R Notebook

First we install the required packages.

Second we load libraries we need

```
require("RPostgreSQL")
require("knitr")
require("ggplot2")
require(psych)
require(dplyr)
```

Check if we can connect to the db and if sessions table does exist (some sort of validation!).

```
# loads the PostgreSQL driver
drv <- dbDriver("PostgreSQL")
# creates a connection to the postgres database
# note that "connection" will be used later in each connection to the database
connection <- dbConnect(drv, dbname = "test",
                 host = "localhost", port = 5432,
                 user = "postgres")

#connection <- dbConnect(drv, dbname = "postgres",
#                 host = "10.187.64.104", port = 5432,
#                 user = "postgres")

# check for the cartable
dbExistsTable(connection, "session")
```

```
## [1] TRUE
```

```
# TRUE
```

Get list of sessions and their lengths both in terms of time and number of measurements.

```
query <- "SELECT id,e1.start,e1.finish-e1.start as duration,e2.count_values
FROM session AS e1
LEFT JOIN LATERAL (
    SELECT COUNT(*) AS count_values
    FROM datavr
    WHERE e1.id=datavr.idsession)
    AS e2
ON TRUE;"
sessions <- dbGetQuery(connection, query)
```

```
kable(sessions)
```

id	start	duration	count_values
0	2017-05-26 20:08:26	00:00:04.579	38
1	2017-05-26 20:08:46	00:00:07.488	63
2	2017-05-26 20:11:53	00:00:02.472	20
3	2017-05-26 20:12:28	00:00:01.576	12
4	2017-05-26 20:14:03	00:00:04.463	37
5	2017-05-26 20:17:34	00:00:06.413	54
6	2017-05-26 20:20:15	00:00:00.649	4
7	2017-05-26 20:24:32	00:00:04.913	41

id	start	duration	count_values
8	2017-05-26 20:30:32	00:00:03.521	29
9	2017-05-26 20:30:37	00:00:03.369	28
10	2017-05-26 21:31:26	00:04:06.76	2090
11	2017-05-26 21:38:24	00:04:56.87	2510
12	2017-05-26 21:58:51	00:04:38.61	2357
13	2017-05-26 22:04:39	00:03:52.934	1974
14	2017-05-26 22:10:46	00:00:44.069	227
15	2017-05-26 22:11:35	00:00:02.827	23
16	2017-05-26 23:24:12	00:00:04.172	35
17	2017-05-26 23:24:56	00:00:04.36	319
18	2017-05-26 23:28:52	NA	15670
19	2017-05-26 23:38:23	00:00:00.41	17
20	2017-05-26 23:44:41	00:02:02.17	4614
21	2017-05-26 23:48:39	00:05:33.214	11894
22	2017-05-28 22:50:48	00:06:18.744	163
23	2017-05-28 23:00:02	00:08:27.684	2212
24	2017-05-28 23:08:34	00:21:43.719	5675
25	2017-05-28 23:30:23	00:00:19.644	85
26	2017-05-28 23:30:46	00:00:01.985	8
27	2017-05-28 23:30:50	00:00:01.748	7
28	2017-05-28 23:30:53	00:00:08.854	38
29	2017-05-28 23:36:38	00:08:41.972	87
30	2017-05-28 23:45:29	00:00:45.742	111
31	2017-05-29 09:53:44	00:02:33.295	542
32	2017-05-29 09:56:42	00:02:50.565	725
33	2017-05-29 09:59:49	00:04:10.837	1058
34	2017-05-29 10:04:25	00:03:57.102	1026
35	2017-05-29 10:08:37	00:04:24.797	1133
36	2017-05-29 10:27:55	NA	8539
37	2017-05-29 10:39:05	00:06:00.106	13081
38	2017-05-29 11:04:19	NA	914
39	2017-05-29 11:05:15	NA	1996
40	2017-05-29 11:11:13	00:00:01.467	0
41	2017-05-29 11:26:38	00:05:30.577	10508

```
session_id = 37
query <- "SELECT datavr.*,datasteering.steering,datasteering.accelerator,datasteering.slider1 AS brake
datasteering
JOIN datavr ON datasteering.time=datavr.time AND datasteering.idsession=datavr.idsession
WHERE datasteering.idsession=$1;"
session_data <- dbGetQuery(connection, query,c(session_id))
```

```
summary(session_data)
```

```
##       time                       idsession    positionx
##  Min.   :2017-05-29 10:39:14   Min.   :37   Min.   :-0.23028
##  1st Qu.:2017-05-29 10:40:38   1st Qu.:37   1st Qu.:-0.16532
##  Median :2017-05-29 10:42:07   Median :37   Median :-0.15483
##  Mean   :2017-05-29 10:42:08   Mean   :37   Mean   :-0.15026
##  3rd Qu.:2017-05-29 10:43:37   3rd Qu.:37   3rd Qu.:-0.13728
##  Max.   :2017-05-29 10:45:05   Max.   :37   Max.   :-0.02226
##    positiony        positionz          rotationx
```

```
##  Min.   :0.2072   Min.   :-0.06451   Min.   :-0.154245
##  1st Qu.:0.3033   1st Qu.: 0.31998   1st Qu.:-0.027067
##  Median :0.3128   Median : 0.34700   Median :-0.001171
##  Mean   :0.3195   Mean   : 0.31593   Mean   : 0.039243
##  3rd Qu.:0.3303   3rd Qu.: 0.35891   3rd Qu.: 0.041778
##  Max.   :0.4277   Max.   : 0.43096   Max.   : 0.535038
##    rotationy          rotationz           steering
##  Min.   :-0.57037   Min.   :-0.09758   Min.   :-858993460
##  1st Qu.:-0.16941   1st Qu.: 0.00591   1st Qu.:        -3
##  Median :-0.13013   Median : 0.02004   Median :        -2
##  Mean   :-0.11516   Mean   : 0.02084   Mean   :   -131337
##  3rd Qu.:-0.05811   3rd Qu.: 0.03515   3rd Qu.:         9
##  Max.   : 0.18952   Max.   : 0.18615   Max.   :       691
##   accelerator             brake
##  Min.   :-858993460   Min.   :-858993460
##  1st Qu.:       286   1st Qu.:      1000
##  Median :      1000   Median :      1000
##  Mean   :   -130670   Mean   :   -130357
##  3rd Qu.:      1000   3rd Qu.:      1000
##  Max.   :      1000   Max.   :      1000
```

```
session_data$steering[order(session_data$steering)[1:5]]
```

```
## [1] -858993460 -858993460       -895       -895       -891
```

```
order(session_data$steering)[1:5]
```

```
## [1] 12808 13081 11695 11696 11697
```

```
#session_data_filtered <- session_data %>%
#  filter(steering>-1001,accelerator>-1001,slider1>-1001)

session_data_filtered <- session_data %>%
  filter(steering>-1001,accelerator>-1001)

session_data_filtered$longitudinal = (-session_data_filtered$accelerator+1000)-(-session_data_filtered$
```

```
summary(session_data_filtered)
```

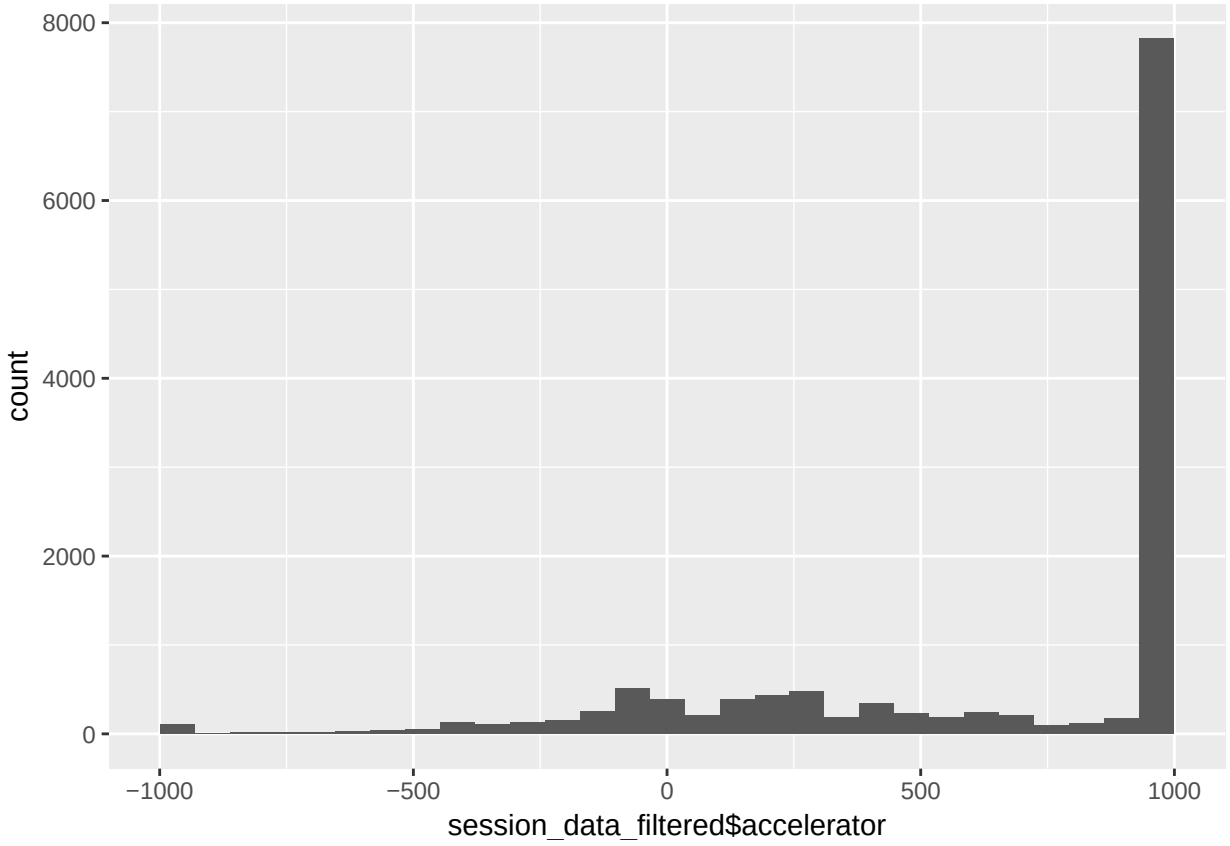
```
##       time                         idsession    positionx
##  Min.   :2017-05-29 10:39:14   Min.   :37   Min.   :-0.23028
##  1st Qu.:2017-05-29 10:40:38   1st Qu.:37   1st Qu.:-0.16532
##  Median :2017-05-29 10:42:07   Median :37   Median :-0.15483
##  Mean   :2017-05-29 10:42:08   Mean   :37   Mean   :-0.15028
##  3rd Qu.:2017-05-29 10:43:37   3rd Qu.:37   3rd Qu.:-0.13729
##  Max.   :2017-05-29 10:45:05   Max.   :37   Max.   :-0.02226
##    positiony        positionz          rotationx
##  Min.   :0.2072   Min.   :-0.06451   Min.   :-0.154245
##  1st Qu.:0.3033   1st Qu.: 0.31998   1st Qu.:-0.027073
##  Median :0.3128   Median : 0.34703   Median :-0.001177
##  Mean   :0.3195   Mean   : 0.31593   Mean   : 0.039219
##  3rd Qu.:0.3303   3rd Qu.: 0.35891   3rd Qu.: 0.041756
##  Max.   :0.4277   Max.   : 0.43096   Max.   : 0.535038
##    rotationy          rotationz           steering
##  Min.   :-0.57037   Min.   :-0.097580   Min.   :-895.000
##  1st Qu.:-0.16942   1st Qu.: 0.005909   1st Qu.:  -3.000
```

```
##  Median :-0.13014   Median : 0.020043   Median :  -2.000
##  Mean   :-0.11517   Mean   : 0.020843   Mean   :  -2.276
##  3rd Qu.:-0.05812   3rd Qu.: 0.035153   3rd Qu.:   9.000
##  Max.   : 0.18952   Max.   : 0.186149   Max.   : 691.000
##   accelerator          brake         longitudinal
##  Min.   :-1000.0   Min.   :-539.0   Min.   :-1539.0
##  1st Qu.:  286.0   1st Qu.:1000.0   1st Qu.:    0.0
##  Median : 1000.0   Median :1000.0   Median :    0.0
##  Mean   :  664.9   Mean   : 977.7   Mean   :  312.8
##  3rd Qu.: 1000.0   3rd Qu.:1000.0   3rd Qu.:  714.0
##  Max.   : 1000.0   Max.   :1000.0   Max.   : 2000.0
```

Plot histogram of Gas pedal

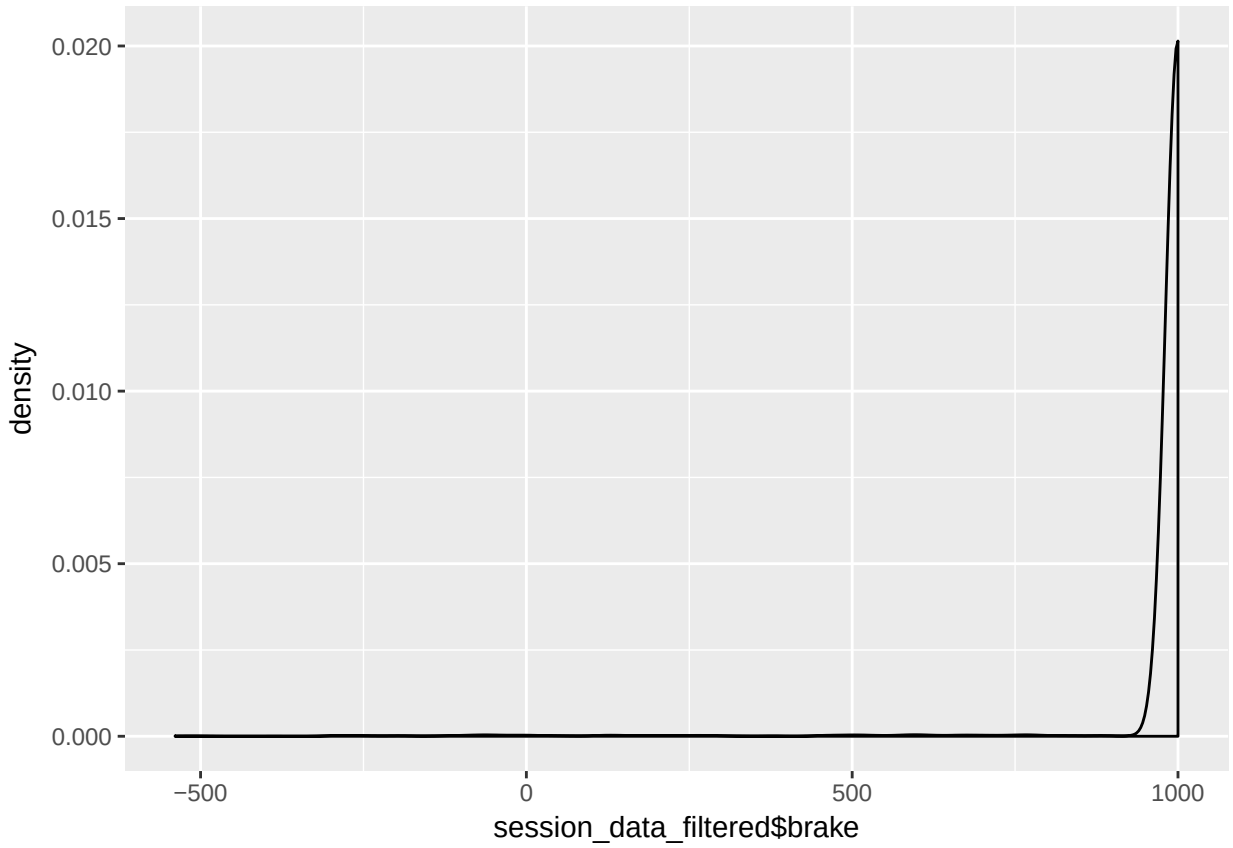
```
ggplot(data=session_data_filtered, aes(session_data_filtered$accelerator)) + geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



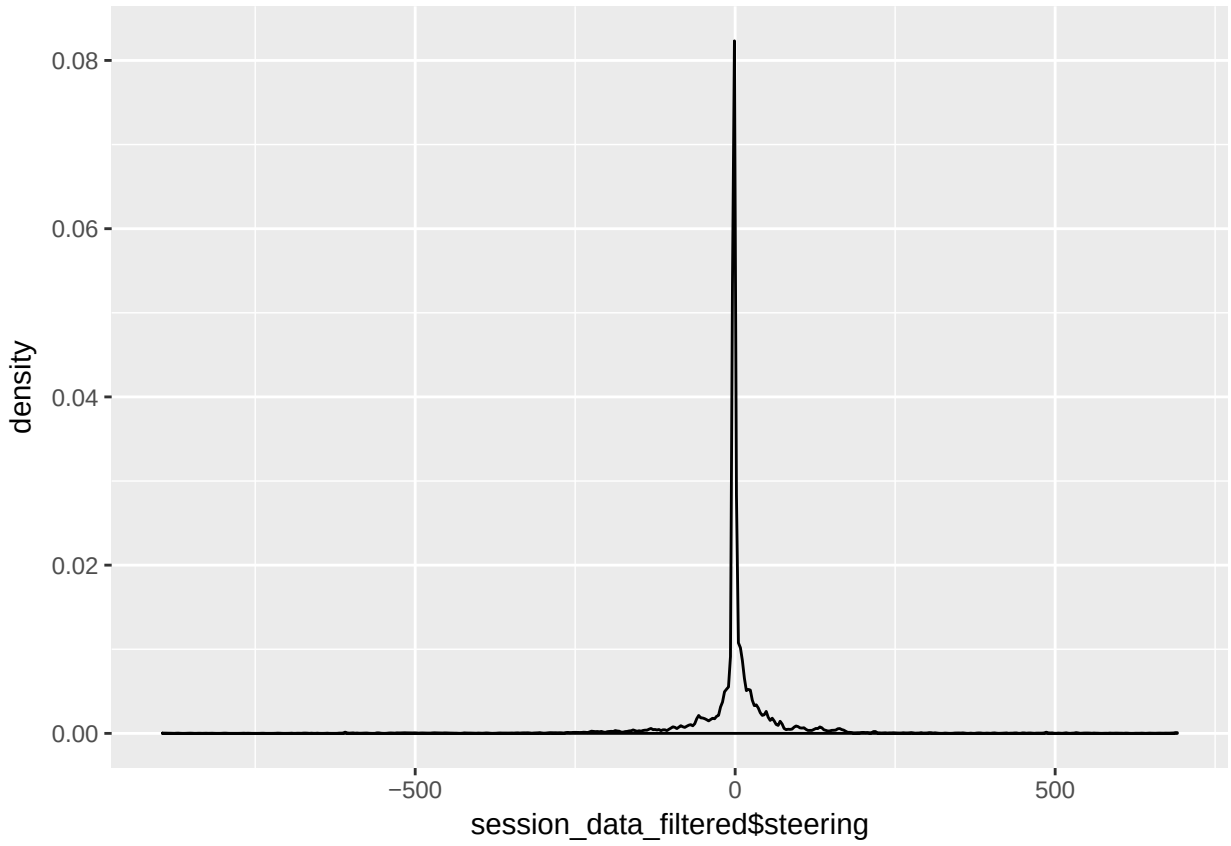
Plot histogram of Brake pedal

```
ggplot(data=session_data_filtered, aes(session_data_filtered$brake)) + geom_density()
```

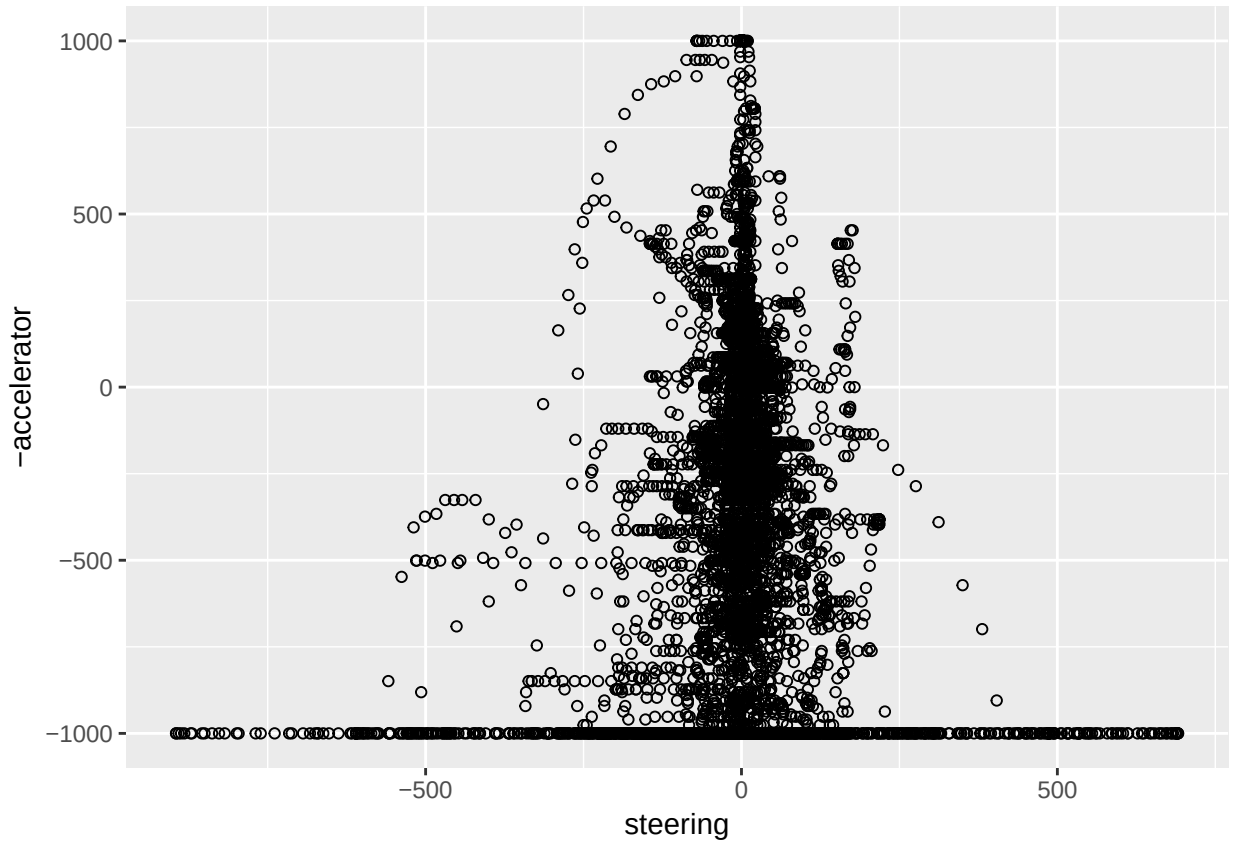


Plot histogram of Steering

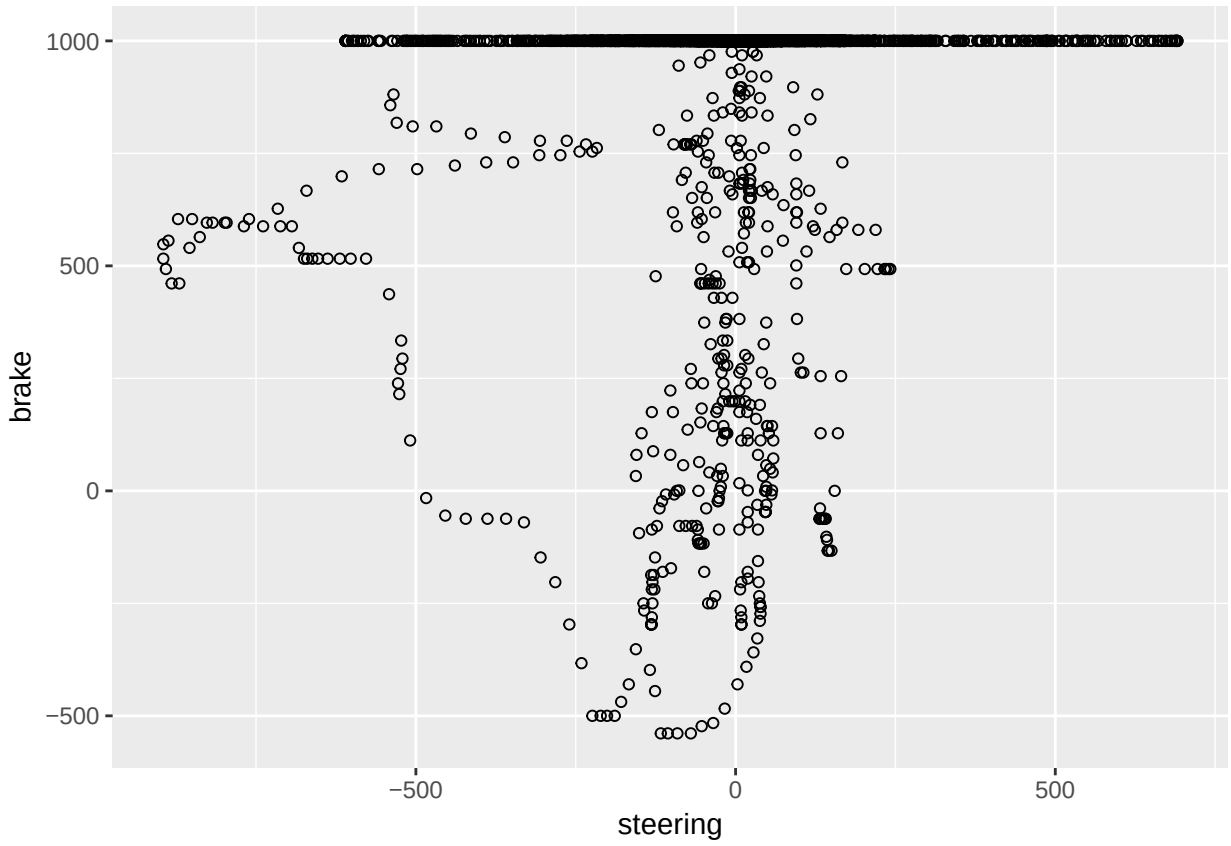
```
ggplot(data=session_data_filtered, aes(session_data_filtered$steering)) + geom_density()
```



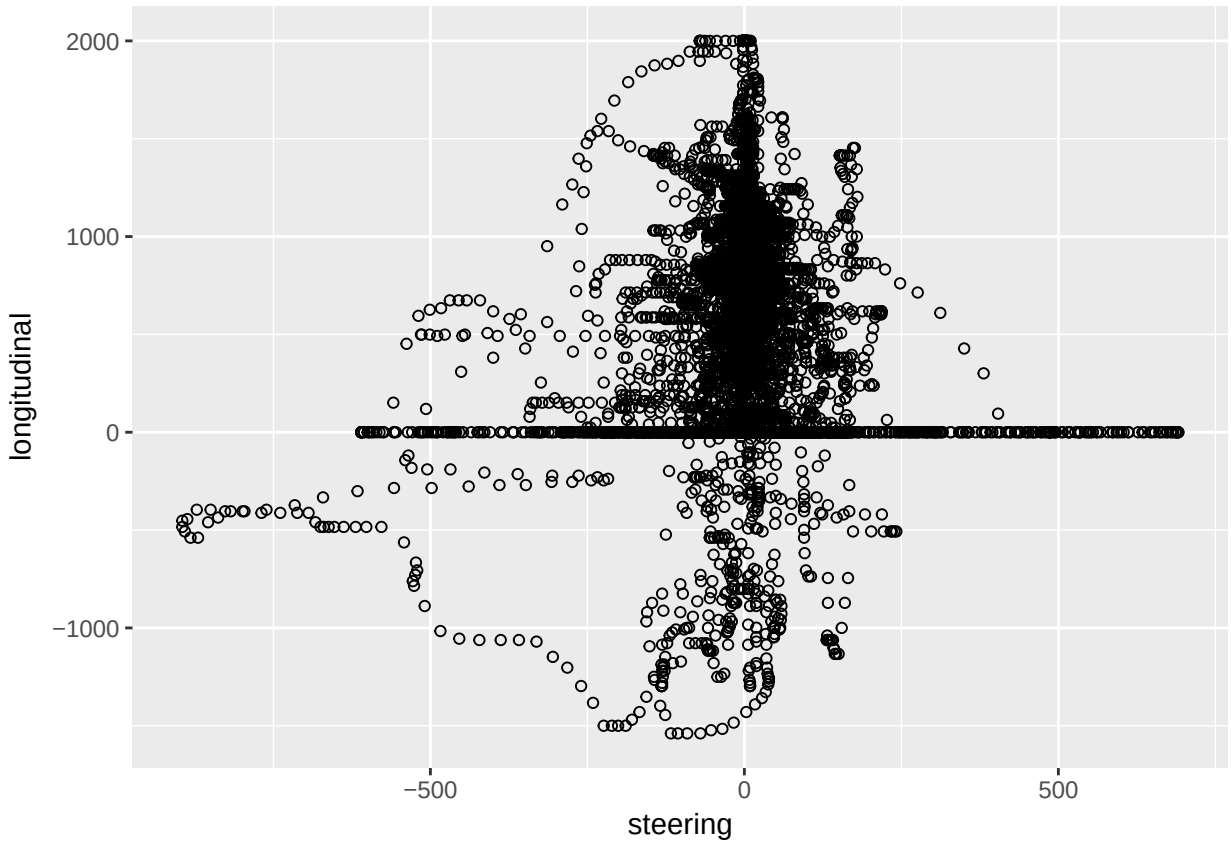

```
ggplot(session_data_filtered, aes(x=steering, y=-accelerator)) +
    geom_point(shape=1)      # Use hollow circles
```




```
ggplot(session_data_filtered, aes(x=steering, y=brake)) +
    geom_point(shape=1)      # Use hollow circles
```

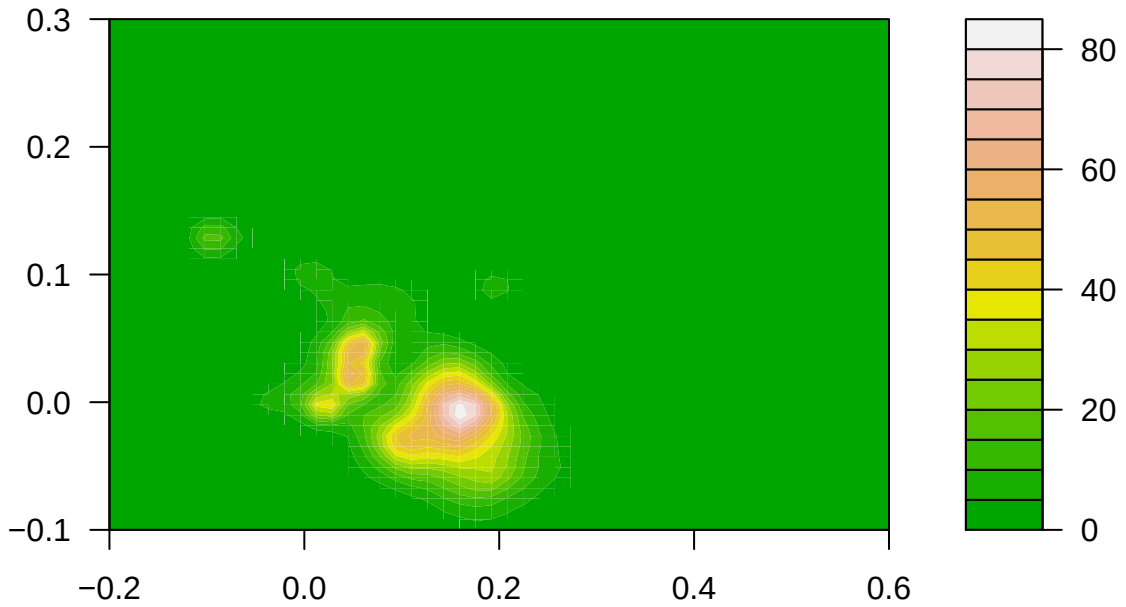



```
ggplot(session_data_filtered, aes(x=steering, y=longitudinal)) +
    geom_point(shape=1)      # Use hollow circles
```

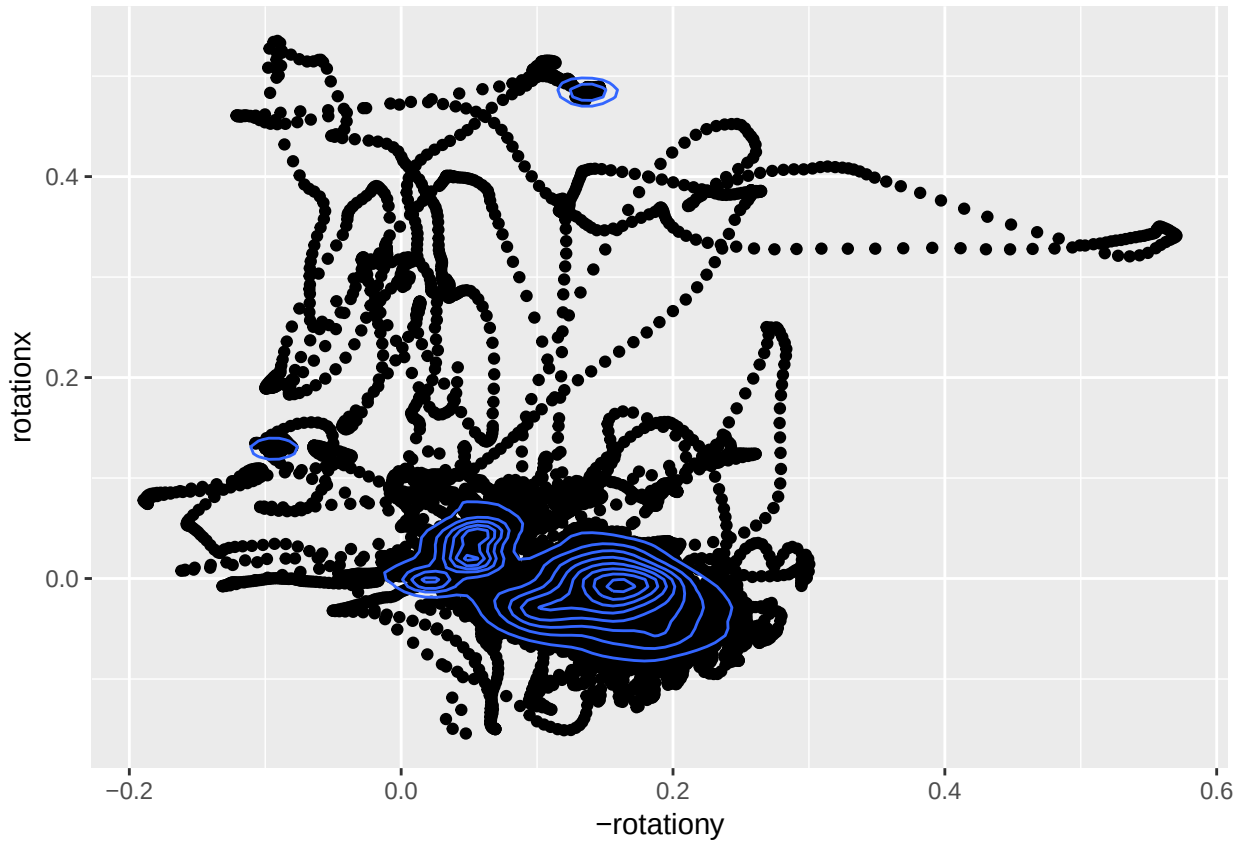


Heatmap of X-Y of headset

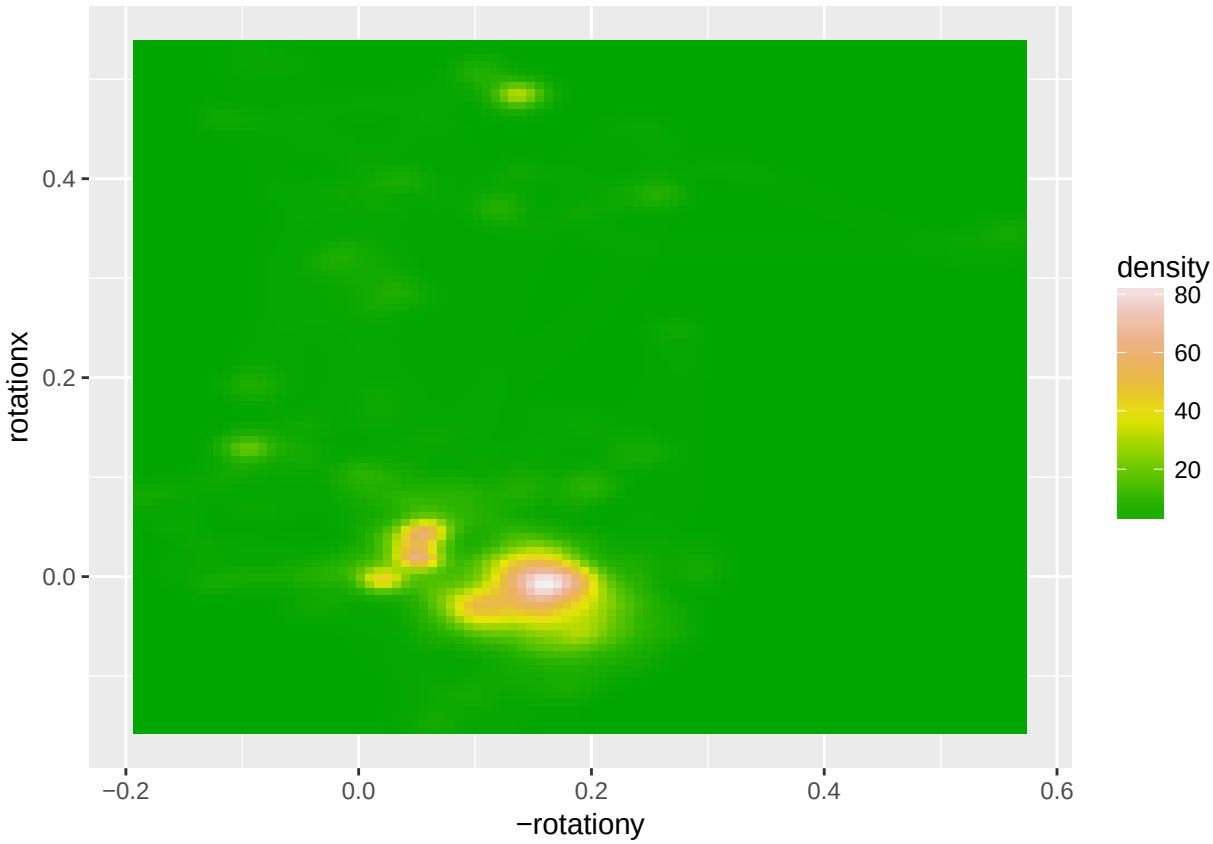
```
k <- with(session_data_filtered,MASS::kde2d(-rotationy,rotationx,n=50,lims=c(-0.2, 0.6, -0.1, 0.3)))
filled.contour(k,color = terrain.colors)
```




```
m <- ggplot(session_data_filtered, aes(x = -rotationy, y = rotationx)) +
 geom_point()
m + geom_density_2d()
```




```
m <- ggplot(session_data_filtered, aes(x = -rotationy, y = rotationx))
m + stat_density_2d(geom = "raster", aes(fill = ..density..), contour = FALSE) +
  scale_fill_gradientn(colours = terrain.colors(10))
```


rotationx
0.4
0.2
0.0
−0.2
0.0
0.2
0.4
0.6
−rotationy
density
80
60
40
20