387e-06 1.337e-06 2.433e-06
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.044e-06 1.144e-06 1.160e-06 1.352e-06 1.293e-06 2.328e-06
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 7.549e-10 1.316e-08 2.468e-08 2.501e-08 3.688e-08 4.961e-08
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 2.599e-05 8.727e-05 9.809e-05 9.900e-05 1.118e-04 1.678e-04
```

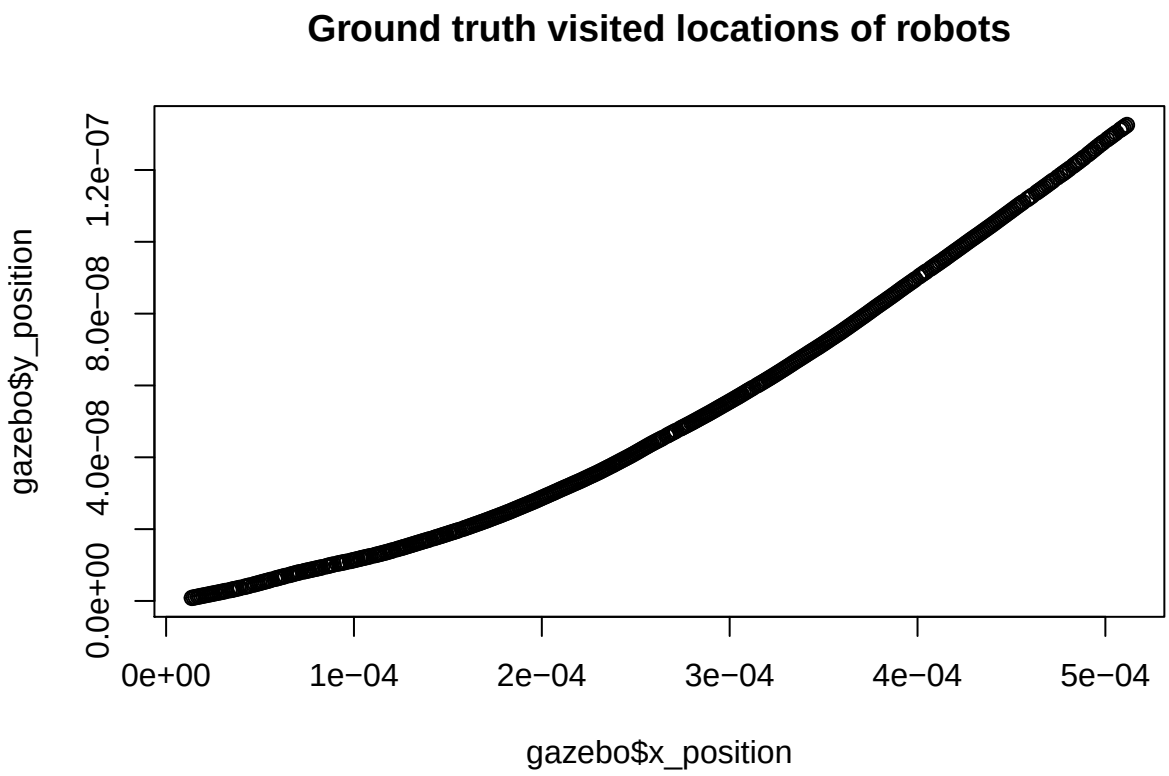
```r
summary(discrete$position_error)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 1.044e-06 1.145e-06 1.161e-06 1.353e-06 1.294e-06 2.328e-06
```

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

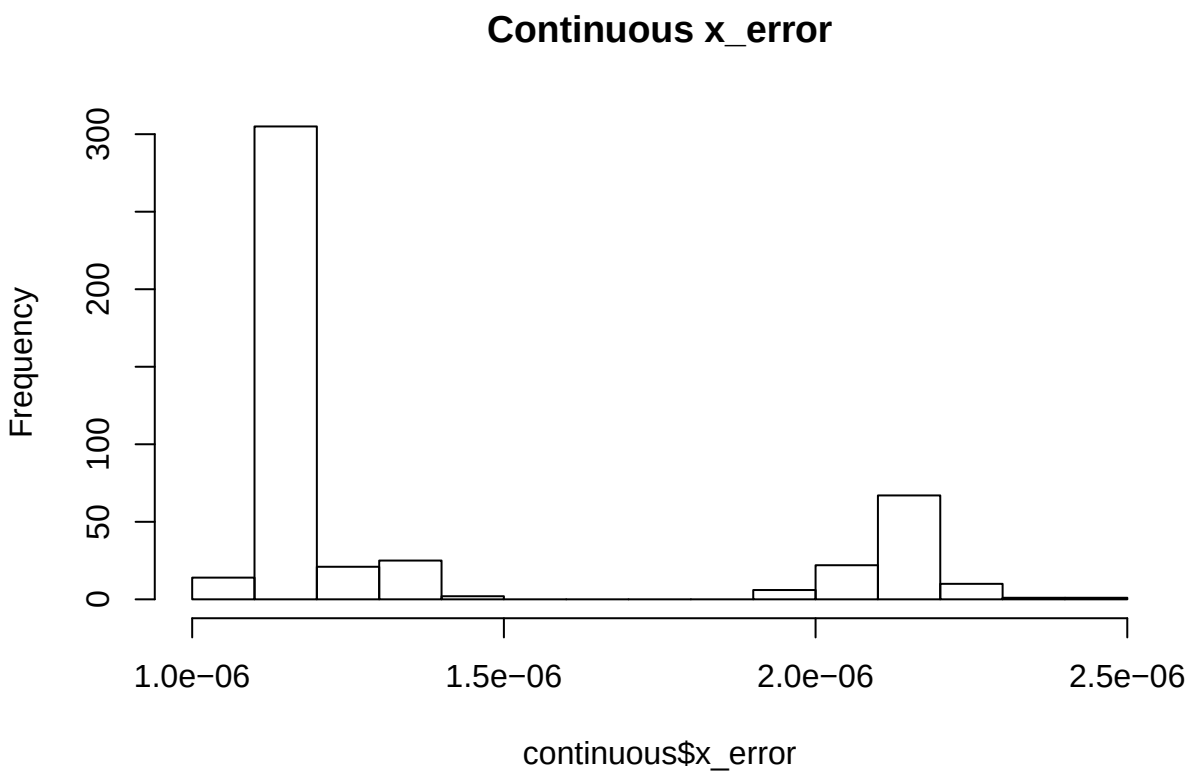
Shown below are plots representing the robot's motion and error over time.

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

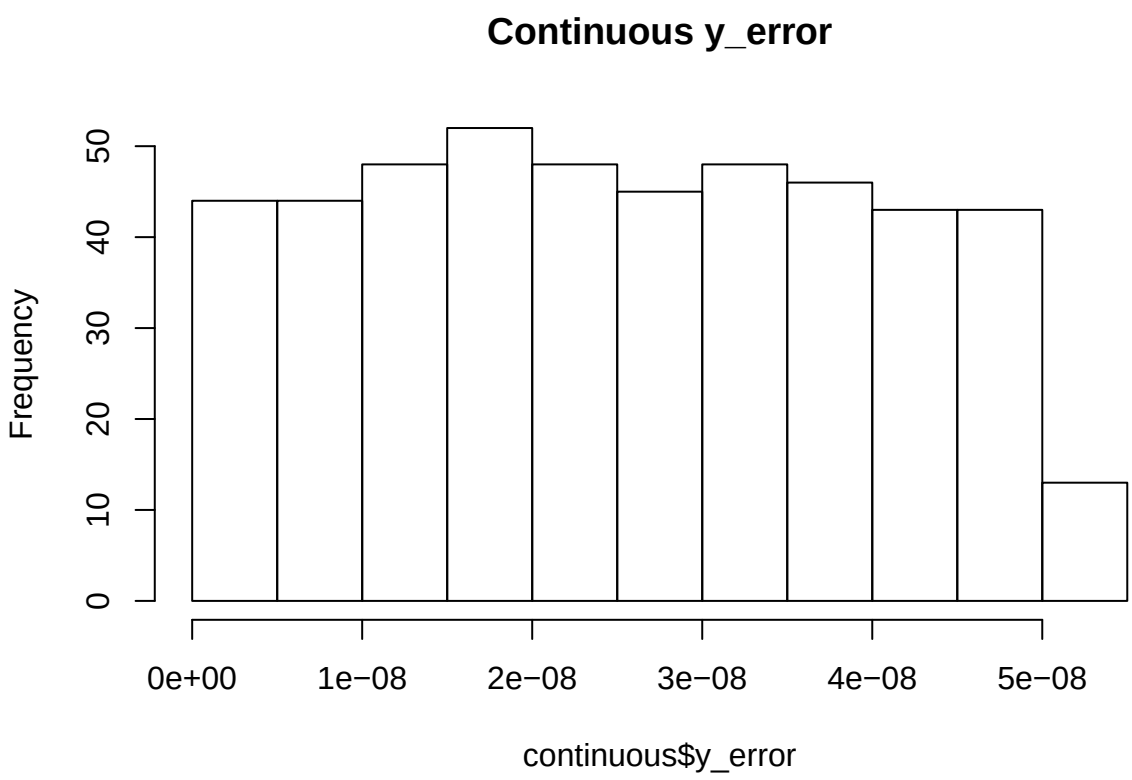



```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

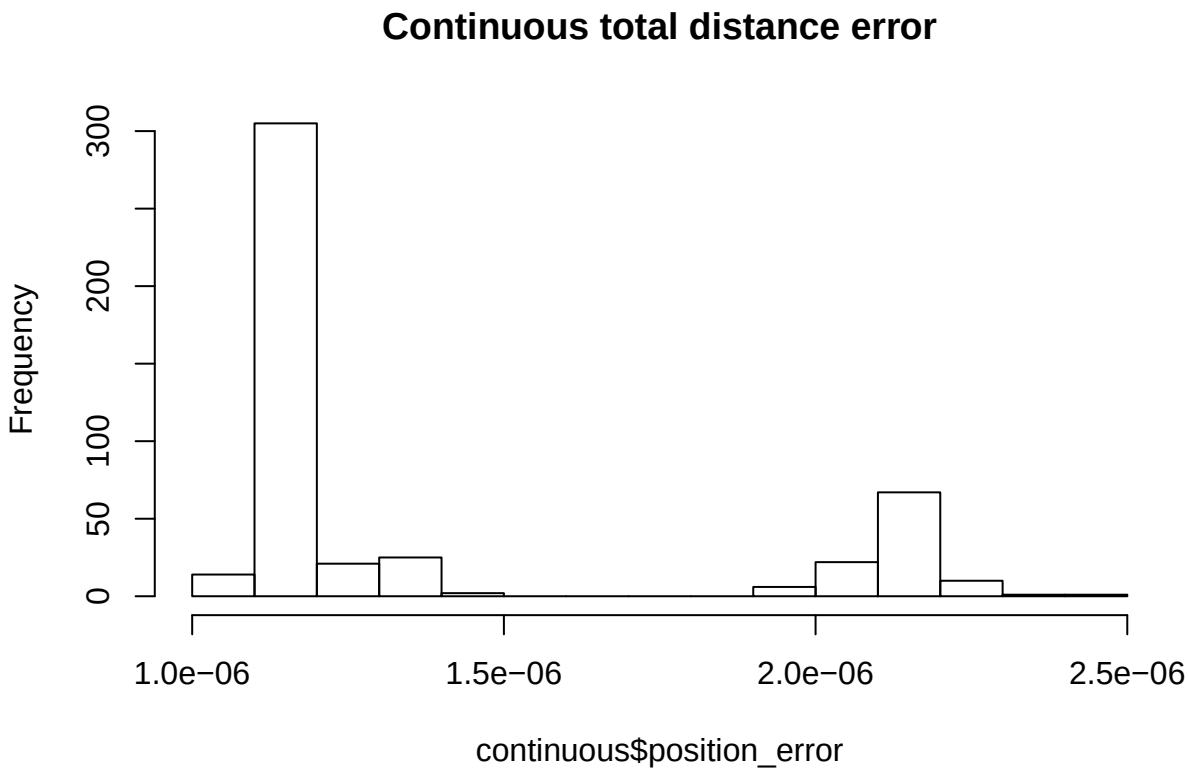

```
hist(continuous$x_error,
     main = "Continuous x_error")
```



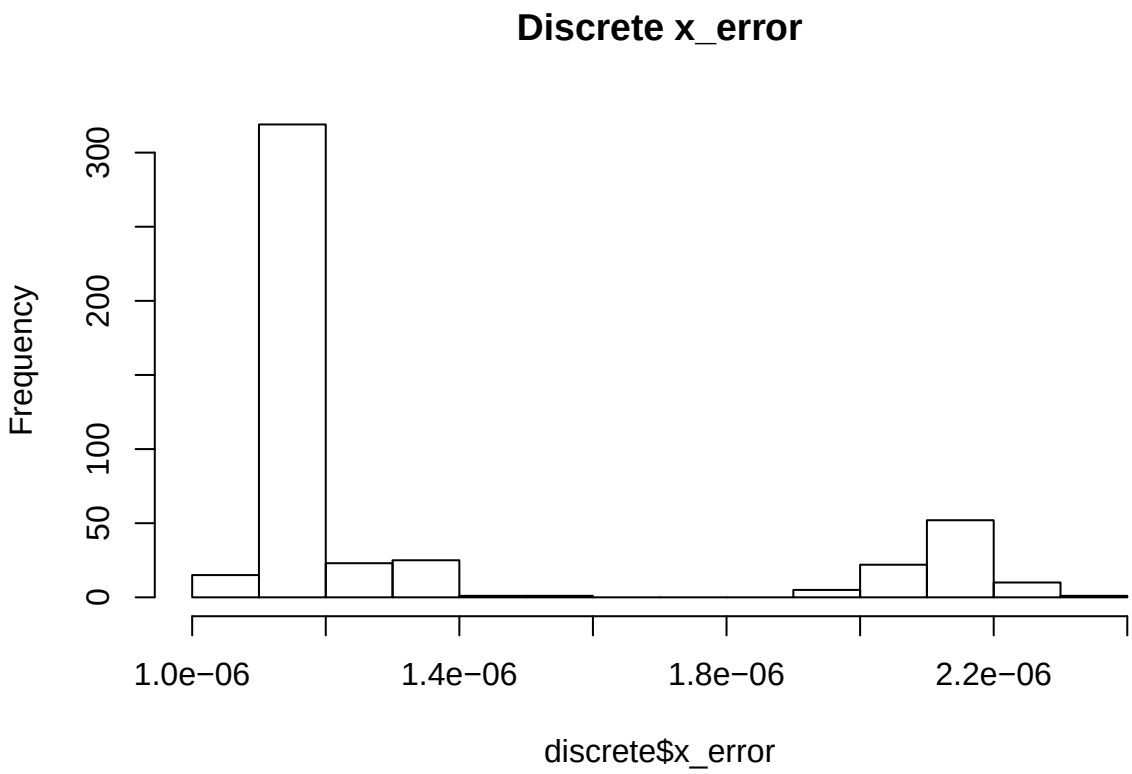
```r
hist(continuous$y_error,
     main = "Continuous y_error")
```



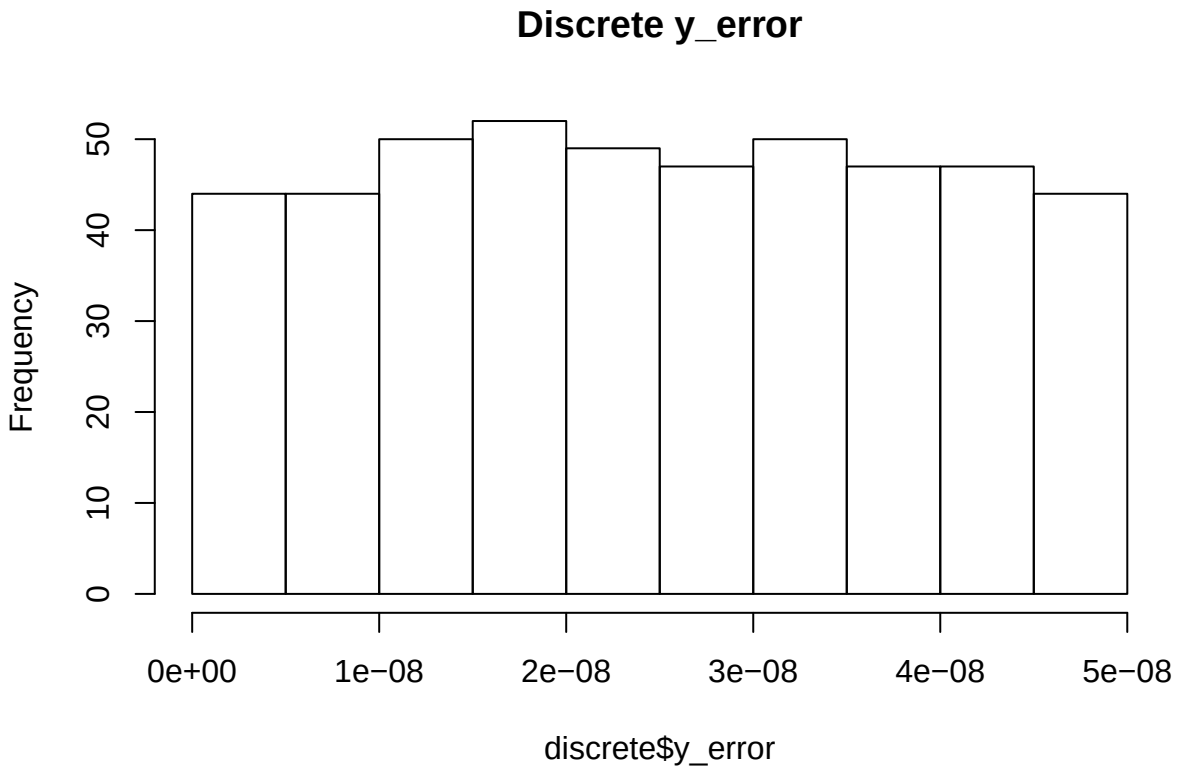

```r
hist(continuous$position_error,
     main = "Continuous total distance error")
```



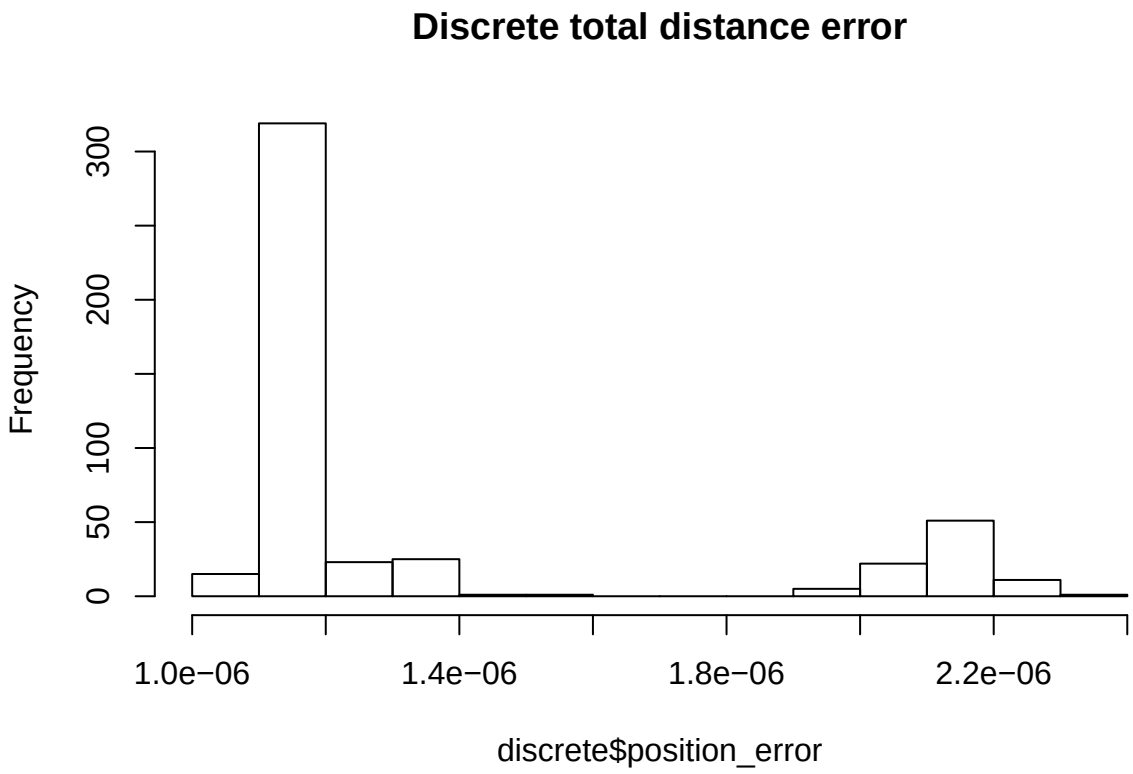

```
hist(discrete$x_error,
     main = "Discrete x_error")
```



```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()
}
```

```
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 - 02:44:20 PM
## \begin{table}[htbp] \centering
##   \caption{Continuous Filter Estimate for one-stationary-noiseless-no-gps Experiment}
##   \label{tab:one_stationary_noiseless_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 & 474 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\
## y\_position & 474 & 0.00000003 & 0.00000002 & 0.000 & 0.0000001 \\
## yaw & 474 & 0.0002 & 0.0001 & $-$0.00004 & 0.0004 \\
## x\_variance & 474 & 2.851 & 1.556 & 0.128 & 5.576 \\
## y\_variance & 474 & 2.851 & 1.556 & 0.128 & 5.576 \\
## yaw\_variance & 474 & 2.564 & 1.401 & 0.116 & 5.017 \\
## x\_error & 474 & 0.000001 & 0.0000004 & 0.000001 & 0.000002 \\
## y\_error & 474 & 0.00000003 & 0.000 & 0.000 & 0.0000001 \\
## yaw\_error & 474 & 0.0001 & 0.00002 & 0.00003 & 0.0002 \\
## position\_error & 474 & 0.000001 & 0.0000004 & 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 - 02:44:20 PM
## \begin{table}[htbp] \centering
##   \caption{Discrete Filter Estimate for one-stationary-noiseless-no-gps Experiment}
##   \label{tab:one_stationary_noiseless_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 & 474 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\
## y\_position & 474 & 0.00000003 & 0.00000003 & 0.000 & 0.0000001 \\
## yaw & 474 & 0.0002 & 0.0001 & $-$0.00004 & 0.0004 \\
## x\_variance & 474 & 2.852 & 1.556 & 0.128 & 5.576 \\
## y\_variance & 474 & 2.852 & 1.556 & 0.128 & 5.576 \\
## yaw\_variance & 474 & 2.564 & 1.401 & 0.116 & 5.017 \\
## x\_error & 474 & 0.000001 & 0.0000004 & 0.000001 & 0.000002 \\
## y\_error & 474 & 0.00000003 & 0.000 & 0.000 & 0.00000005 \\
## yaw\_error & 474 & 0.0001 & 0.00002 & 0.00003 & 0.0002 \\
## position\_error & 474 & 0.000001 & 0.0000004 & 0.000001 & 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)
}
```