Initial experiment - sensor recording

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# Goal of the script

This script reads the CSV files generated with the sensors (SMARTTESTER) during an initaial experiment in order to check the functionality of the sensors.  
The script will:

1. Read in the original CSV files, combines them and organise the data
2. Plot the data
3. Write an XLSX-file and save an R object ready for further analysis in R

dir\_in <- "analysis/raw\_data/"  
dir\_out <- "analysis/plots"

Raw data must be located in ~/analysis/raw\_data/.  
Formatted data will be saved in ~/analysis/plots. The knit directory for this script is the project directory.

# Load packages

library(ggplot2)

Warning: package 'ggplot2' was built under R version 4.0.3

library(readr)

Warning: package 'readr' was built under R version 4.0.3

library(reshape2)

Warning: package 'reshape2' was built under R version 4.0.3

library(ggpubr)

Warning: package 'ggpubr' was built under R version 4.0.3

library(magrittr)

Warning: package 'magrittr' was built under R version 4.0.3

library(wesanderson)  
library(tools)  
library(chron)

# Get name, path and information of the file

data\_file <- list.files(dir\_in, pattern = "\\.csv$", full.names = TRUE)  
md5\_in <- md5sum(data\_file)  
info\_in <- data.frame(files = basename(names(md5\_in)), checksum = md5\_in,   
 row.names = NULL)

The checksum (MD5 hashes) of the imported files are:

files checksum  
1 force.csv dbd0e66dcda6cbd5974e09cf37e6ff21  
2 friction.csv 619972f50049e2d4d2ee7365d9f58023  
3 length.csv 02e8b95bd84378fc0010d435d6bb01bf  
4 messung3.csv 43b2968677a1737470175d0406188513  
5 velocity.csv 4ff510dd57430747ab2ffac2565061f3

# Read in original data

# the data contains information about force, friction, length and velocity  
  
force <- read\_table2(data\_file[1])

Warning: 1 parsing failure.  
row col expected actual file  
 11 -- 51 columns 7 columns 'analysis/raw\_data/force.csv'

friction <- read\_table2(data\_file[2])

Warning: 1 parsing failure.  
row col expected actual file  
 11 -- 51 columns 7 columns 'analysis/raw\_data/friction.csv'

length <- read\_table2(data\_file[3])

Warning: 1 parsing failure.  
row col expected actual file  
 11 -- 51 columns 7 columns 'analysis/raw\_data/length.csv'

depth <- read\_table2(data\_file[4])

Warning: 1 parsing failure.  
row col expected actual file  
 11 -- 51 columns 7 columns 'analysis/raw\_data/messung3.csv'

velocity <- read\_table2(data\_file[5])

Warning: 1 parsing failure.  
row col expected actual file  
 11 -- 51 columns 7 columns 'analysis/raw\_data/velocity.csv'

# Organise the data

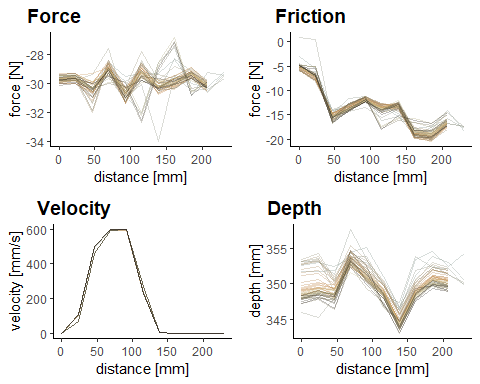
# fills empty fields  
  
# force  
data\_force <- as.data.frame(force)  
data\_force <- melt(data\_force, id = "steps")  
  
# friction  
data\_friction <- as.data.frame(friction)  
data\_friction <- melt(data\_friction, id = "steps")  
  
# length  
data\_length <- as.data.frame(length)  
data\_length[is.na(data\_length)] <- 0  
data\_lenght <- melt(data\_length, id = "steps")  
  
# depth  
data\_depth <- as.data.frame(depth)  
data\_depth <- melt(data\_depth, id = "steps")  
  
# velocity  
data\_velocity <- as.data.frame(velocity)  
data\_velocity[is.na(data\_velocity)] <- 0  
data\_velocity <- melt(data\_velocity, id = "steps")

# Plot the data

# force  
forceplot <- ggplot(data\_force, aes(x = steps, y = value, colour = variable)) +  
 geom\_line(alpha = 0.3) +   
 theme\_classic() +  
 labs(x = "distance [mm]", y = "force [N]",   
 title = "") +   
 theme(legend.position = "none") +  
 scale\_colour\_manual(values = wes\_palette(n = 50, name =  
 "Moonrise2", type = "continuous"))   
   
# friction  
frictionplot <- ggplot(data\_friction, aes(x = steps, y = value, colour =   
 variable)) + geom\_line(alpha = 0.3) +  
 theme\_classic() +  
 labs(x = "distance [mm]",   
 y = "force [N]", title = "", colour = "Strokes") +  
 theme(legend.position = "none") +  
 scale\_colour\_manual(values = wes\_palette(n = 50, name =  
 "Moonrise2", type = "continuous"))   
  
# velocity  
velocityplot <- ggplot(data\_velocity, aes(x = steps, y = value, colour =  
 variable)) + geom\_line(alpha=0.3) +  
 theme\_classic() +  
 geom\_line(alpha = 0.3) +   
 labs(x = "distance [mm]", y = "velocity [mm/s]", title = "", colour = "Strokes") +   
 theme(legend.position = "none") +  
 scale\_colour\_manual(values = wes\_palette(n = 50, name =  
 "Moonrise2", type = "continuous"))   
  
# depth  
depthplot <- ggplot(data\_depth, aes(x = steps, y = value, colour = variable)) +  
 geom\_line(alpha = 0.3) +   
 theme\_classic() +   
 labs(x = "distance [mm]", y = "depth [mm]",  
 title = "", colour = "Strokes") + theme(legend.position = "none") +  
 scale\_colour\_manual(values = wes\_palette(n = 50, name =  
 "Moonrise2", type = "continuous"))   
  
# plot all together  
all <- ggarrange(forceplot, frictionplot, velocityplot, depthplot,  
 labels = c("Force", "Friction", "Velocity", "Depth"),  
 ncol = 2, nrow = 2)

Warning: Removed 45 row(s) containing missing values (geom\_path).  
  
Warning: Removed 45 row(s) containing missing values (geom\_path).  
  
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print(all)



file\_out <- paste0(file\_path\_sans\_ext(info\_in[["file"]]), "all", ".pdf")  
ggsave(filename = file\_out, plot = all, path = dir\_out, device = "pdf")

# sessionInfo() and RStudio version

sessionInfo()

R version 4.0.2 (2020-06-22)  
Platform: x86\_64-w64-mingw32/x64 (64-bit)  
Running under: Windows 10 x64 (build 19041)  
  
Matrix products: default  
  
locale:  
[1] LC\_COLLATE=German\_Germany.1252 LC\_CTYPE=German\_Germany.1252   
[3] LC\_MONETARY=German\_Germany.1252 LC\_NUMERIC=C   
[5] LC\_TIME=German\_Germany.1252   
  
attached base packages:  
[1] tools stats graphics grDevices utils datasets methods   
[8] base   
  
other attached packages:  
[1] chron\_2.3-56 wesanderson\_0.3.6 magrittr\_2.0.1 ggpubr\_0.4.0   
[5] reshape2\_1.4.4 readr\_1.4.0 ggplot2\_3.3.3   
  
loaded via a namespace (and not attached):  
 [1] tidyselect\_1.1.0 xfun\_0.20 purrr\_0.3.4 haven\_2.3.1   
 [5] carData\_3.0-4 colorspace\_2.0-0 vctrs\_0.3.6 generics\_0.1.0   
 [9] htmltools\_0.5.1.1 yaml\_2.2.1 rlang\_0.4.10 pillar\_1.4.7   
[13] foreign\_0.8-81 glue\_1.4.2 withr\_2.4.1 DBI\_1.1.1   
[17] readxl\_1.3.1 lifecycle\_0.2.0 plyr\_1.8.6 stringr\_1.4.0   
[21] munsell\_0.5.0 ggsignif\_0.6.0 gtable\_0.3.0 cellranger\_1.1.0   
[25] zip\_2.1.1 evaluate\_0.14 labeling\_0.4.2 knitr\_1.31   
[29] rio\_0.5.16 forcats\_0.5.1 curl\_4.3 highr\_0.8   
[33] broom\_0.7.4 Rcpp\_1.0.6 scales\_1.1.1 backports\_1.2.0   
[37] abind\_1.4-5 farver\_2.0.3 hms\_1.0.0 digest\_0.6.27   
[41] stringi\_1.5.3 openxlsx\_4.2.3 rstatix\_0.6.0 dplyr\_1.0.3   
[45] cowplot\_1.1.1 grid\_4.0.2 cli\_2.3.0 tibble\_3.0.5   
[49] crayon\_1.4.0 tidyr\_1.1.2 car\_3.0-10 pkgconfig\_2.0.3   
[53] ellipsis\_0.3.1 data.table\_1.13.6 rstudioapi\_0.13 assertthat\_0.2.1   
[57] rmarkdown\_2.6 R6\_2.5.0 compiler\_4.0.2

RStudio version 1.3.1056.

END OF SCRIPT