one_mobile_noiseless Experiment Report

Matthew Swartwout

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This is a summary of the data from the one_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.
## -0.0517900 -0.0038270  0.0002504  0.0006525  0.0056550  0.0690100
```

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

```
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0884100 -0.0044270  0.0003898  0.0004778  0.0043330  0.0794000
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.292300 -0.014490  0.001532  0.001830  0.019690  0.272100
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 6.400e-07 3.610e-03 7.989e-03 1.282e-02 1.521e-02 9.470e-02
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -1.171000 -0.045660  0.007996  0.007693  0.078100  0.802600
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.596900 -0.061000 -0.006094 -0.020990  0.039090  0.458500
```

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

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.127000 -0.119900  0.005509 -0.036380  0.096240  3.135000
```

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

```
##      Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.0000009 0.0493700 0.0893600 0.1550000 0.1329000 1.2550000
```

```r
if (params$robot >= 2) {
    summary(external_data_averages)
}
```
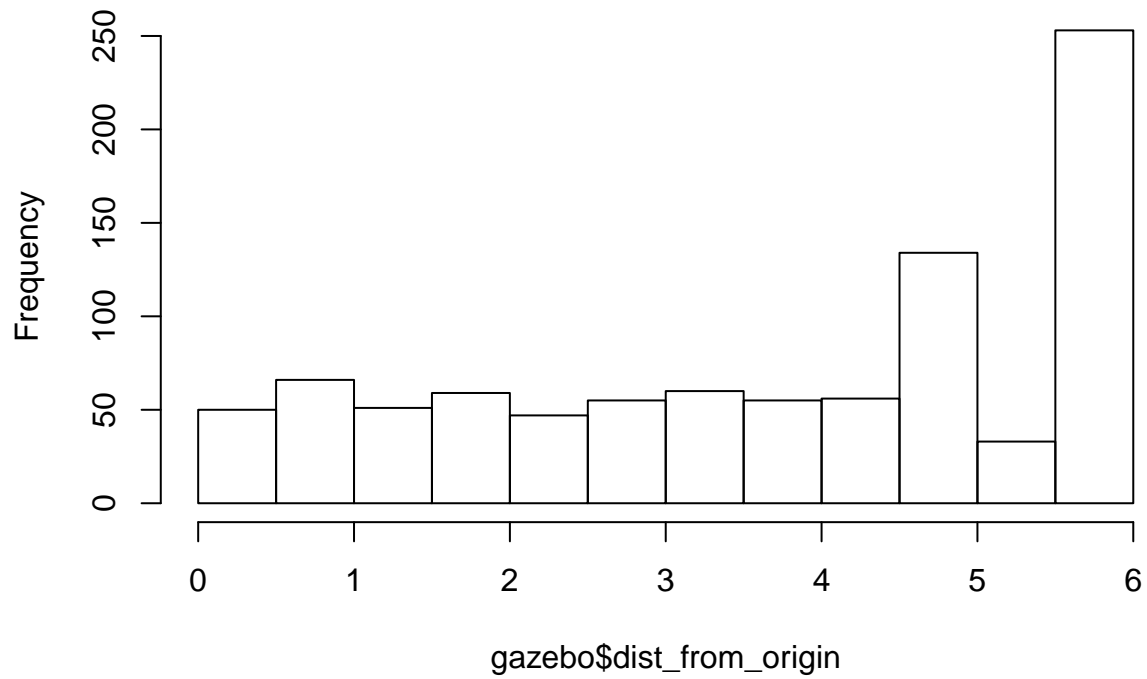
Shown below are plots representing the robot's motion and error over time.

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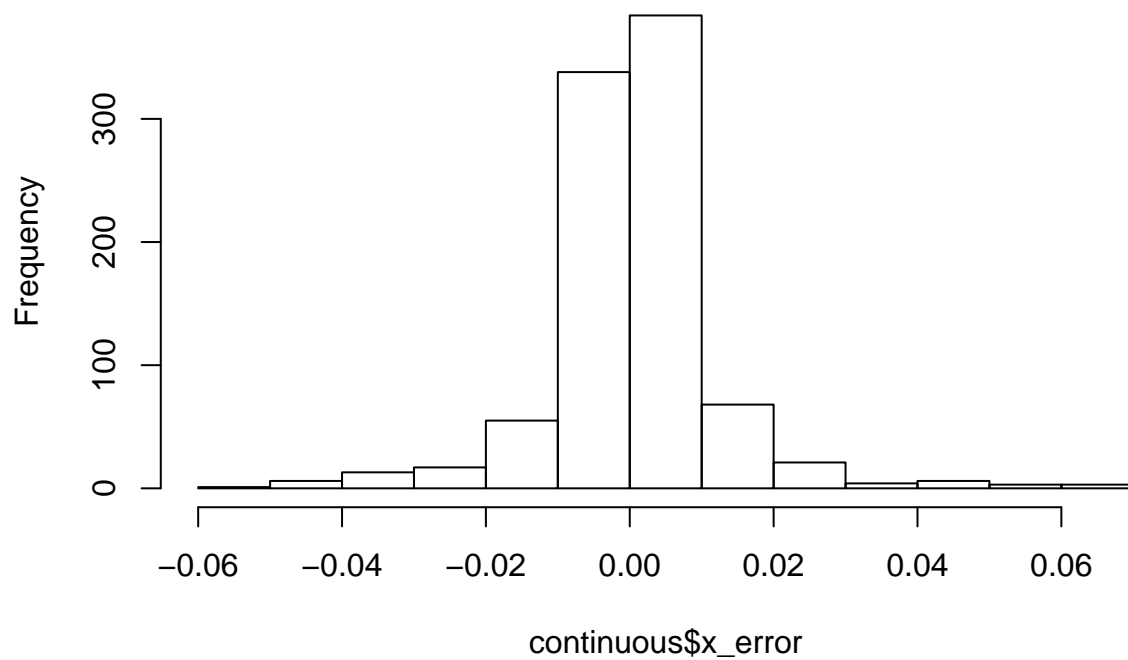
Ground truth visited locations of robots
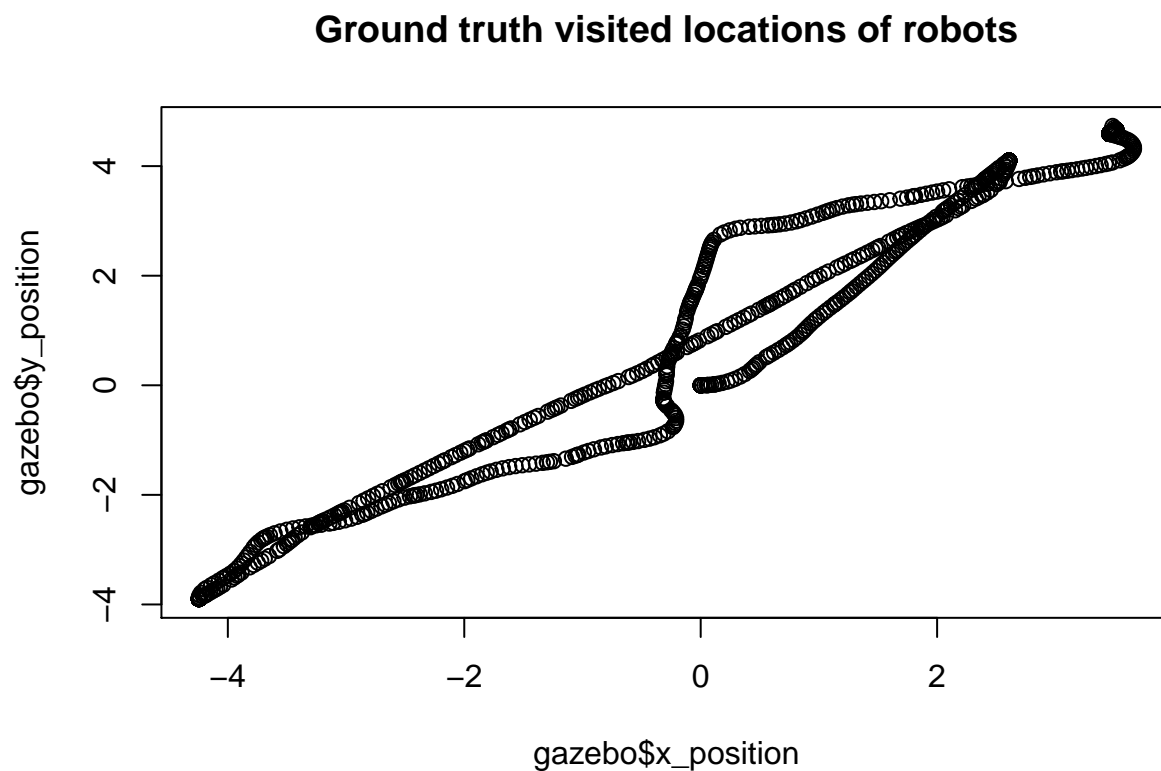

```r
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```
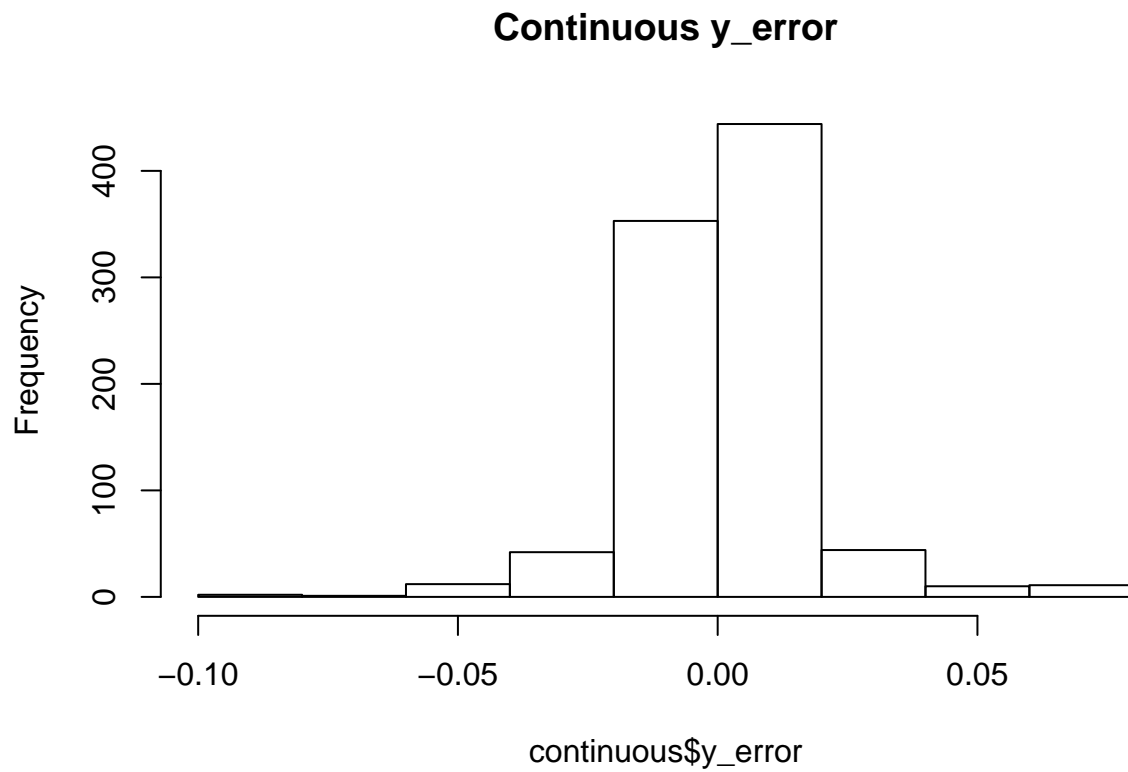
Distance from origin vs. time


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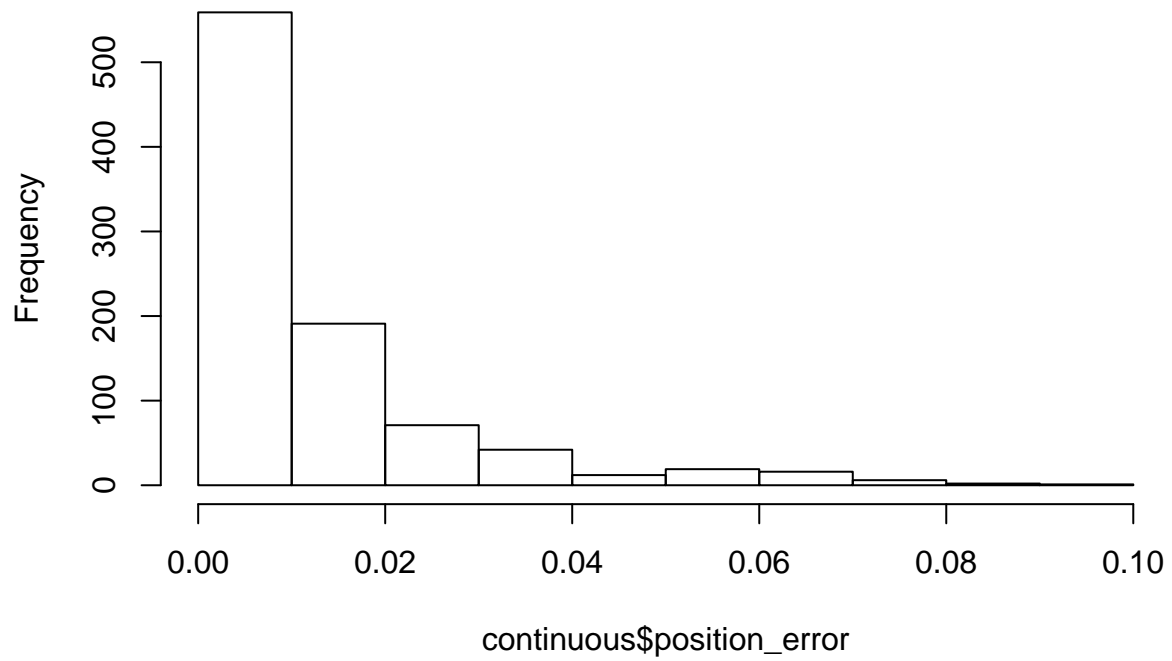
Continuous x_error

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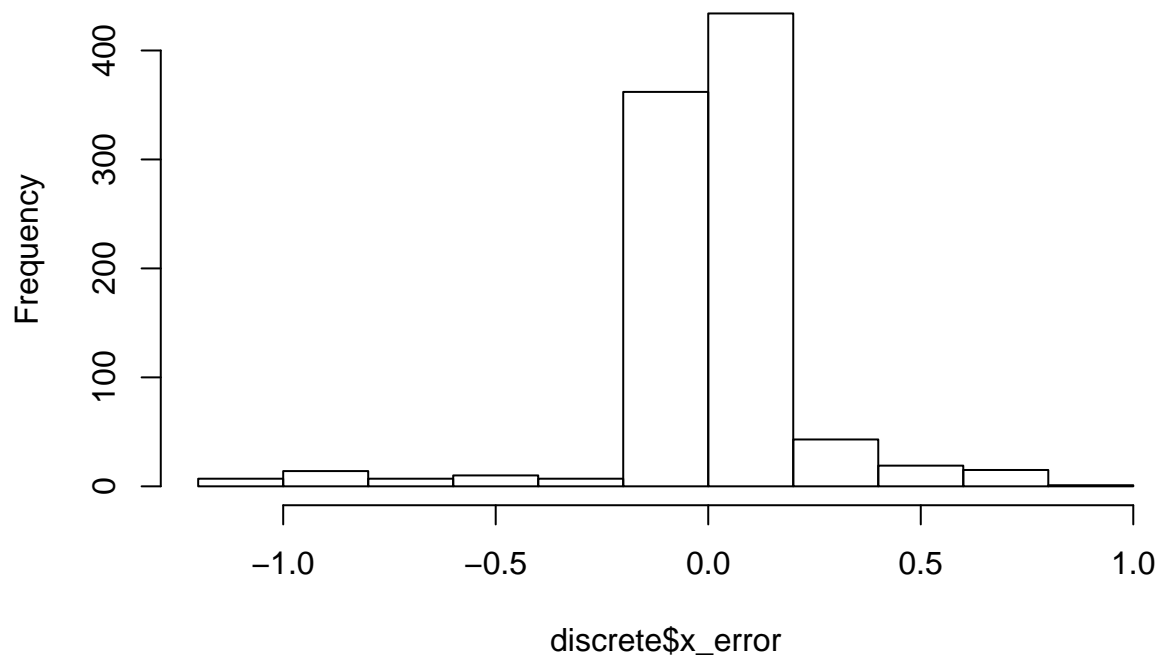
Continuous y_error


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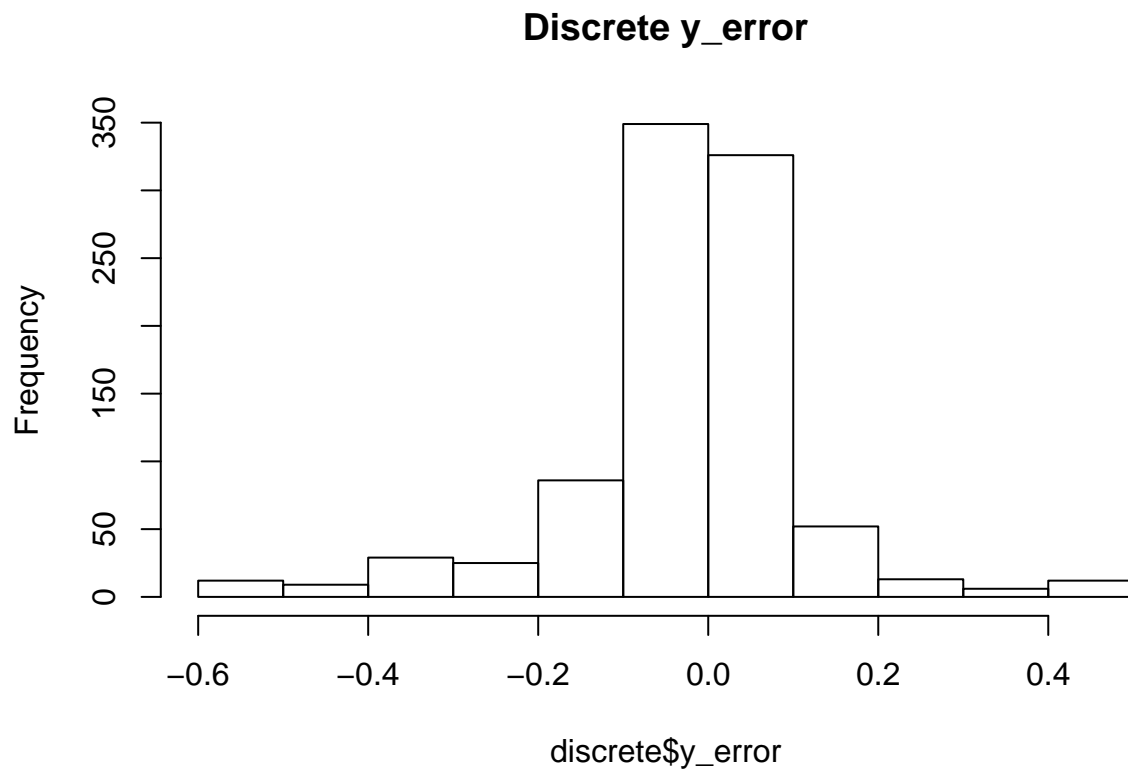
Continuous total distance error


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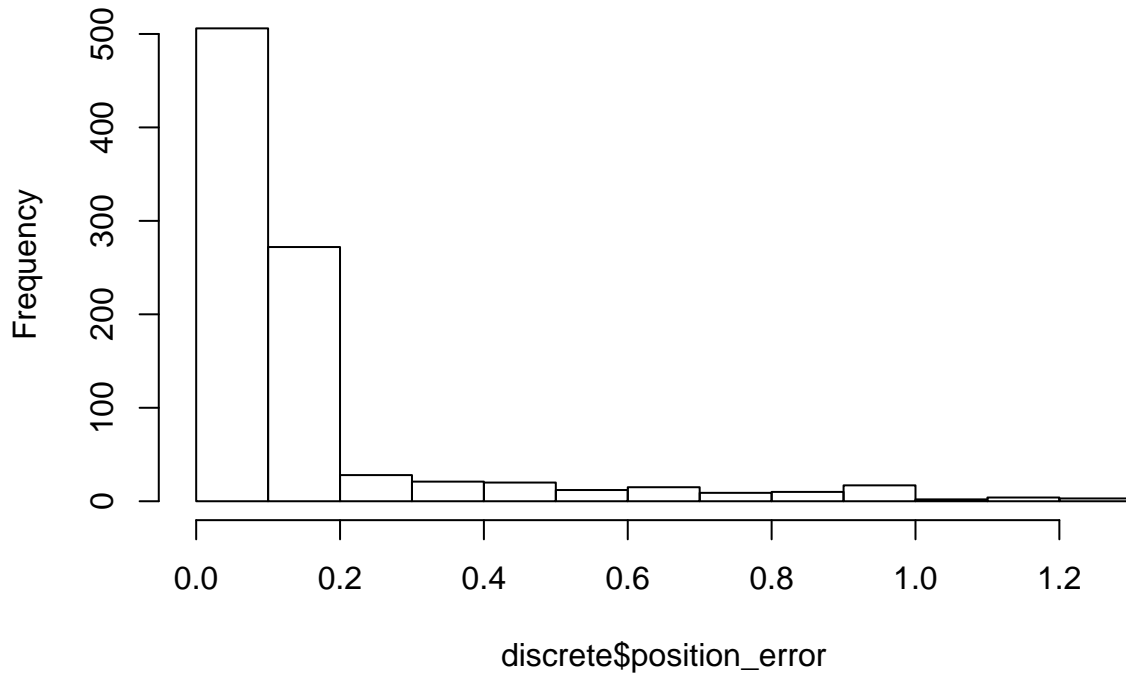
Discrete x_error

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

Discrete y_error


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

Discrete total distance error

discrete$position_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, " 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: Fri, Aug 19, 2016 - 02:43:21 PM
## \begin{table}[htbp] \centering
##   \caption{Continuous Filter Estimate for one-mobile-noiseless Experiment}
##   \label{tab:one_mobile_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.} & \multic
## \hline \\[-1.8ex]
## x\_position & 919 & 0.210 & 2.658 & $-$4.262 & 3.668 \\
## y\_position & 919 & 1.064 & 2.996 & $-$3.921 & 4.709 \\
## yaw & 919 & 0.099 & 1.606 & $-$3.132 & 3.042 \\
## x\_variance & 919 & 0.076 & 0.003 & 0.056 & 0.098 \\
## y\_variance & 919 & 0.076 & 0.003 & 0.056 & 0.098 \\
## yaw\_variance & 919 & 0.043 & 0.002 & 0.037 & 0.056 \\
## x\_error & 919 & 0.001 & 0.012 & $-$0.052 & 0.069 \\
## y\_error & 919 & 0.0005 & 0.016 & $-$0.088 & 0.079 \\
## yaw\_error & 919 & 0.002 & 0.054 & $-$0.292 & 0.272 \\
## position\_error & 919 & 0.013 & 0.015 & 0.000001 & 0.095 \\
## \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.harvard
## % Date and time: Fri, Aug 19, 2016 - 02:43:22 PM
## \begin{table}[htbp] \centering
##   \caption{Discrete Filter Estimate for one-mobile-noiseless Experiment}
##   \label{tab:one_mobile_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 & 919 & 0.203 & 2.650 & $-$4.260 & 3.617 \\
## y\_position & 919 & 1.086 & 2.969 & $-$3.886 & 4.716 \\
## yaw & 919 & 0.178 & 1.710 & $-$3.094 & 3.136 \\
## x\_variance & 919 & 0.590 & 0.252 & 0.135 & 1.095 \\
## y\_variance & 919 & 0.590 & 0.252 & 0.135 & 1.095 \\
## yaw\_variance & 919 & 0.500 & 0.242 & 0.092 & 0.930 \\
## x\_error & 919 & 0.008 & 0.224 & $-$1.171 & 0.803 \\
## y\_error & 919 & $-$0.021 & 0.139 & $-$0.597 & 0.459 \\
## yaw\_error & 919 & $-$0.036 & 0.863 & $-$3.127 & 3.135 \\
## position\_error & 919 & 0.155 & 0.215 & 0.000001 & 1.255 \\
## \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)
}
```