

# two\_stationary\_noiseless\_no\_gps Experiment Report

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This is a summary of the data from the two\_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.
## 1.436e-05 1.387e-04 2.637e-04 2.640e-04 3.897e-04 5.147e-04
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -3.203e-11 1.371e-08 4.278e-08 5.597e-08 8.341e-08 1.904e-07
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.294e-05 1.666e-04 2.759e-04 2.833e-04 3.911e-04 6.146e-04
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.436e-05 1.387e-04 2.637e-04 2.640e-04 3.897e-04 5.147e-04
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.491e-05 2.631e-04 5.110e-04 1.520e-02 3.041e-02 3.066e-02
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -2.668e-03 -2.668e-03 1.700e-09 -1.322e-03 7.200e-08 1.904e-07
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.294e-05 1.666e-04 2.759e-04 2.833e-04 3.911e-04 6.146e-04
```

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

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## 1.491e-05 2.631e-04 5.110e-04 1.526e-02 3.052e-02 3.077e-02
```

```
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**

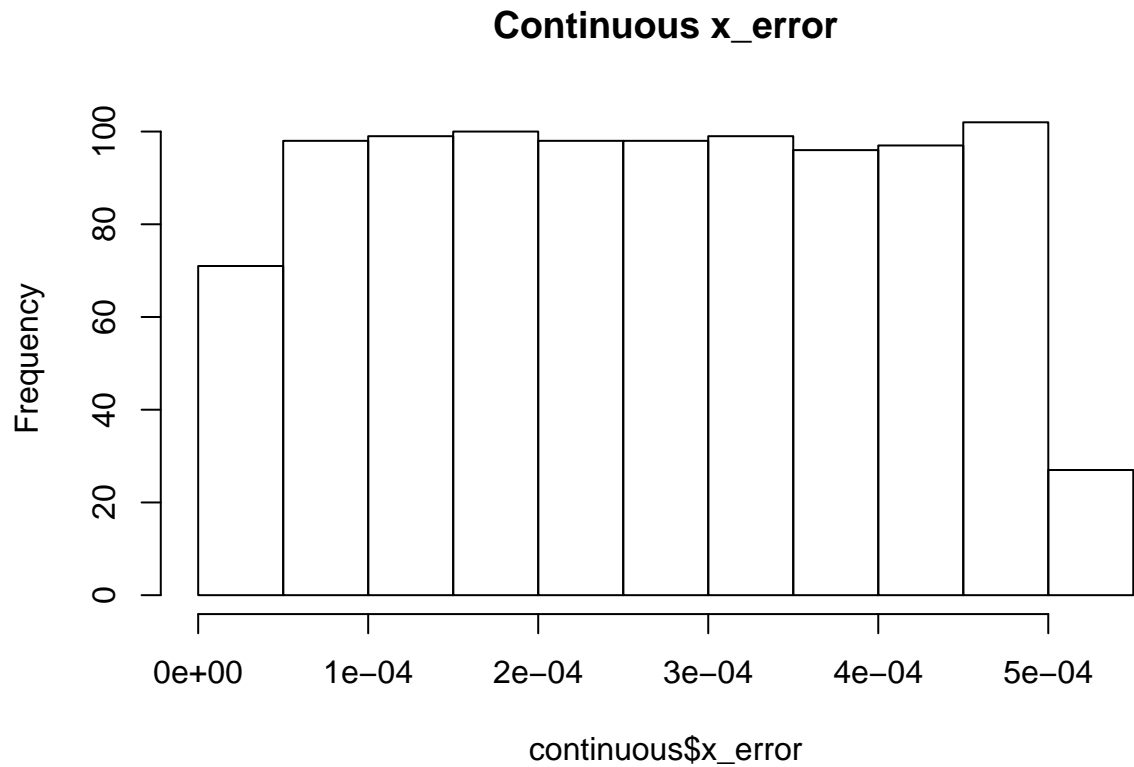


```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```

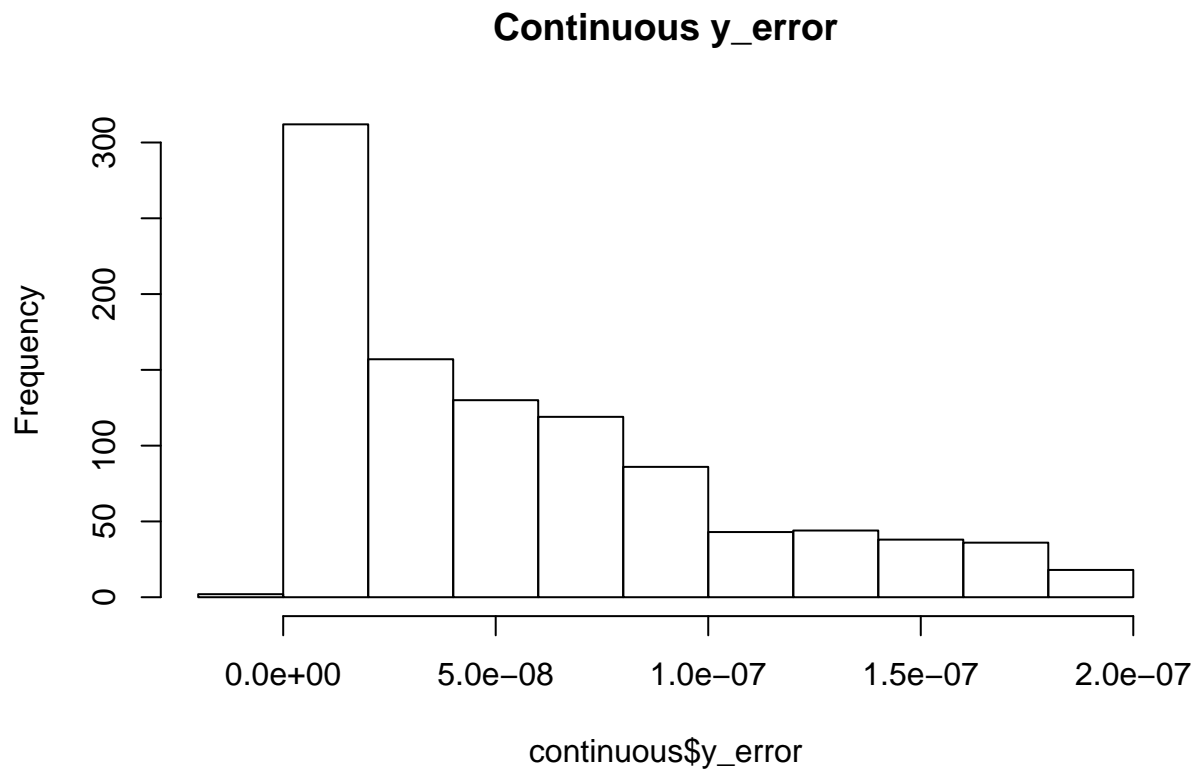
**Distance from origin vs. time**



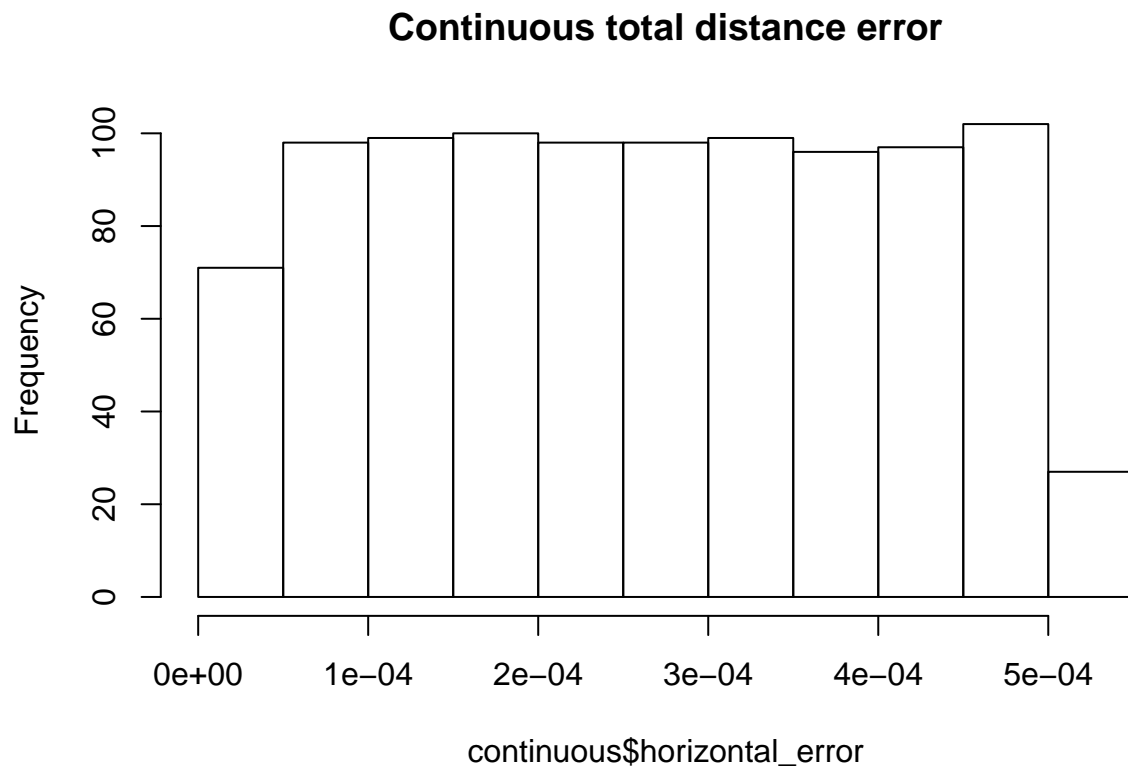
```
hist(continuous$x_error,  
     main = "Continuous x_error")
```



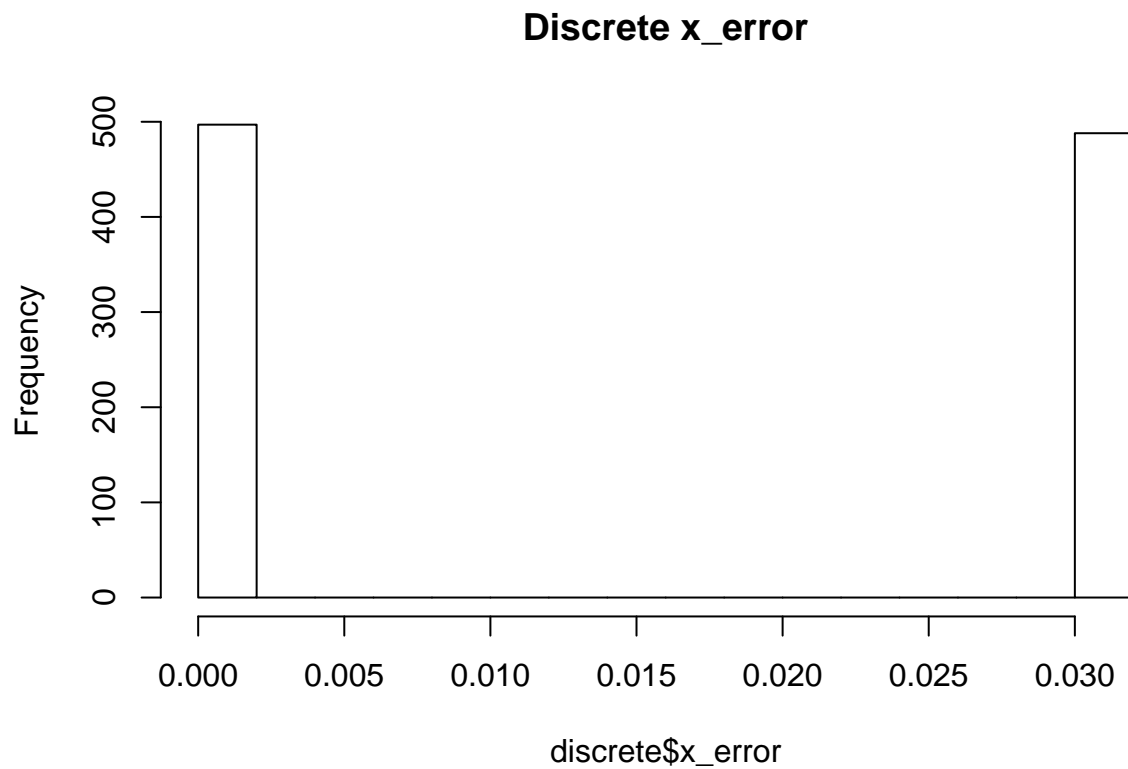
```
hist(continuous$y_error,  
     main = "Continuous y_error")
```



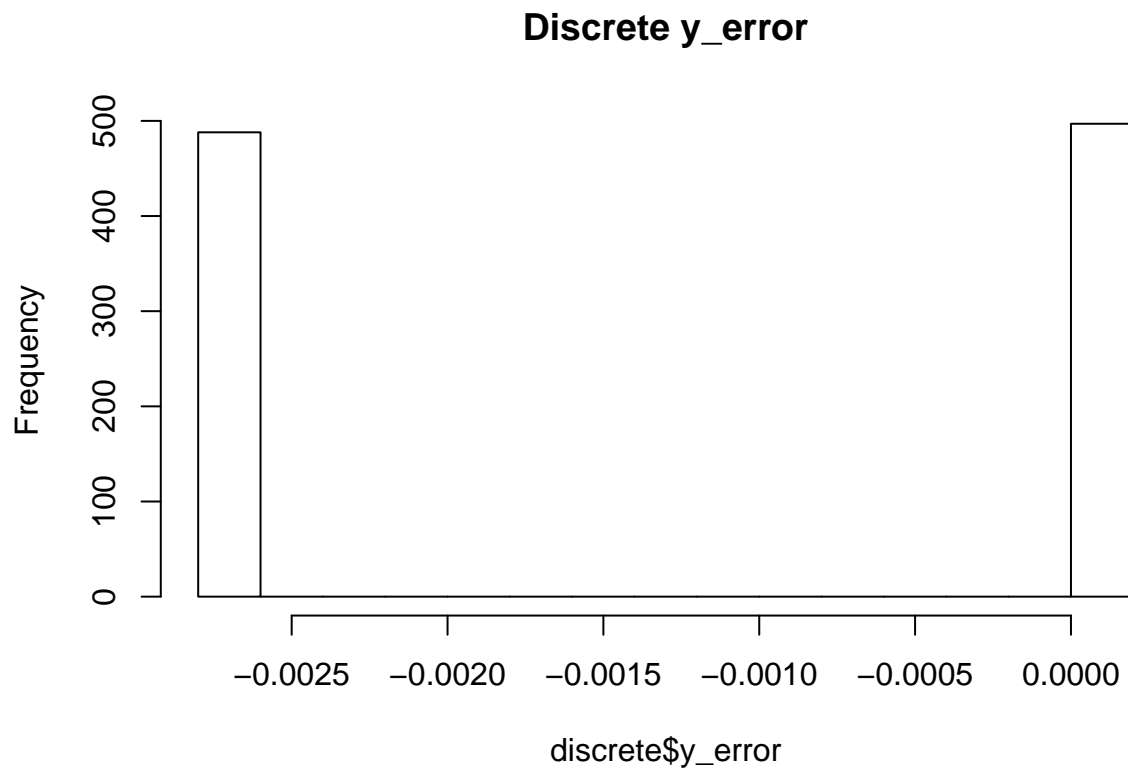
```
hist(continuous$horizontal_error,  
     main = "Continuous total distance error")
```



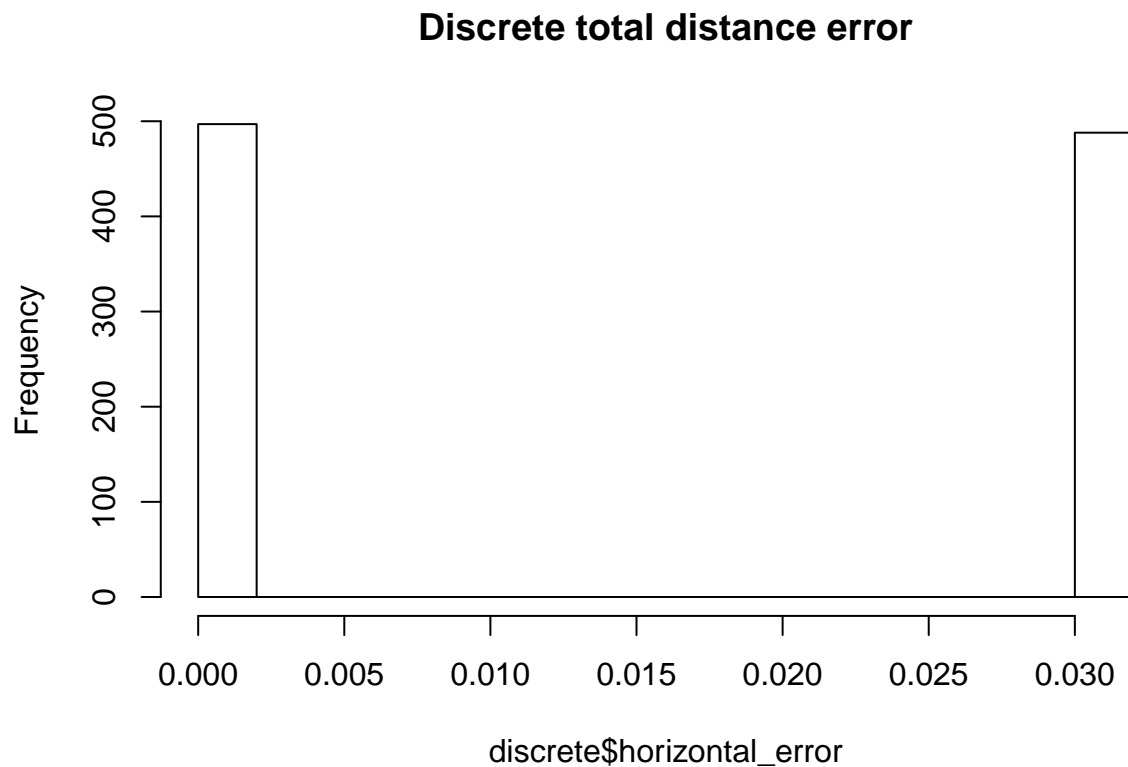
```
hist(discrete$x_error,  
     main = "Discrete x_error")
```



```
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 - 04:04:56 PM
## \begin{table}[h] \centering
## \caption{Continuous Filter Estimate for two-stationary-noiseless-no-gps Experiment}
## \label{tab:two_stationary_noiseless_no_gps_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 & 985 & 0.991 & 1.000 & $-$0 & 2 \\\
## y\_position & 985 & $-$0.000 & 0.000 & $-$0 & 0 \\\
## yaw & 985 & $-$0.000 & 0.000 & $-$0 & 0 \\\
## x\_variance & 985 & 2.855 & 1.582 & 0.123 & 5.596 \\\
## y\_variance & 985 & 2.855 & 1.582 & 0.123 & 5.596 \\\
## yaw\_variance & 985 & 2.570 & 1.425 & 0.113 & 5.040 \\\
## yaw\_error & 985 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\\
## x\_error & 985 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\\

```

```

## y\_error & 985 & 0.0000001 & 0.00000005 & $-\$0.000 & 0.0000002 \\
## horizontal\_error & 985 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\
## \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 - 04:04:56 PM
## \begin{table}[h] \centering
## \caption{Discrete Filter Estimate for two-stationary-noiseless-no-gps Experiment}
## \label{tab:two_stationary_noiseless_no_gps_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. Error} \\
## \hline \\[-1.8ex]
## x\_position & 985 & 0.976 & 0.985 & $-\$0.000 & 1.970 \\
## y\_position & 985 & 0.001 & 0.001 & $-\$0.000 & 0.003 \\
## yaw & 985 & 0.000 & 0.000 & $-\$0 & 0 \\
## x\_variance & 985 & 1.451 & 1.822 & 0.002 & 5.596 \\
## y\_variance & 985 & 1.451 & 1.822 & 0.002 & 5.596 \\
## yaw\_variance & 985 & 2.575 & 1.424 & 0.128 & 5.040 \\
## x\_error & 985 & 0.015 & 0.015 & 0.00001 & 0.031 \\
## y\_error & 985 & $-\$0.001 & 0.001 & $-\$0.003 & 0.0000002 \\
## horizontal\_error & 985 & 0.015 & 0.015 & 0.00001 & 0.031 \\
## yaw\_error & 985 & 0.0003 & 0.0001 & 0.00001 & 0.001 \\
## \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)
}

```