

phaseshift_zantiks_example

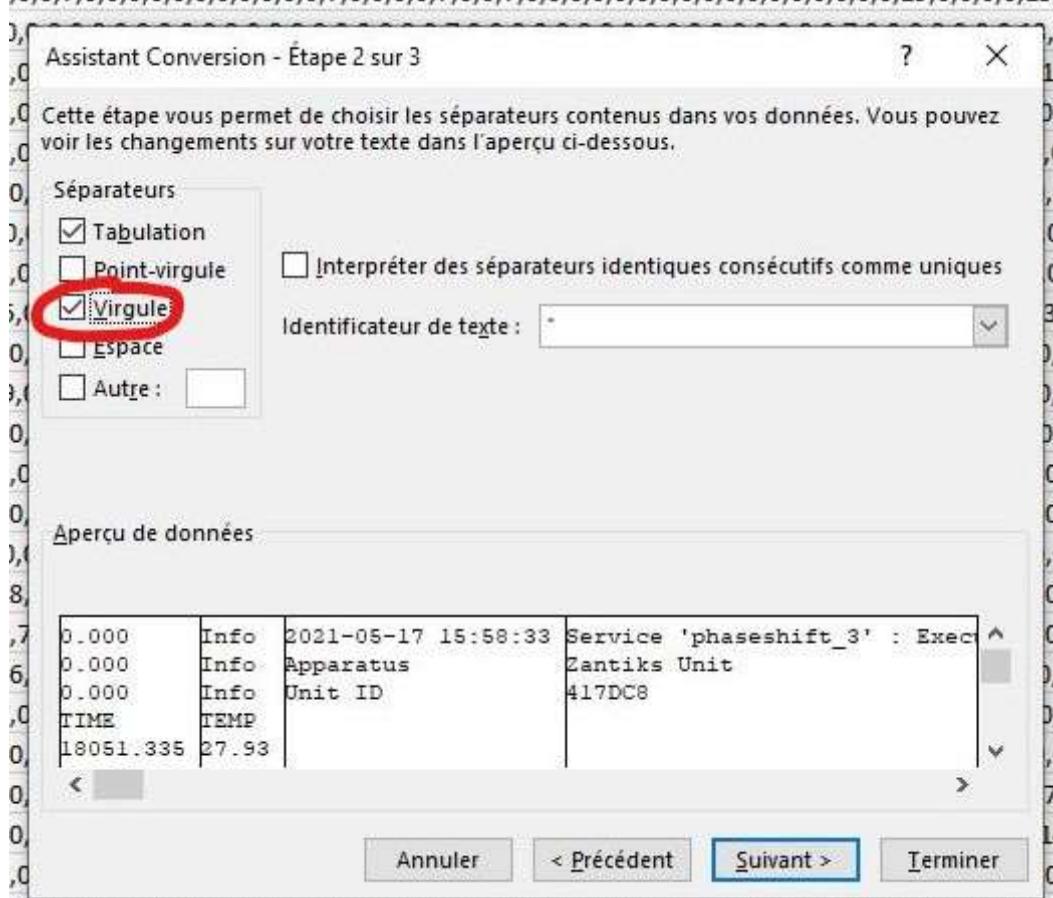
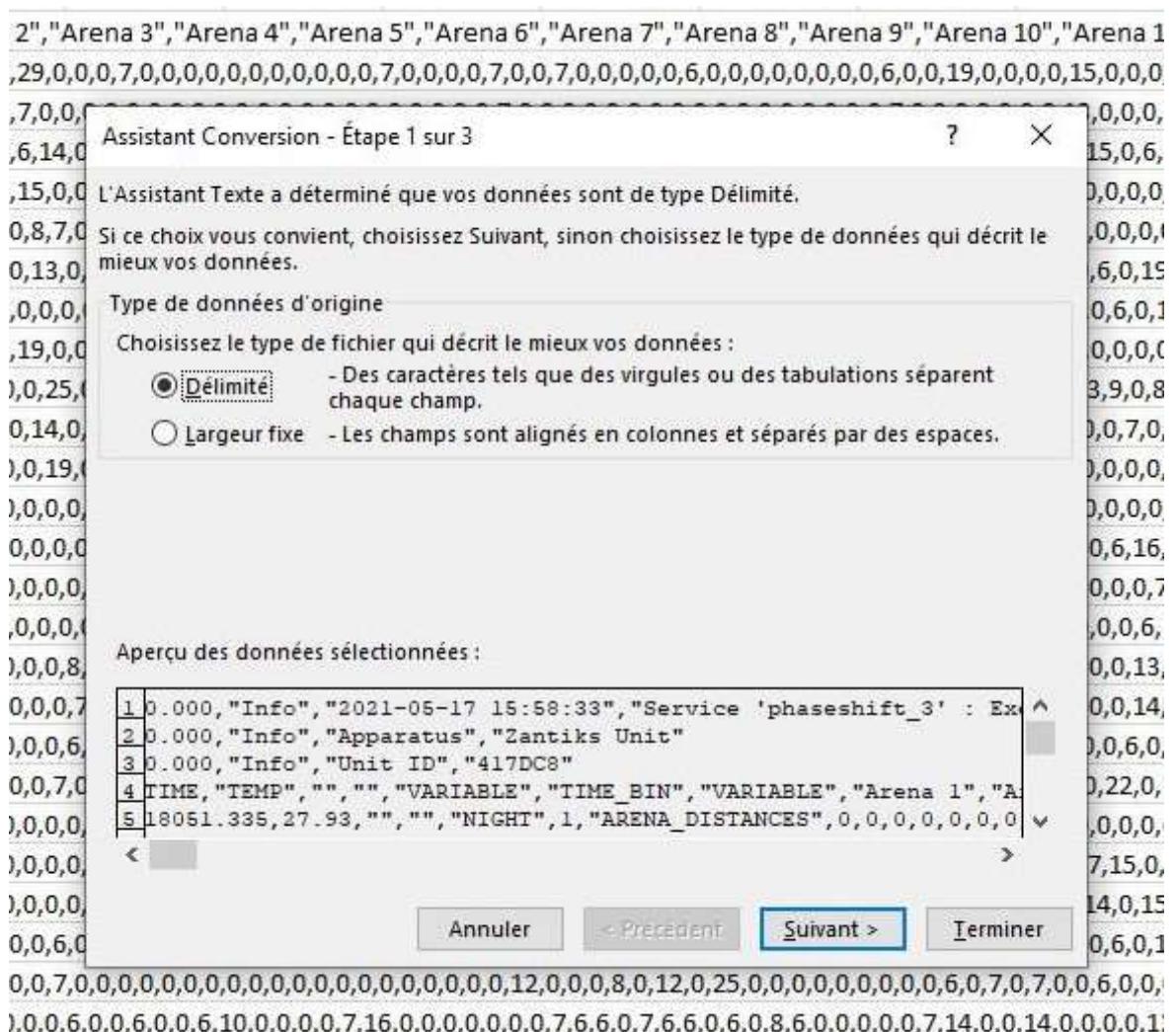
Clair Chaigne

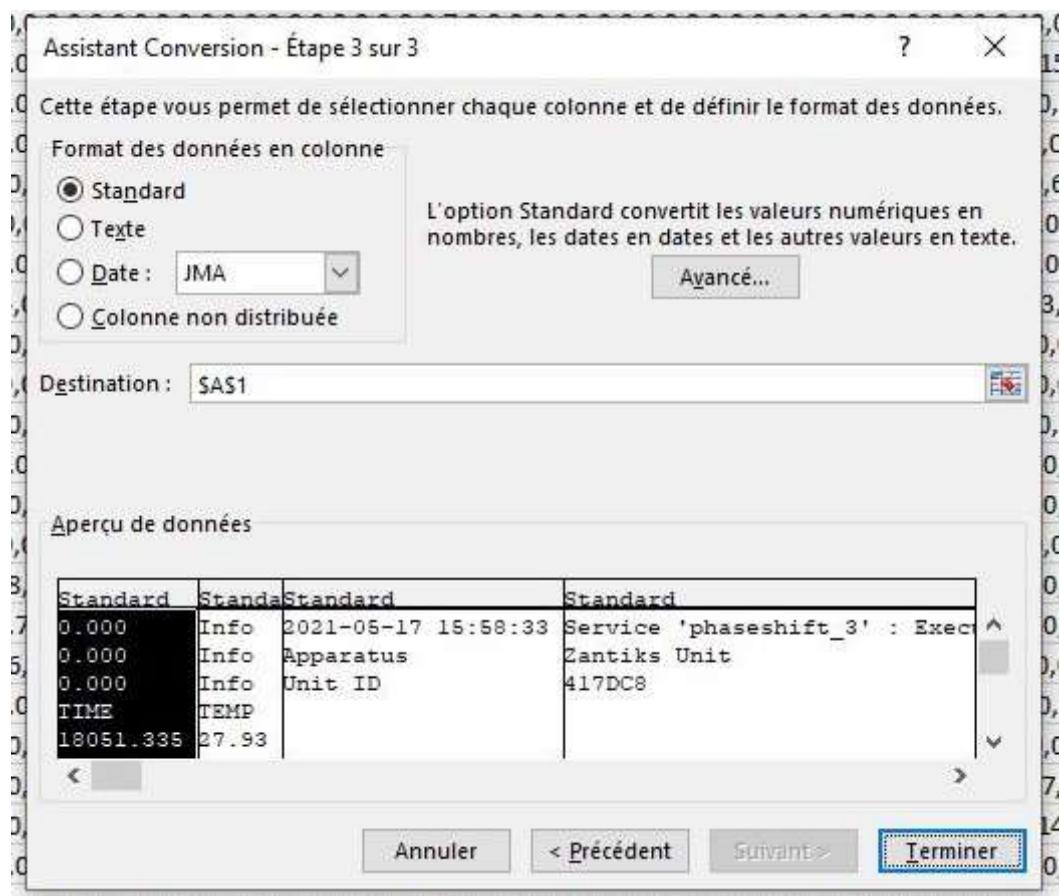
18 mai 2021

1. INSTRUCTIONS

1.1 STEPS

0. the R script used work with zantiks files containing data in seconds and with autoreference of 300 seconds
1. manually transform your zantiks file step 1 : click on the first column, then Donnees , Convertir , delimite , separateur virgule , terminer . your data should now be appropriately separated in





The screenshot shows an Excel spreadsheet with the ribbon menu at the top. The 'Données' tab is selected. The table below has columns A through J. Rows 4 through 38 are highlighted with a red oval. Row 4 contains column headers: TIME, TEMP, VARIABLE, TIME_BIN, VARIABLE, Arena 1, Arena 2, and Arena 3. Rows 5 through 38 contain data points with values such as 18051.335, 27.93, NIGHT, 1 ARENA_DIST, 0, 0, and 0 respectively.

	A	B	C	D	E	F	G	H	I	J
4	TIME	TEMP		VARIABLE	TIME_BIN	VARIABLE	Arena 1	Arena 2	Arena 3	
5	18051.335	27.93		NIGHT	1	ARENA_DIST	0	0		
6	18052.339	27.93		NIGHT	2	ARENA_DIST	0	0		
7	18053.356	27.93		NIGHT	3	ARENA_DIST	0	0		
8	18054.360	27.93		NIGHT	4	ARENA_DIST	0	0		
9	18055.363	28.11		NIGHT	5	ARENA_DIST	0	13		
10	18056.367	28.11		NIGHT	6	ARENA_DIST	0	6		
11	18057.371	28.11		NIGHT	7	ARENA_DIST	7	7		
12	18058.386	28.11		NIGHT	8	ARENA_DIST	0	0		
13	18059.390	27.93		NIGHT	9	ARENA_DIST	0	13		
14	18060.399	27.93		NIGHT	10	ARENA_DIST	0	7		
15	18061.402	27.93		NIGHT	11	ARENA_DIST	0	0		
16	18062.407	27.93		NIGHT	12	ARENA_DIST	0	0		
17	18063.423	27.93		NIGHT	13	ARENA_DIST	0	7		
18	18064.427	27.93		NIGHT	14	ARENA_DIST	8	13		
19	18065.431	27.93		NIGHT	15	ARENA_DIST	0	12		
20	18066.435	27.93		NIGHT	16	ARENA_DIST	6	0		
21	18067.438	28.02		NIGHT	17	ARENA_DIST	0	7		
22	18068.454	28.02		NIGHT	18	ARENA_DIST	0	13		
23	18069.458	28.02		NIGHT	19	ARENA_DIST	7	0		
24	18070.461	28.02		NIGHT	20	ARENA_DIST	0	0		
25	18071.465	27.93		NIGHT	21	ARENA_DIST	0	0		
26	18072.469	27.93		NIGHT	22	ARENA_DIST	7	0		
27	18073.485	27.93		NIGHT	23	ARENA_DIST	0	0		
28	18074.491	27.93		NIGHT	24	ARENA_DIST	0	0		
29	18075.496	27.93		NIGHT	25	ARENA_DIST	7	6		
30	18076.501	27.93		NIGHT	26	ARENA_DIST	0	0		
31	18077.517	27.93		NIGHT	27	ARENA_DIST	0	0		
32	18078.521	27.93		NIGHT	28	ARENA_DIST	0	0		
33	18079.526	27.75		NIGHT	29	ARENA_DIST	0	0		
34	18080.529	27.75		NIGHT	30	ARENA_DIST	7	0		
35	18081.534	27.75		NIGHT	31	ARENA_DIST	0	0		
36	18082.552	27.75		NIGHT	32	ARENA_DIST	0	15		
37	18083.556	27.93		NIGHT	33	ARENA_DIST	0	6		
38	18084.561	27.93		NIGHT	34	ARENA_DIST	0	6		

2. manually transform your zantiks file step 2 : remove the first rows so that it contains the column names ("TIME", "TEMPS", etc...)
3. manually transform your zantiks file step 3 : save your zantiks file as xlsx
4. put your transformed file in the data folder
5. run your corresponding R script : run libraries , set directory , and functions sections and then run your desired sections/lines
6. to export a file go to the export files section with your appropriate file name
7. to export a plot click on export , save as image , choose your width and height, image format, directory (where to save the image) and file name

1.2 TO CHECK IF THERE ARE ANY ISSUES

1. be sure you have the correct libraries installed in R studio : readxl, writexl, dplyr, ggplot2, plotly, data.table (if they are not installed, an error message "aucun package nomme 'nomdelalibrairie' n'est trouve" should appear). To install the library run this command : install.packages("nomdelalibrairie")
2. be sure the set directory is appropriate (it points to the folder which contains your file)
3. be sure your file (in the data folder) is xlsx with the first row containing column names ("TIME", "TEMPS", etc....)

2. EXAMPLE

for this example I used the 2021.04.13 file

- this first line allows to clean the R studio environment (remove functions, variables, data frames etc... to start with a clean workplace)

```
rm(list=ls()) # clean R studio environment
```

2.0.1 LIBRARIES

- load the required libraries

```
library(readxl)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.0.5
```

```
library(plotly)
```

```
##
## Attaching package: 'plotly'
```

```
## The following object is masked from 'package:ggplot2':
##
##     last_plot
```

```
## The following object is masked from 'package:stats':  
##  
##     filter
```

```
## The following object is masked from 'package:graphics':  
##  
##     layout
```

```
library(data.table)
```

```
##  
## Attaching package: 'data.table'
```

```
## The following objects are masked from 'package:dplyr':  
##  
##     between, first, last
```

```
library(writexl)
```

if you get an error message such as

Error in library(readxl) : aucun package nomme 'readxl' n'est trouve , run this line :
install.packages("readxl") and then try to load the libraries again. ----

2.0.2 FUNCTIONS

- load the required functions

```

# Do the sum over n rows
n.colsum = function(df, n){
  # df = data frame to do the sum on
  # n = number of rows to sum
  aggregate(x = df,
            by = list(gl(ceiling(nrow(df)/n), n)[1:nrow(df)]),
            FUN = sum)
}

# Do the mean over n rows
n.colmean<-function(df,n){
  # df = data frame to do the mean on
  # n = number of rows to mean
  aggregate(x = df,
            by = list(gl(ceiling(nrow(df)/n), n)[1:nrow(df)]),
            FUN = mean)
}

# Identify day/night and Light transitions (return row numbers in a vector) from the column VARIABLE...5
transitions<-function(fichier){
  # fichier = zantiks file containing the VARIABLE...5 column specifying DAY/NIGHT/PULSE etc...
  v<-vector()
  for (i in 2:nrow(fichier)){
    if(fichier$VARIABLE...5[i-1]!=fichier$VARIABLE...5[i]){
      v<-c(v,i)
    }
  }
  return(v)
}

# Add transitions to the plot (red line represent night to day transitions, purple : day to night, grey : light pulse)
lignestrans<-function(trans,n){
  # the first transition should be a day to night one, the light pulse should correspond to the 5th transition
  # trans = row numbers in the zantiks file (data in seconds) corresponding to the transitions (identified by the transitions function)
  # n = 60 for the minute plot
  # n = 600 for the 10minute plot
  # n = 3600 for the hour plot
  for(i in 1:length(trans)){
    if((i==5)|(i==6)){ # Light pulse
      abline(v=trans[i]/n,col="grey")}
    else{
      if((i%2==0)){ # night to day
        abline(v=trans[i]/n,col="purple")}
      else{ # day to night
        abline(v=trans[i]/n,col="red")}
    }
  }
}

```

```

# Detect autoreference moments (gaps of 300 seconds every hour)
autoreferences<-function(fichier){
  # fichier = zantiks file
  fichier$TIME <- as.numeric(fichier$TIME)  # transform time column from character to numeric
  autoref <- c()
  for (i in 1:(nrow(fichier)-1)){
    if (fichier$TIME[i+1]-fichier$TIME[i]>60) { # detect gaps of more than 60 seconds in the
      TIME column
      autoref <- c(autoref, i)
    }
  }
  return(autoref)
}

```

2.1 DEFINE FOLDERS

- define the folder containing zantiks files and folder containing results files

```

setwd("Y://ELISE DATA_17Gb a trier//EXCELL+stats//excell//zebrafish locomotor activity//Zanti
ks_Claire//phaseshift_zantiks//data") # folder containing zantiks files
dossier_sortie <- "Y://ELISE DATA_17Gb a trier//EXCELL+stats//excell//zebrafish locomotor acti
vity//Zantiks_Claire//phaseshift_zantiks//resultats" # folder to put transformed files in (me
aned by 10minutes for example)

```

2.2 LOAD FILE

- load the 2021.04.13.xlsx file **CHANGE "yourfile.xlsx" BY THE NAME OF YOUR FILE (don't forget the quotation marks)**

```

# can take several minutes
fichier <- read_excel("2021.04.13.xlsx") # change "yourfile.xlsx" by the name of your file
(don't forget the quotation marks)

```

```

## Warning in read_fun(path = enc2native(normalizePath(path)), sheet_i = sheet, :
## Expecting logical in C349742 / R349742C3: got a date

```

```

## Warning in read_fun(path = enc2native(normalizePath(path)), sheet_i = sheet, :
## Expecting logical in D349742 / R349742C4: got 'Service 'phaseshift_3' :
## Execution end'

```

```

## New names:
## * `` -> ...3
## * `` -> ...4
## * VARIABLE -> VARIABLE...5
## * VARIABLE -> VARIABLE...7

```

- you can check if your file is correctly loaded by looking at the first lines of fichier

```
head(fichier)
```

```

## # A tibble: 6 x 103
##   TIME TEMP ...3 ...4 VARIABLE...5 TIME_BIN VARIABLE...7 `Arena 1` `Arena 2`
##   <chr> <chr> <lgl> <lgl> <chr>          <dbl> <chr>          <dbl> <dbl>
## 1 1875~ 28.02 NA    NA    NIGHT           1 ARENA_DISTA~     0     0
## 2 1875~ 28.02 NA    NA    NIGHT           2 ARENA_DISTA~     0     0
## 3 1875~ 28.02 NA    NA    NIGHT           3 ARENA_DISTA~     0     0
## 4 1875~ 28.02 NA    NA    NIGHT           4 ARENA_DISTA~     0     25
## 5 1875~ 27.93 NA    NA    NIGHT           5 ARENA_DISTA~     0     0
## 6 1875~ 27.93 NA    NA    NIGHT           6 ARENA_DISTA~     6     13
## # ... with 94 more variables: `Arena 3` <dbl>, `Arena 4` <dbl>, `Arena
## # 5` <dbl>, `Arena 6` <dbl>, `Arena 7` <dbl>, `Arena 8` <dbl>, `Arena
## # 9` <dbl>, `Arena 10` <dbl>, `Arena 11` <dbl>, `Arena 12` <dbl>, `Arena
## # 13` <dbl>, `Arena 14` <dbl>, `Arena 15` <dbl>, `Arena 16` <dbl>, `Arena
## # 17` <dbl>, `Arena 18` <dbl>, `Arena 19` <dbl>, `Arena 20` <dbl>, `Arena
## # 21` <dbl>, `Arena 22` <dbl>, `Arena 23` <dbl>, `Arena 24` <dbl>, `Arena
## # 25` <dbl>, `Arena 26` <dbl>, `Arena 27` <dbl>, `Arena 28` <dbl>, `Arena
## # 29` <dbl>, `Arena 30` <dbl>, `Arena 31` <dbl>, `Arena 32` <dbl>, `Arena
## # 33` <dbl>, `Arena 34` <dbl>, `Arena 35` <dbl>, `Arena 36` <dbl>, `Arena
## # 37` <dbl>, `Arena 38` <dbl>, `Arena 39` <dbl>, `Arena 40` <dbl>, `Arena
## # 41` <dbl>, `Arena 42` <dbl>, `Arena 43` <dbl>, `Arena 44` <dbl>, `Arena
## # 45` <dbl>, `Arena 46` <dbl>, `Arena 47` <dbl>, `Arena 48` <dbl>, `Arena
## # 49` <dbl>, `Arena 50` <dbl>, `Arena 51` <dbl>, `Arena 52` <dbl>, `Arena
## # 53` <dbl>, `Arena 54` <dbl>, `Arena 55` <dbl>, `Arena 56` <dbl>, `Arena
## # 57` <dbl>, `Arena 58` <dbl>, `Arena 59` <dbl>, `Arena 60` <dbl>, `Arena
## # 61` <dbl>, `Arena 62` <dbl>, `Arena 63` <dbl>, `Arena 64` <dbl>, `Arena
## # 65` <dbl>, `Arena 66` <dbl>, `Arena 67` <dbl>, `Arena 68` <dbl>, `Arena
## # 69` <dbl>, `Arena 70` <dbl>, `Arena 71` <dbl>, `Arena 72` <dbl>, `Arena
## # 73` <dbl>, `Arena 74` <dbl>, `Arena 75` <dbl>, `Arena 76` <dbl>, `Arena
## # 77` <dbl>, `Arena 78` <dbl>, `Arena 79` <dbl>, `Arena 80` <dbl>, `Arena
## # 81` <dbl>, `Arena 82` <dbl>, `Arena 83` <dbl>, `Arena 84` <dbl>, `Arena
## # 85` <dbl>, `Arena 86` <dbl>, `Arena 87` <dbl>, `Arena 88` <dbl>, `Arena
## # 89` <dbl>, `Arena 90` <dbl>, `Arena 91` <dbl>, `Arena 92` <dbl>, `Arena
## # 93` <dbl>, `Arena 94` <dbl>, `Arena 95` <dbl>, `Arena 96` <dbl>

```

2.3 CLEAN FILE AND FILL AUTOREFENCE GAPS

- remove the last line containing NAs

```
fichier <- fichier[-(nrow(fichier)), ] # remove the Last Line containing NAs
```

- the next lines are used to make another data frame, fichier2 (in seconds) from fichier (also in seconds), where the 300 seconds autoreference gaps are filled ** USE THE LINE

```
fichier2 <- fichier[c(1:300), ] ONLY IF YOUR ZANTIKS SCRIPT STARTS WITH AN
AUTOREFERENCE (like in phaseshift_3 or phaseshift_4)**
```

```

autoref <- autoreferences(fichier) # detect the lines preceding an autoreference
# next line to use if your zantiks script begins with an autoreference just after lightoff (like in phaseshift_3 and phaseshift_4)
fichier2 <- fichier[c(1:300), ] # copy the first 300 seconds of fichier
fichier2 <- rbind(fichier2, fichier[c(1:autoref[1]), ]) # copy data until the first autoreference
for (i in c(1:(length(autoref))-1)){
  fichier2 <- rbind(fichier2, fichier[c((autoref[i]-299):autoref[i]), ]) # copy and add the data of the previous 300 seconds before the ith autoref to fill the gap
  fichier2 <- rbind(fichier2, fichier[c((autoref[i]+1):autoref[(i+1)]), ]) # add the data from the ith autoref to the next autoref
}
fichier2 <- rbind(fichier2, fichier[c((autoref[length(autoref])-299):autoref[length(autoref)]), ]) # copy and add the data of the previous 300 seconds before the last autoref to fill the gap
fichier2 <- rbind(fichier2, fichier[c((autoref[length(autoref)]+1):nrow(fichier)), ]) # add the data from the last autoref to the last row

```

- you can check that your fichier2 is correctly created by looking at its first lines

```
head(fichier2)
```

```

## # A tibble: 6 x 103
##   TIME TEMP ...3 ...4 VARIABLE...5 TIME_BIN VARIABLE...7 `Arena 1` `Arena 2`
##   <chr> <chr> <lgl> <lgl> <chr>          <dbl> <chr>          <dbl> <dbl>
## 1 1875~ 28.02 NA    NA    NIGHT           1 ARENA_DISTA~     0     0
## 2 1875~ 28.02 NA    NA    NIGHT           2 ARENA_DISTA~     0     0
## 3 1875~ 28.02 NA    NA    NIGHT           3 ARENA_DISTA~     0     0
## 4 1875~ 28.02 NA    NA    NIGHT           4 ARENA_DISTA~     0     25
## 5 1875~ 27.93 NA    NA    NIGHT           5 ARENA_DISTA~     0     0
## 6 1875~ 27.93 NA    NA    NIGHT           6 ARENA_DISTA~     6     13
## # ... with 94 more variables: `Arena 3` <dbl>, `Arena 4` <dbl>, `Arena
## # 5` <dbl>, `Arena 6` <dbl>, `Arena 7` <dbl>, `Arena 8` <dbl>, `Arena
## # 9` <dbl>, `Arena 10` <dbl>, `Arena 11` <dbl>, `Arena 12` <dbl>, `Arena
## # 13` <dbl>, `Arena 14` <dbl>, `Arena 15` <dbl>, `Arena 16` <dbl>, `Arena
## # 17` <dbl>, `Arena 18` <dbl>, `Arena 19` <dbl>, `Arena 20` <dbl>, `Arena
## # 21` <dbl>, `Arena 22` <dbl>, `Arena 23` <dbl>, `Arena 24` <dbl>, `Arena
## # 25` <dbl>, `Arena 26` <dbl>, `Arena 27` <dbl>, `Arena 28` <dbl>, `Arena
## # 29` <dbl>, `Arena 30` <dbl>, `Arena 31` <dbl>, `Arena 32` <dbl>, `Arena
## # 33` <dbl>, `Arena 34` <dbl>, `Arena 35` <dbl>, `Arena 36` <dbl>, `Arena
## # 37` <dbl>, `Arena 38` <dbl>, `Arena 39` <dbl>, `Arena 40` <dbl>, `Arena
## # 41` <dbl>, `Arena 42` <dbl>, `Arena 43` <dbl>, `Arena 44` <dbl>, `Arena
## # 45` <dbl>, `Arena 46` <dbl>, `Arena 47` <dbl>, `Arena 48` <dbl>, `Arena
## # 49` <dbl>, `Arena 50` <dbl>, `Arena 51` <dbl>, `Arena 52` <dbl>, `Arena
## # 53` <dbl>, `Arena 54` <dbl>, `Arena 55` <dbl>, `Arena 56` <dbl>, `Arena
## # 57` <dbl>, `Arena 58` <dbl>, `Arena 59` <dbl>, `Arena 60` <dbl>, `Arena
## # 61` <dbl>, `Arena 62` <dbl>, `Arena 63` <dbl>, `Arena 64` <dbl>, `Arena
## # 65` <dbl>, `Arena 66` <dbl>, `Arena 67` <dbl>, `Arena 68` <dbl>, `Arena
## # 69` <dbl>, `Arena 70` <dbl>, `Arena 71` <dbl>, `Arena 72` <dbl>, `Arena
## # 73` <dbl>, `Arena 74` <dbl>, `Arena 75` <dbl>, `Arena 76` <dbl>, `Arena
## # 77` <dbl>, `Arena 78` <dbl>, `Arena 79` <dbl>, `Arena 80` <dbl>, `Arena
## # 81` <dbl>, `Arena 82` <dbl>, `Arena 83` <dbl>, `Arena 84` <dbl>, `Arena
## # 85` <dbl>, `Arena 86` <dbl>, `Arena 87` <dbl>, `Arena 88` <dbl>, `Arena
## # 89` <dbl>, `Arena 90` <dbl>, `Arena 91` <dbl>, `Arena 92` <dbl>, `Arena
## # 93` <dbl>, `Arena 94` <dbl>, `Arena 95` <dbl>, `Arena 96` <dbl>

```

for the rest of the analysis in this example I will only use fichier2

2.4 SPECIFICATION OF GENOTYPES

- SPECIFY THE CORRESPONDING ARENA NUMBERS TO THE CONDITIONS/GENOTYPES YOU WANT TO MAKE A PLOT FROM**

```

pig <- c(1,4,7,12,23,30,42,45,46,47,54,58,60,63,66,69,76,80,82,85,88,92,96)
bad <- c(32,39,44,51,56,59,70,71) # arenas to discard from plots
notpig <- c(1:96)[!(c(1:96)%in%bad)&!(c(1:96)%in%pig)]
good <- c(1:96)[!(c(1:96)%in%bad)] # all good arenas (pigmented and not pigmented larvae)

double <- c(7,30,42,45,63,69,76,85,88)
ctrl <- c(3,18,27,34,35,52,55,73,74,84,91,94)
opn4xa <- c(2,8,16,24,25,33,36,50,57,61,67,77,83)
lak <- c(4,46,47,54,80)

```

2.5 DETECTION OF TRANSITIONS

- detect the transitions rows

```
t2<-transitions(fichier2) # detection of transitions row in fichier2
t2 # Look at t2
```

```
## [1] 32401 82801 118801 169201 176461 183721 205441 255841 291841 342241
## [11] 378241
```

- extract row numbers corresponding to the transitions +/- 60 seconds

```
dtol2 <- c((t2[5]-60):(t2[5]+60))
ltod2 <- c((t2[6]-60):(t2[6]+60)) # ATTENTION if used phaseshift_3 use this instead :ltod2<-
c((t2[6]):(t2[6]+120))
ltod2<-c((t2[6]):(t2[6]+120))
dtol2 # Look at dtol2
```

```
## [1] 176401 176402 176403 176404 176405 176406 176407 176408 176409 176410
## [11] 176411 176412 176413 176414 176415 176416 176417 176418 176419 176420
## [21] 176421 176422 176423 176424 176425 176426 176427 176428 176429 176430
## [31] 176431 176432 176433 176434 176435 176436 176437 176438 176439 176440
## [41] 176441 176442 176443 176444 176445 176446 176447 176448 176449 176450
## [51] 176451 176452 176453 176454 176455 176456 176457 176458 176459 176460
## [61] 176461 176462 176463 176464 176465 176466 176467 176468 176469 176470
## [71] 176471 176472 176473 176474 176475 176476 176477 176478 176479 176480
## [81] 176481 176482 176483 176484 176485 176486 176487 176488 176489 176490
## [91] 176491 176492 176493 176494 176495 176496 176497 176498 176499 176500
## [101] 176501 176502 176503 176504 176505 176506 176507 176508 176509 176510
## [111] 176511 176512 176513 176514 176515 176516 176517 176518 176519 176520
## [121] 176521
```

```
ltod2 # Look at ltod2
```

```
## [1] 183721 183722 183723 183724 183725 183726 183727 183728 183729 183730
## [11] 183731 183732 183733 183734 183735 183736 183737 183738 183739 183740
## [21] 183741 183742 183743 183744 183745 183746 183747 183748 183749 183750
## [31] 183751 183752 183753 183754 183755 183756 183757 183758 183759 183760
## [41] 183761 183762 183763 183764 183765 183766 183767 183768 183769 183770
## [51] 183771 183772 183773 183774 183775 183776 183777 183778 183779 183780
## [61] 183781 183782 183783 183784 183785 183786 183787 183788 183789 183790
## [71] 183791 183792 183793 183794 183795 183796 183797 183798 183799 183800
## [81] 183801 183802 183803 183804 183805 183806 183807 183808 183809 183810
## [91] 183811 183812 183813 183814 183815 183816 183817 183818 183819 183820
## [101] 183821 183822 183823 183824 183825 183826 183827 183828 183829 183830
## [111] 183831 183832 183833 183834 183835 183836 183837 183838 183839 183840
## [121] 183841
```

2.6 CHECKPOINTS

- check that the transitions in fichier2 are spaced appropriately

```

for(i in c(1:(length(t2)-1))){ # should be 14, 10, 14, ~2, ~2, ~6, 14, 10, 14, 10
  print(i)
  print((t2[i+1]-t2[i])/3600) # to have the spacing between transitions in hours
}

```

```

## [1] 1
## [1] 14
## [1] 2
## [1] 10
## [1] 3
## [1] 14
## [1] 4
## [1] 4
## [1] 2.016667
## [1] 5
## [1] 2.016667
## [1] 6
## [1] 6.033333
## [1] 7
## [1] 14
## [1] 8
## [1] 10
## [1] 9
## [1] 14
## [1] 10
## [1] 10

```

- check that there is indeed an autoref gap between the autoref rows detected and their respective next rows

```

fichier$TIME<-as.numeric(fichier$TIME) # transform time column from character to numeric
check<-c()
for (i in 1:(length(autoref))){
  d<-fichier[c((autoref[i]-10):(autoref[i]+10)), ]
  check<-c(check,(d$TIME[12]-d$TIME[11]))
}
check # should be around 301 seconds each time

```

```

## [1] 301.117 301.100 301.118 301.148 301.216 301.114 301.114 301.101 301.067
## [10] 301.052 301.107 301.149 301.107 301.135 301.121 301.119 301.140 301.129
## [19] 301.120 301.147 301.141 301.139 301.080 301.068 301.141 301.136 301.115
## [28] 301.140 301.117 301.142 301.111 301.099 301.036 301.050 301.119 301.167
## [37] 301.109 301.143 301.143 301.110 301.111 301.138 301.138 301.151 301.108
## [46] 301.135 301.039 301.037 301.113 301.116 301.172 301.135 301.152 301.128
## [55] 301.114 301.137 301.045 301.047 301.145 301.167 301.155 301.125 301.118
## [64] 301.113 301.106 301.123 301.121 301.107 301.154 301.169 301.048 301.041
## [73] 301.109 301.145 301.110 301.173 301.098 301.106 301.122 301.099 301.039
## [82] 301.048 301.098 301.149 301.140 301.171 301.169 301.134 301.140 301.122
## [91] 301.127 301.112 301.108 301.114 301.051 301.039 301.146 301.141 301.112
## [100] 301.107 301.134 301.106 301.117 301.131 301.039 301.036

```

- check that the differences in the number of rows between fichier and fichier2 are correct (for 106 autoref (phaseshift_3 and phaseshift_4) we should have (number of autoref * length of autoref + length of the first autoref) 106*300+300=32100 seconds of differences)

```
nrow(fichier2)-nrow(fichier) # ok 32100 secondes
```

```
## [1] 32100
```

2.7 TRANSFORM FILE

- let's transform our fichier2 (who is in seconds) in minutes

```
fichiermin2 <- n.colsum(fichier2[,c(8:ncol(fichier2))],n=60) # our first arena is in the 8th column
```

- we now have the distance travelled in minutes

```
head(fichiermin2)
```

##	Group.1	Arena 1	Arena 2	Arena 3	Arena 4	Arena 5	Arena 6	Arena 7	Arena 8
## 1	1	194	85	82	371	0	55	0	664
## 2	2	0	0	6	463	23	19	0	579
## 3	3	0	0	6	429	66	0	0	589
## 4	4	0	0	0	352	7	0	402	370
## 5	5	121	0	0	548	30	0	0	719
## 6	6	194	85	82	371	0	55	0	664
##	Arena 9	Arena 10	Arena 11	Arena 12	Arena 13	Arena 14	Arena 15	Arena 16	
## 1	0	0	424	472	383	374	413	0	
## 2	141	0	264	464	377	408	320	192	
## 3	0	0	339	364	62	382	234	29	
## 4	0	0	487	330	224	426	468	98	
## 5	26	0	202	371	0	244	341	254	
## 6	0	0	424	472	383	374	413	0	
##	Arena 17	Arena 18	Arena 19	Arena 20	Arena 21	Arena 22	Arena 23	Arena 24	
## 1	161	179	340	83	0	78	266	77	
## 2	15	274	148	0	0	117	44	69	
## 3	157	238	0	0	51	53	147	26	
## 4	0	314	0	0	0	95	26	58	
## 5	0	129	80	6	0	82	0	44	
## 6	161	179	340	83	0	78	266	77	
##	Arena 25	Arena 26	Arena 27	Arena 28	Arena 29	Arena 30	Arena 31	Arena 32	
## 1	154	159	466	163	171	119	250	122	
## 2	158	162	527	95	170	0	243	60	
## 3	0	207	572	136	179	101	218	66	
## 4	0	211	488	170	215	49	200	104	
## 5	0	171	603	0	124	0	229	111	
## 6	154	159	466	163	171	119	250	122	
##	Arena 33	Arena 34	Arena 35	Arena 36	Arena 37	Arena 38	Arena 39	Arena 40	
## 1	14	0	14	137	6	142	1197	119	
## 2	0	0	0	125	0	184	1048	114	
## 3	8	0	0	71	0	160	635	140	
## 4	0	0	0	106	30	115	209	82	
## 5	0	0	0	77	0	0	1288	56	
## 6	14	0	14	137	6	142	1197	119	
##	Arena 41	Arena 42	Arena 43	Arena 44	Arena 45	Arena 46	Arena 47	Arena 48	
## 1	605	0	232	136	0	182	199	198	
## 2	365	15	165	0	0	180	186	167	
## 3	324	0	268	0	0	149	310	129	
## 4	380	0	196	0	0	147	180	81	
## 5	338	0	299	0	139	0	144	34	
## 6	605	0	232	136	0	182	199	198	
##	Arena 49	Arena 50	Arena 51	Arena 52	Arena 53	Arena 54	Arena 55	Arena 56	
## 1	34	260	0	227	132	217	193	248	
## 2	7	211	0	185	199	179	55	287	
## 3	0	142	0	7	185	106	97	148	
## 4	0	108	0	0	140	14	38	114	
## 5	0	36	0	0	97	0	19	0	
## 6	34	260	0	227	132	217	193	248	
##	Arena 57	Arena 58	Arena 59	Arena 60	Arena 61	Arena 62	Arena 63	Arena 64	
## 1	127	262	36	0	100	290	60	226	
## 2	52	105	0	99	6	150	43	174	
## 3	12	254	20	0	0	121	99	185	
## 4	61	198	7	0	0	122	31	70	
## 5	33	186	0	0	0	25	37	33	

```

## 6      127      262      36       0     100      290      60     226
## Arena 65 Arena 66 Arena 67 Arena 68 Arena 69 Arena 70 Arena 71 Arena 72
## 1      234      139     103     210      59     121     274      72
## 2      325      120     205     226     107      97     107       8
## 3      299      128     110     105      94     525      34       0
## 4      154      122     163     140       7     618     110      36
## 5      206      36      54     140       0      68      37       0
## 6      234      139     103     210      59     121     274      72
## Arena 73 Arena 74 Arena 75 Arena 76 Arena 77 Arena 78 Arena 79 Arena 80
## 1      221      252      85     228      60     216     193     104
## 2      35       196      91     240      49     206     241       0
## 3      133      27      87     184      36      67     253       0
## 4      144       0      53      88      40     194     212      20
## 5      132      26     125     163      66     206      49       0
## 6      221      252      85     228      60     216     193     104
## Arena 81 Arena 82 Arena 83 Arena 84 Arena 85 Arena 86 Arena 87 Arena 88
## 1      124      165     547     186       7     128      61       0
## 2      85       115     542      87       0     309       0       0
## 3      73       14      523      71       0     107       0      38
## 4      25       0     145       7       0     126       0       8
## 5      67       0      77       0       0      71       0      16
## 6      124      165     547     186       7     128      61       0
## Arena 89 Arena 90 Arena 91 Arena 92 Arena 93 Arena 94 Arena 95 Arena 96
## 1      221      26      14     280     191      77      88      44
## 2      248      21       0     300     235      26      88     110
## 3      113       6       0     113      13      27      43       0
## 4      193       0       0     124      95      13      64      79
## 5      145       0       0       0      66      38      92      12
## 6      221      26      14     280     191      77      88      44

```

- let's transform our fichier2min (in minutes) in minutes travelled meanned over 10 minutes

```
fichier10min2<-n.colmean(fichiermin2[,c(2:ncol(fichiermin2))],n=10) # our first arena is in  
the 2nd column
```

- we now have the distance travelled in minutes meanned over ten minutes

```
head(fichier10min2)
```

##	Group.1	Arena 1	Arena 2	Arena 3	Arena 4	Arena 5	Arena 6	Arena 7	Arena 8
## 1	1	63.0	17.0	18.8	432.6	25.2	14.8	80.4	584.2
## 2	2	15.0	56.0	0.0	211.9	15.3	2.8	4.8	173.7
## 3	3	0.0	68.1	0.0	75.8	1.3	0.0	0.0	8.6
## 4	4	0.0	37.5	0.0	67.6	7.4	13.8	0.0	71.1
## 5	5	5.5	50.0	0.0	0.0	23.5	2.6	0.0	30.4
## 6	6	2.9	9.9	6.0	0.6	22.8	4.8	0.0	0.0
##	Arena 9	Arena 10	Arena 11	Arena 12	Arena 13	Arena 14	Arena 15	Arena 16	
## 1	33.4	0.0	343.2	400.2	209.2	366.8	355.2	114.6	
## 2	29.6	20.1	53.4	177.4	6.5	145.9	40.0	0.0	
## 3	11.9	7.6	23.5	0.0	0.0	0.0	0.6	0.0	
## 4	0.0	13.3	54.0	2.2	15.7	23.1	5.0	11.5	
## 5	0.0	20.9	30.7	3.5	23.6	143.2	1.2	11.0	
## 6	0.0	8.6	13.9	12.9	0.0	99.0	0.0	0.0	
##	Arena 17	Arena 18	Arena 19	Arena 20	Arena 21	Arena 22	Arena 23	Arena 24	
## 1	66.6	226.8	113.6	17.8	10.2	85.0	96.6	54.8	
## 2	10.8	117.5	47.6	1.3	0.0	99.4	0.0	46.7	
## 3	0.0	38.7	27.6	0.0	0.0	85.4	14.3	18.1	
## 4	0.0	0.0	38.9	0.0	0.0	5.8	28.6	0.0	
## 5	0.0	46.2	62.1	0.0	4.8	7.6	0.0	5.5	
## 6	0.0	98.6	59.0	7.5	0.0	46.3	0.0	19.9	
##	Arena 25	Arena 26	Arena 27	Arena 28	Arena 29	Arena 30	Arena 31	Arena 32	
## 1	62.4	182.0	531.2	112.8	171.8	53.8	228.0	92.6	
## 2	0.0	18.9	261.8	0.0	59.3	112.3	239.3	38.2	
## 3	2.0	10.5	0.0	0.0	90.0	79.2	181.5	23.4	
## 4	11.4	29.3	0.0	12.5	95.7	48.8	153.5	22.4	
## 5	58.2	17.4	0.0	3.5	62.2	105.1	140.9	27.9	
## 6	26.2	87.8	0.0	0.0	53.3	71.6	162.6	22.0	
##	Arena 33	Arena 34	Arena 35	Arena 36	Arena 37	Arena 38	Arena 39	Arena 40	
## 1	4.4	0.0	2.8	103.2	7.2	120.2	875.4	102.2	
## 2	132.7	0.0	0.0	12.9	20.1	7.0	884.5	10.0	
## 3	930.1	0.0	18.9	21.4	29.2	7.3	2912.8	15.5	
## 4	454.6	0.0	33.6	2.1	21.7	44.0	2841.3	1.7	
## 5	42.3	3.1	12.3	17.0	2.4	38.2	3183.1	18.5	
## 6	75.4	0.0	1.4	0.0	2.0	40.2	2711.0	17.7	
##	Arena 41	Arena 42	Arena 43	Arena 44	Arena 45	Arena 46	Arena 47	Arena 48	
## 1	402.4	3.0	232.0	27.2	27.8	131.6	203.8	121.8	
## 2	236.9	59.4	203.0	13.3	146.6	17.4	107.1	1.2	
## 3	26.8	29.7	91.5	34.3	285.8	42.7	31.2	10.6	
## 4	71.2	0.0	0.0	0.0	0.0	39.0	21.3	22.0	
## 5	90.9	0.0	10.8	216.4	0.0	24.9	39.1	23.2	
## 6	111.7	0.0	1.8	145.6	0.0	12.3	23.6	7.7	
##	Arena 49	Arena 50	Arena 51	Arena 52	Arena 53	Arena 54	Arena 55	Arena 56	
## 1	8.2	151.4	0	83.8	150.6	103.2	80.4	159.4	
## 2	0.0	0.0	0	0.0	94.6	2.3	4.2	79.6	
## 3	19.0	8.7	0	12.2	82.0	16.4	28.5	47.1	
## 4	20.1	9.9	0	12.8	48.6	43.0	40.3	4.6	
## 5	47.7	10.3	0	24.3	49.0	3.3	50.0	10.6	
## 6	1.3	44.3	0	46.2	55.2	0.6	37.3	24.0	
##	Arena 57	Arena 58	Arena 59	Arena 60	Arena 61	Arena 62	Arena 63	Arena 64	
## 1	57.0	201.0	12.6	19.8	21.2	141.6	54.0	137.6	
## 2	1415.0	86.0	3.0	85.1	2.7	84.7	25.4	4.6	
## 3	4634.8	1078.4	4.5	35.8	5.3	26.2	15.0	36.9	
## 4	3784.0	560.5	1.6	2.6	2.9	0.0	2.8	2.7	
## 5	13.1	10.1	10.0	38.8	12.4	24.2	0.0	20.1	

```

## 6      25.6     14.9     15.0     34.5     11.6     35.8      0.0     9.5
## Arena 65 Arena 66 Arena 67 Arena 68 Arena 69 Arena 70 Arena 71 Arena 72
## 1     243.6    109.0    127.0    164.2     53.4    285.8    112.4    23.2
## 2      27.3      0.7     10.0     72.3     35.3      6.6     77.2     4.4
## 3     22.2     12.5      3.4    140.7     28.7     75.4     80.3    21.5
## 4     62.1     13.3     24.6    160.3    181.3    295.6     37.4    16.5
## 5     66.0     10.4     28.5   136.7     19.1     44.4     73.9    19.0
## 6     69.1      7.7      0.7   192.2     18.2     25.6    120.8     3.5
## Arena 73 Arena 74 Arena 75 Arena 76 Arena 77 Arena 78 Arena 79 Arena 80
## 1     133.0    100.2     88.2    180.6     50.2    177.8    189.6    24.8
## 2      3.5     55.1     35.0     19.3      7.3     22.4     11.9    51.2
## 3      8.6     37.3     16.6      0.0      0.0     0.0     19.3    27.6
## 4     42.3     31.5     15.5     51.6      2.8     3.0     25.4    47.5
## 5    136.4      5.2     5.6   288.3     19.9     13.7     10.6     0.0
## 6     43.2     9.4     25.2    575.9     32.9     13.2     33.2     0.8
## Arena 81 Arena 82 Arena 83 Arena 84 Arena 85 Arena 86 Arena 87 Arena 88
## 1     74.8     58.8    366.8    70.2      1.4    148.2     12.2    12.4
## 2     55.6     81.2    40.1     38.6      3.1     61.6     32.1    25.0
## 3     26.8   4115.6    72.7     26.9      3.3     26.7     25.4     7.3
## 4     14.8   4208.0    72.9     8.4      8.5     31.8     45.2     0.0
## 5     39.4     36.8    41.6     14.2      3.5     46.0     64.9    21.4
## 6     33.4     23.1      7.2    23.4      0.0     25.9     22.1     1.4
## Arena 89 Arena 90 Arena 91 Arena 92 Arena 93 Arena 94 Arena 95 Arena 96
## 1    184.0     10.6      2.8    163.4    120.0     36.2     75.0    49.0
## 2     80.2      3.5      3.2      2.0     30.9     51.6     91.2     5.5
## 3     16.8      7.0      5.3      7.5     40.3     31.9     42.4     0.6
## 4     36.9      8.0      1.4     26.7     20.5     9.8     40.4     3.1
## 5     74.3     25.3     27.8      4.5     55.1     9.7     35.0     0.0
## 6     37.1     11.2      0.6      7.8     80.6     8.6     36.7     3.9

```

2.8 PLOTS

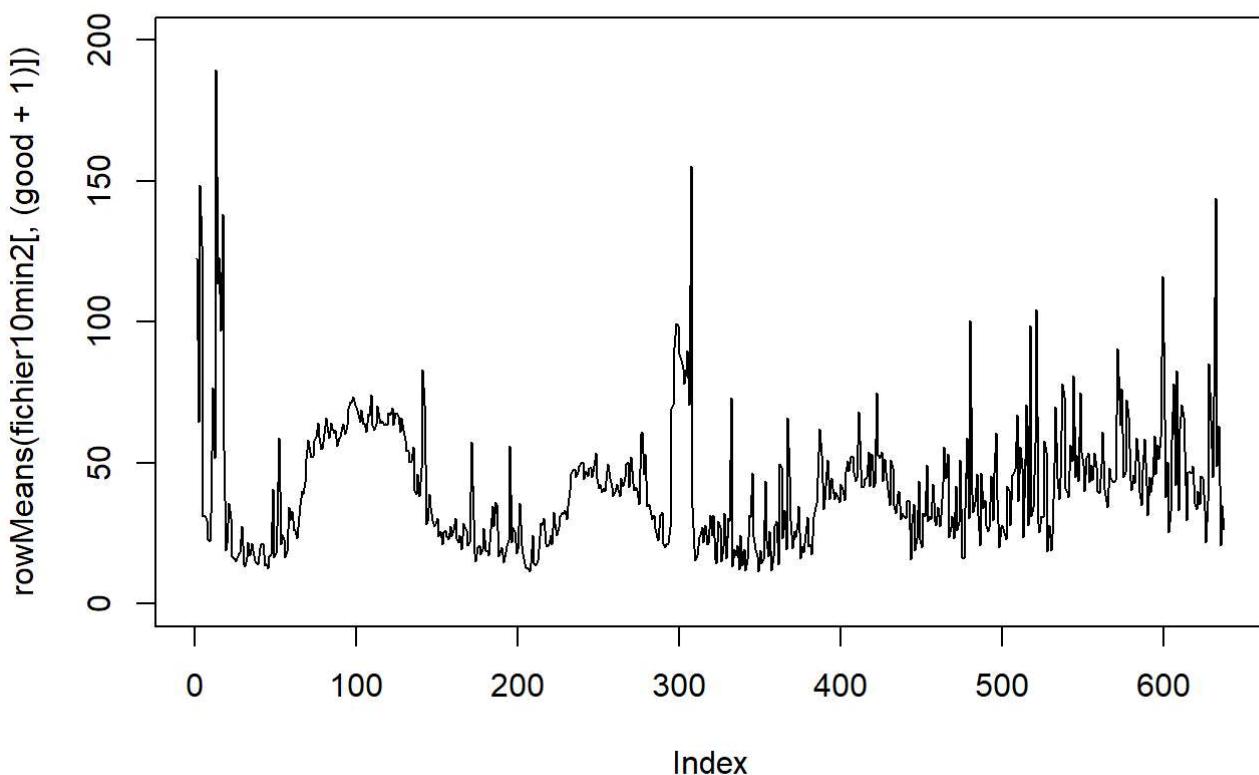
- let's have a look at the mean of all the good arenas (those who do not contain bubbles etc...) in minutes travelled meanned over 10 minutes

```
plot(rowMeans(fichiertoplot[, (genotype+1)]), type = "l", main = "Title", ylim = c(0,maxdey))
```

REPLACE * fichiertoplot by your data (fichiermin, fichier10min, ...) * genotype by your genotype (good, ctrl, lak, opn4xa...) * Title by your plot title (don't forget the quotes) * maxdey by what you want your maximum in y to be (remove ylim = c(0,maxdey) if you don't want to specify this)

```
plot(rowMeans(fichier10min2[, (good+1)]), type = "l", main = "Good arenas 10min mean", ylim = c(0,200))
```

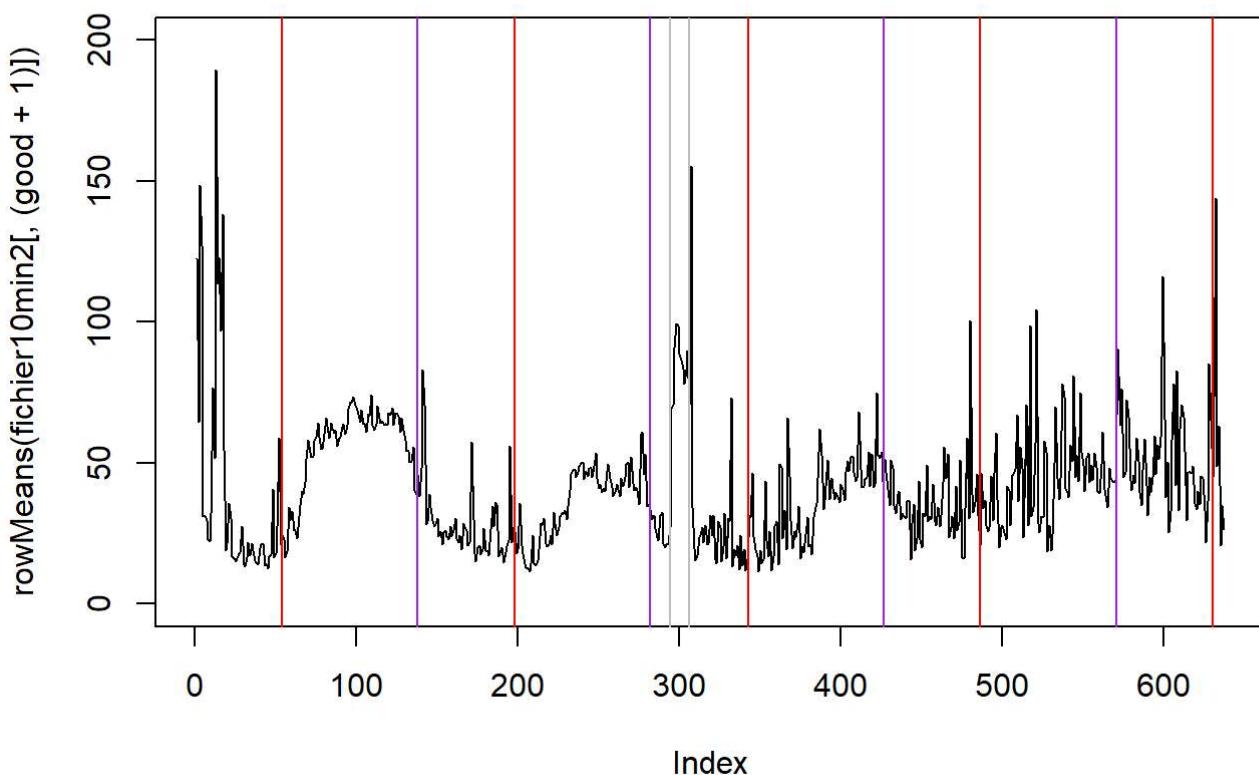
Good arenas 10min mean



- let's look at it with the transitions

```
plot(rowMeans(fichier10min2[, (good+1)]), type = "l", main = "Good arenas 10min mean", ylim = c(0,200))
lignestrans(t2, 600)
```

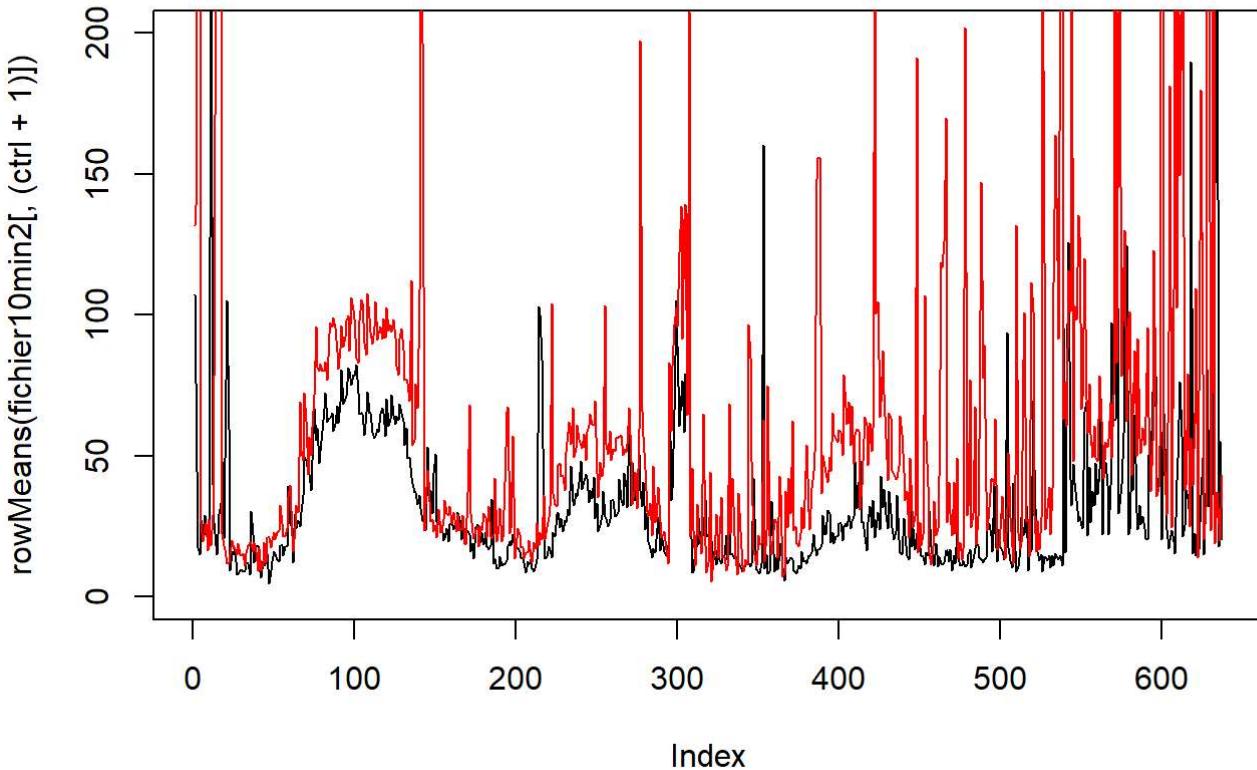
Good arenas 10min mean



- now let's compare ctrl and opn4xa mutants

```
plot(rowMeans(fichier10min2[, (ctrl+1)]), type = "l", main = "Ctrl vs opn4xa 10min mean", ylim = c(0,200)) +
  lines(rowMeans(fichier10min2[, (opn4xa+1)]), type = "l", col = "red")
```

Ctrl vs opn4xa 10min mean



```
## integer(0)
```

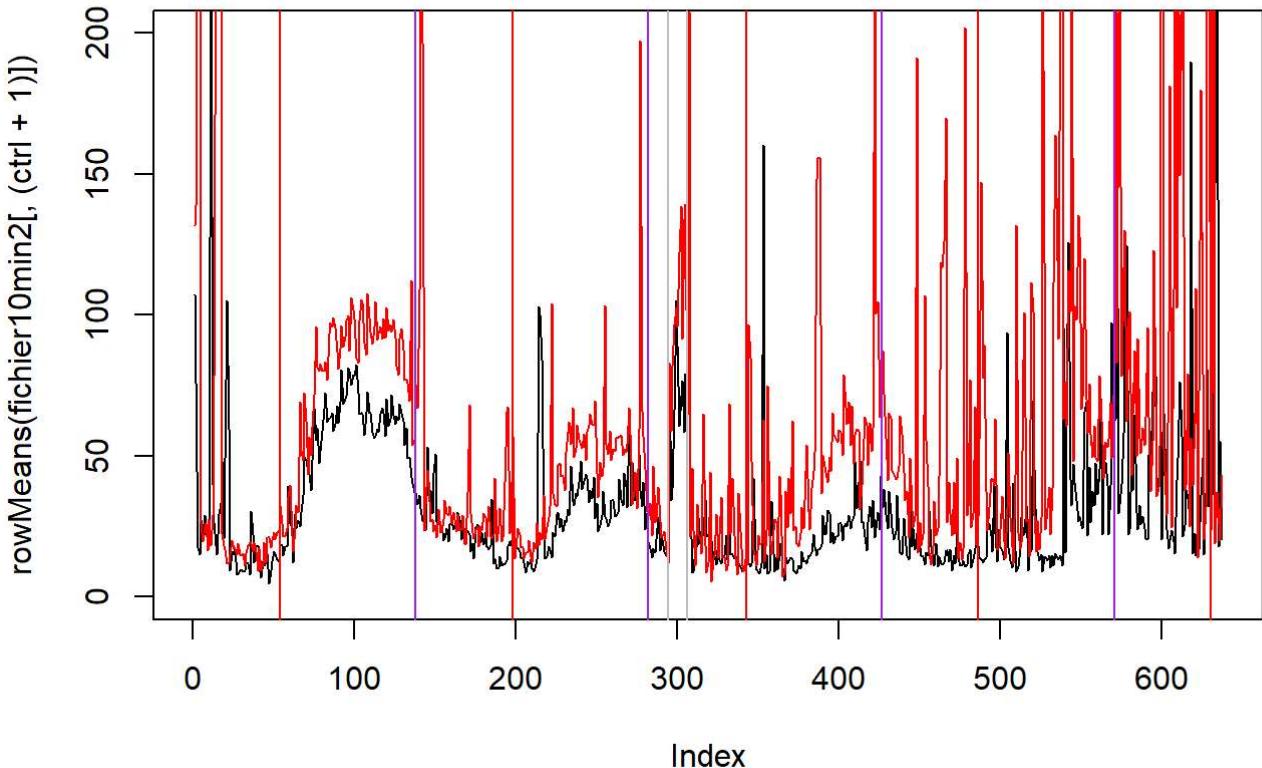
- let's look at it with the transitions

```
plot(rowMeans(fichier10min2[, (ctrl+1)]), type = "l", main = "Ctrl vs opn4xa 10min mean", ylim = c(0,200)) +
  lines(rowMeans(fichier10min2[, (opn4xa+1)]), type = "l", col = "red")
```

```
## integer(0)
```

```
lignestrans(t2,600)
```

Ctrl vs opn4xa 10min mean

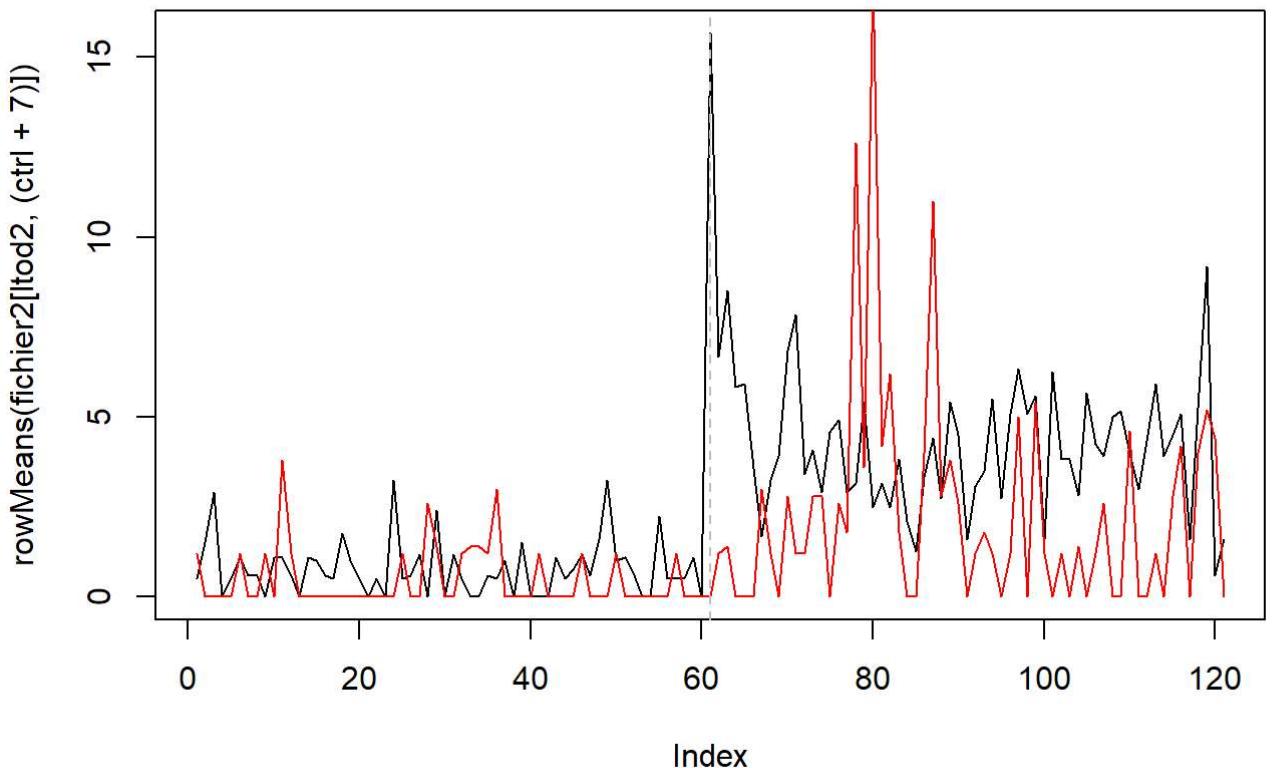


- now let's look at the light to dark transitions +/- 60 seconds for control and lakritz

```
plot(rowMeans(fichier2[1tod2,(ctrl+7)]),type="l")+
  lines(rowMeans(fichier2[1tod2,(lak+7)]),type="l",col="red")
```

```
## integer(0)
```

```
abline(v=61,col="grey",lty=2) # add a grey line at 61 seconds
```

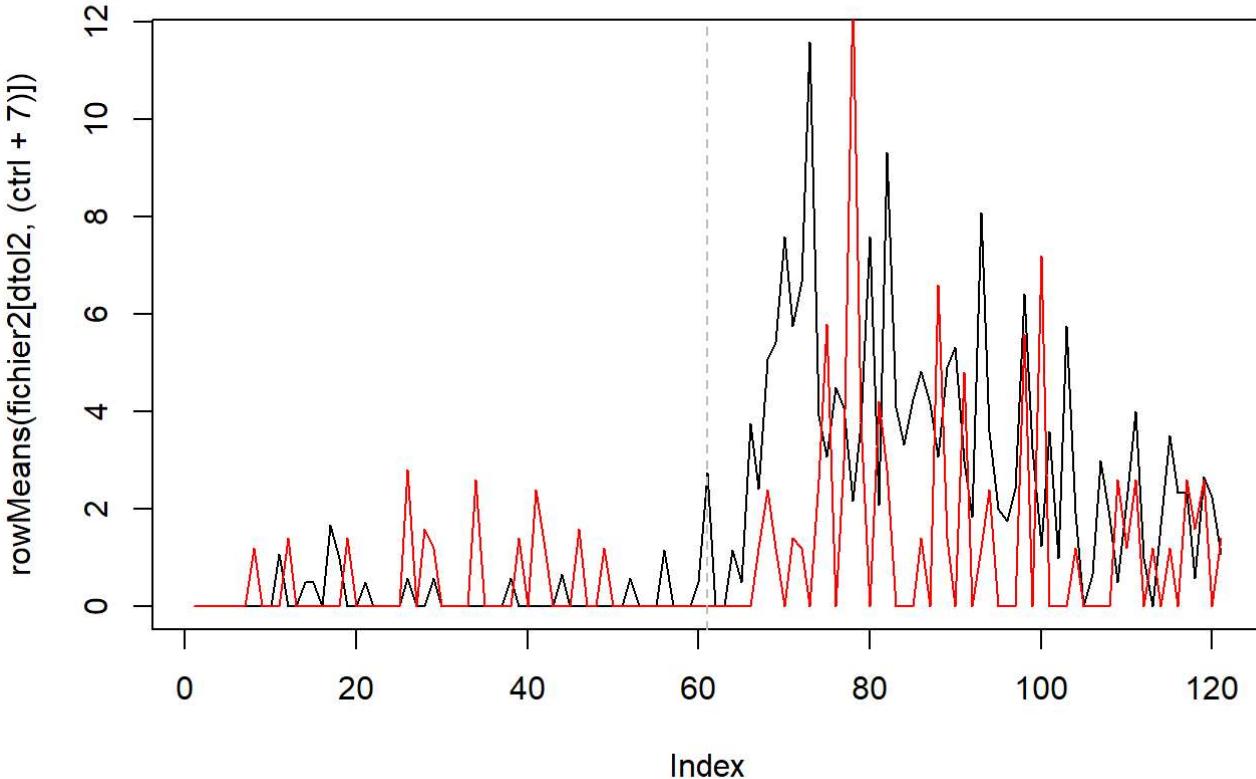


now let's look at the dark to light transitions +/- 60 seconds for control and lakritz

```
plot(rowMeans(fichier2[dtol2,(ctrl+7)]),type="l")+
  lines(rowMeans(fichier2[dtol2,(lak+7)]),type="l",col="red")

## integer(0)

abline(v=61,col="grey",lty=2) # add a grey line at 61 seconds
```



2.9 EXPORT FILES

- let's export our fichier10min2 file **REPLACE "fichiertoexport"" to which file you want to export (fichiermin, fichier10min, etc...) and "nametogive.xlsx" by the name you want to give to this file (don't forget the quotes)**

```
write_xlsx(fichier10min2, path = paste(dossier_sortie,"//","2021.04.13_fichier10min_autoref.xlsx",sep=""), col_names = TRUE)
```