one_mobile_noiseless_no_gps Experiment Report

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This is a summary of the data from the one_mobile_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.
## -1.8680 -1.8660  1.5490  0.7197  1.8010  3.9690
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -4.613   1.154   3.461   1.776   3.761   3.761
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.14100 -1.67400 -0.06331 -0.06767  1.48600  3.13600
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000015 3.428000 4.198000 4.107000 4.951000 5.207000
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -1.616  -1.611   1.665   0.840   1.740   3.938
```

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

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -4.638   1.156   3.306   1.740   3.792   3.792
```

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

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -3.13900 -1.66200 -0.05543 -0.04970  1.50500  3.14100
```

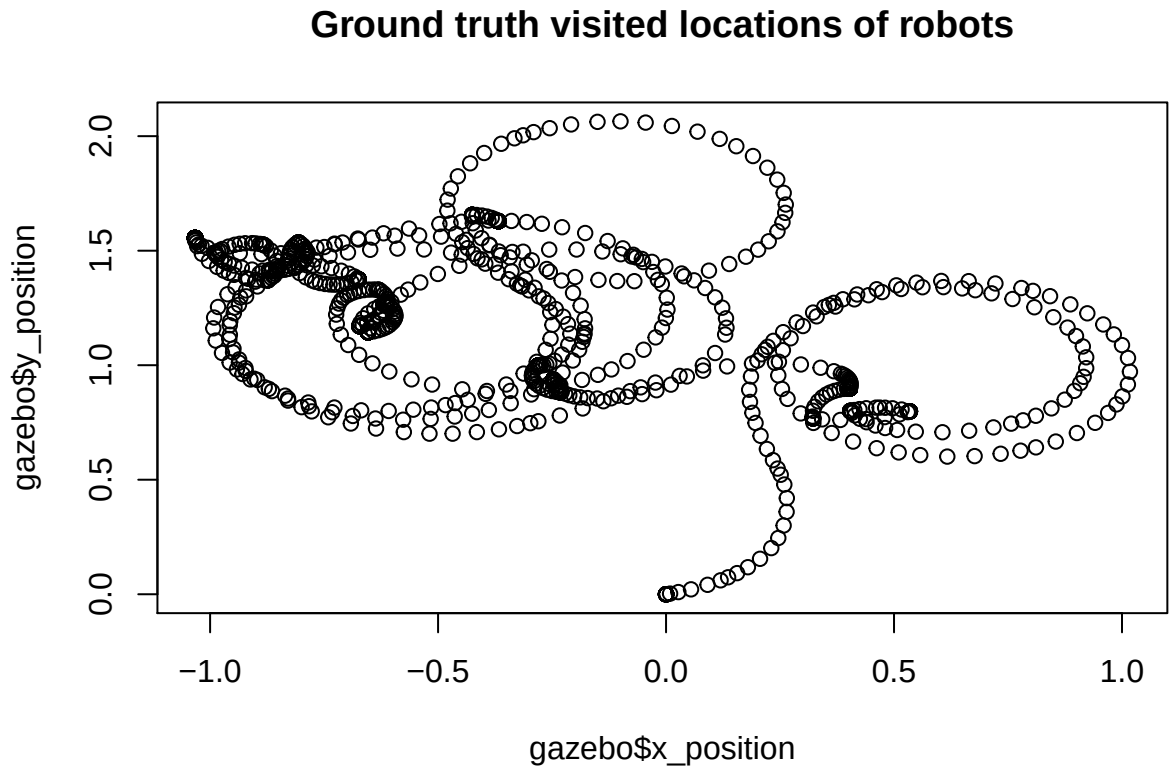
```
summary(discrete$horizontal_error)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.000015 3.407000 4.120000 4.064000 4.953000 5.164000
```

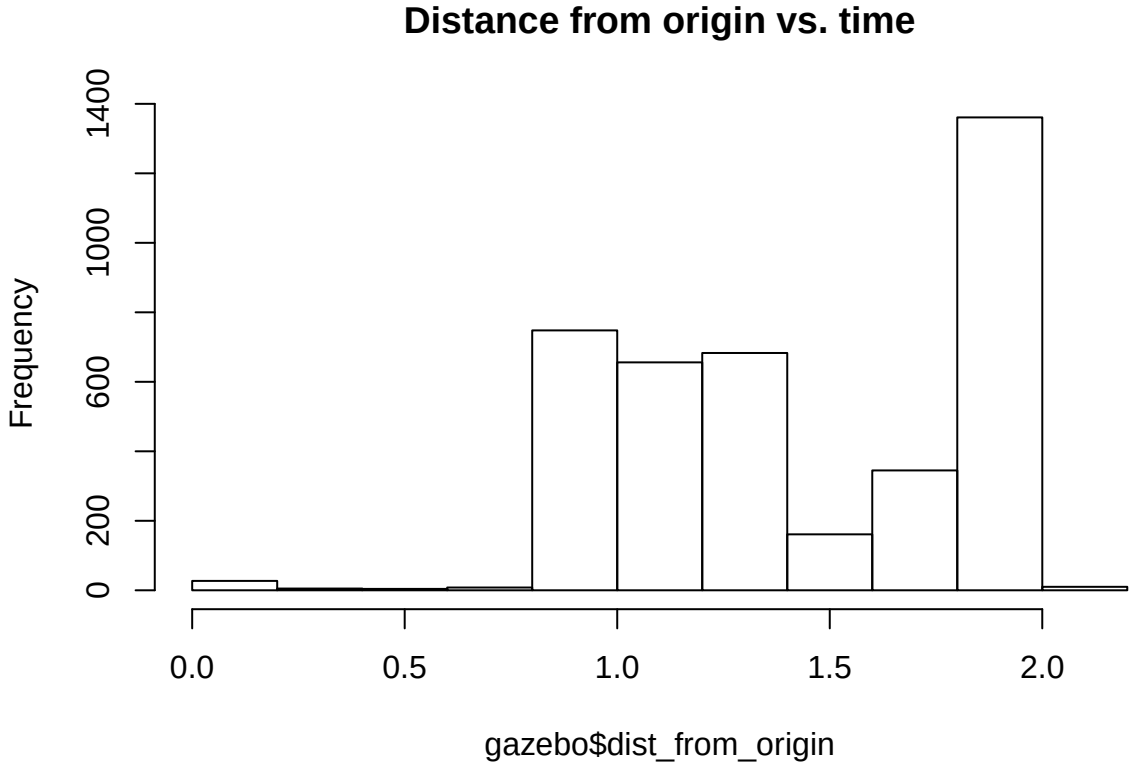
```
if (params$robot >= 2) {
    summary(external_data_averages)
}
```

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")
```



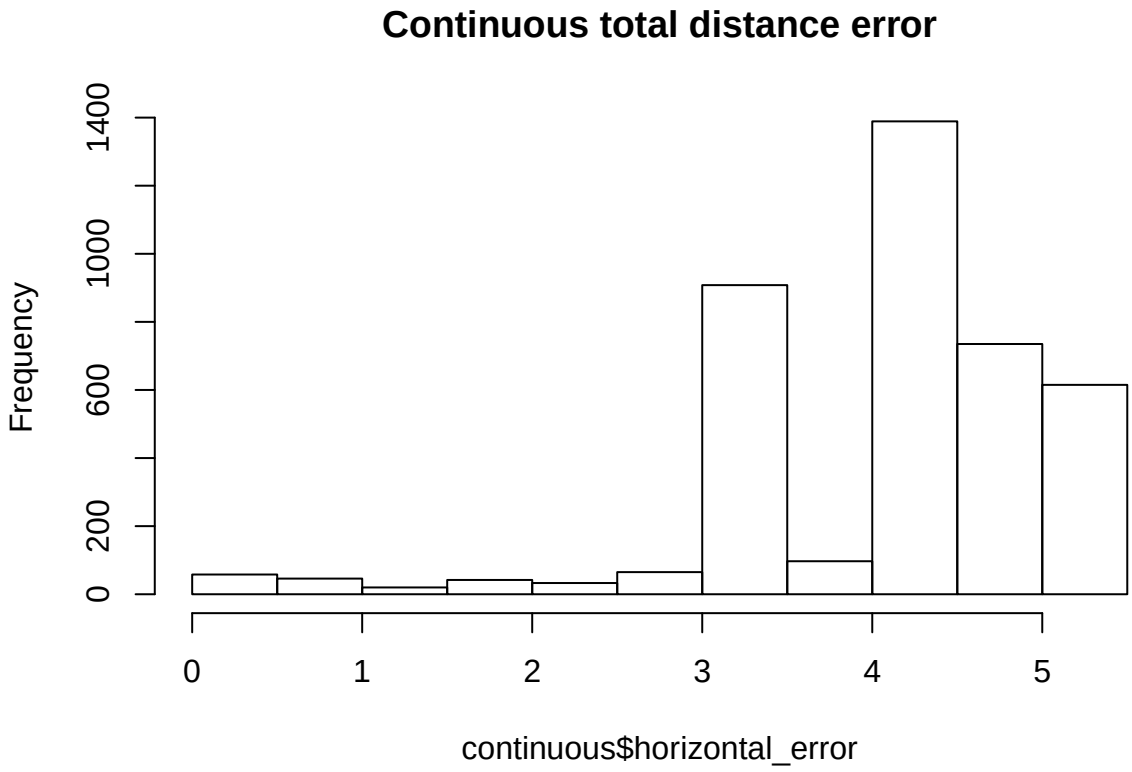

```
hist(gazebo$dist_from_origin,
     main = "Distance from origin vs. time")
```



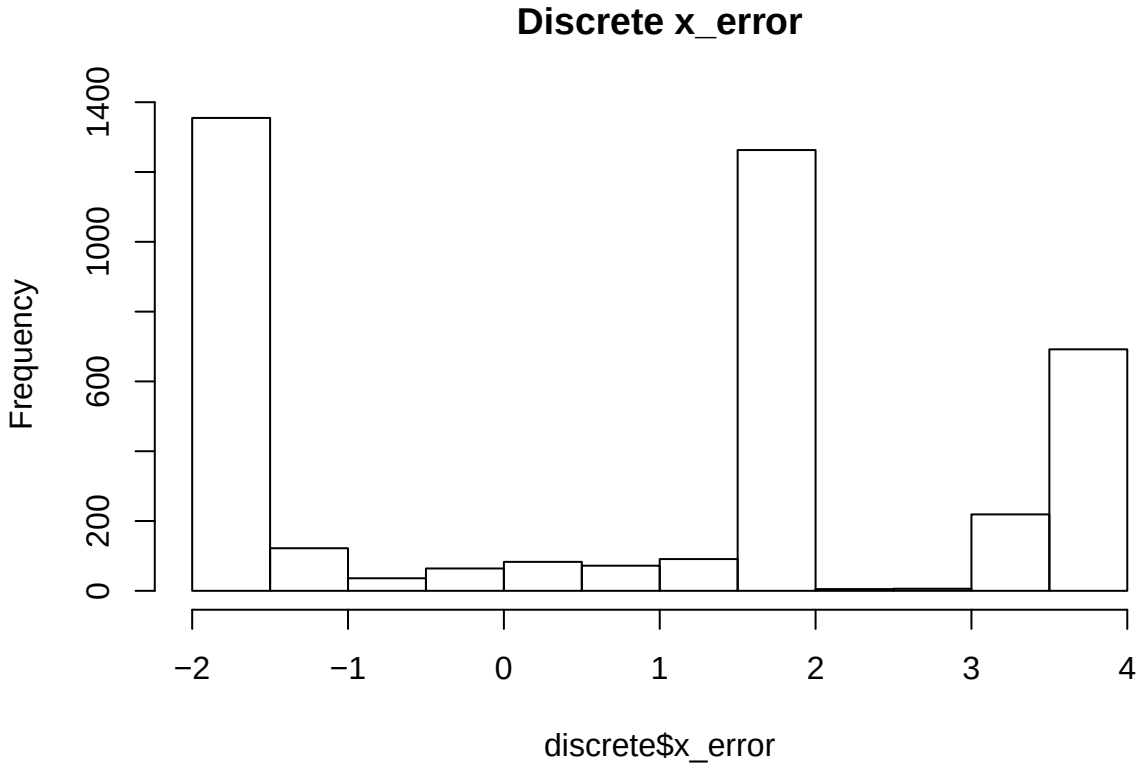

```
hist(continuous$x_error,
     main = "Continuous x_error")
```


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


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

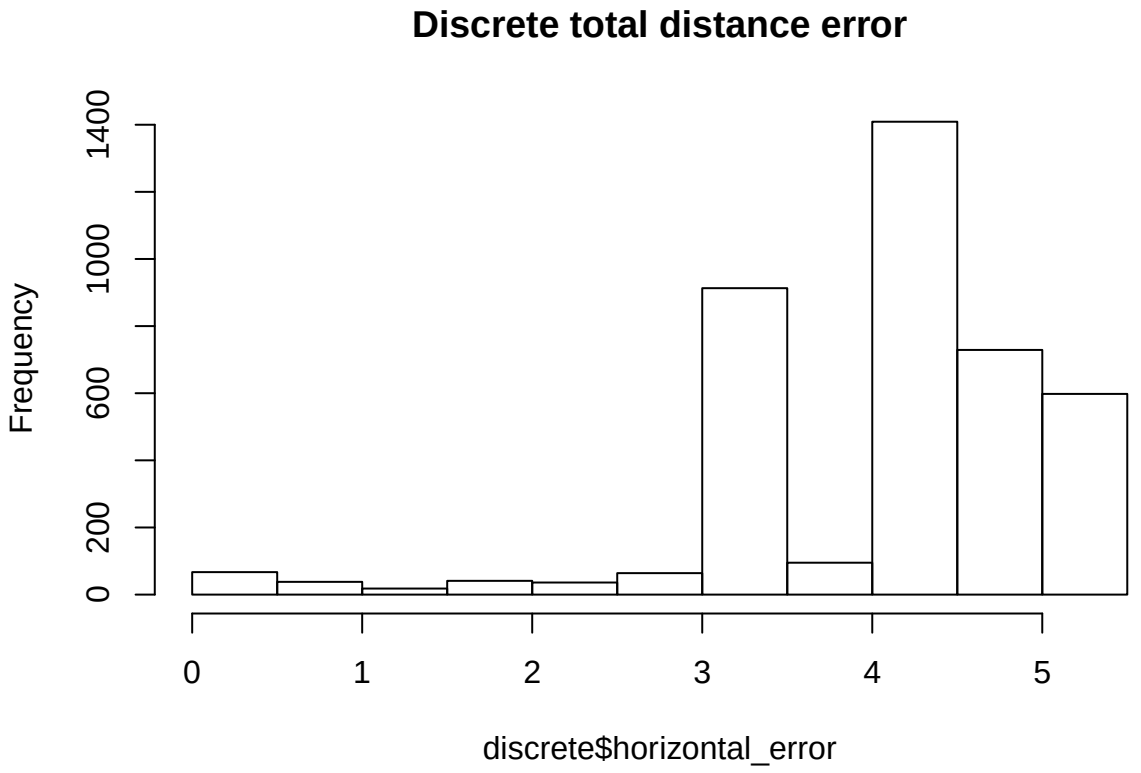



```
hist(discrete$x_error,
     main = "Discrete x_error")
```




```
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, " 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: Wed, Aug 10, 2016 - 04:37:27 PM
## \begin{table}[h] \centering
##   \caption{Continuous Filter Estimate for one-mobile-noiseless-no-gps Experiment}
##   \label{tab:one_mobile_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 & 4,008 & $-$1.211 & 1.858 & $-$4.095 & 0.836 \\
## y\_position & 4,008 & $-$0.529 & 2.898 & $-$2.514 & 5.523 \\
## yaw & 4,008 & $-$0.291 & 1.980 & $-$3.140 & 3.136 \\
## x\_variance & 4,008 & 12.059 & 6.916 & 0.082 & 24.016 \\
## y\_variance & 4,008 & 12.059 & 6.916 & 0.082 & 24.016 \\
## yaw\_variance & 4,008 & 14.453 & 8.289 & 0.099 & 28.786 \\
## yaw\_error & 4,008 & $-$0.068 & 1.826 & $-$3.141 & 3.136 \\
## x\_error & 4,008 & 0.720 & 2.178 & $-$1.868 & 3.969 \\
## y\_error & 4,008 & 1.776 & 3.065 & $-$4.613 & 3.761 \\
## horizontal\_error & 4,008 & 4.107 & 0.972 & 0.00001 & 5.207 \\
```

```
## \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.harvar
## % Date and time: Wed, Aug 10, 2016 - 04:37:27 PM
## \begin{table}[h] \centering
##   \caption{Discrete Filter Estimate for one-mobile-noiseless-no-gps Experiment}
##   \label{tab:one_mobile_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 & 4,008 & $-$1.332 & 1.790 & $-$4.215 & 0.585 \\
## y\_position & 4,008 & $-$0.492 & 2.886 & $-$2.328 & 5.548 \\
## yaw & 4,008 & $-$0.333 & 1.985 & $-$3.126 & 3.125 \\
## x\_variance & 4,008 & 12.061 & 6.916 & 0.082 & 24.021 \\
## y\_variance & 4,008 & 12.061 & 6.916 & 0.082 & 24.021 \\
## yaw\_variance & 4,008 & 14.455 & 8.289 & 0.099 & 28.791 \\
## x\_error & 4,008 & 0.840 & 2.092 & $-$1.616 & 3.938 \\
## y\_error & 4,008 & 1.740 & 3.058 & $-$4.638 & 3.792 \\
## horizontal\_error & 4,008 & 4.064 & 0.971 & 0.00001 & 5.164 \\
## yaw\_error & 4,008 & $-$0.050 & 1.826 & $-$3.139 & 3.141 \\
## \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)
}
```