######## fun\_gg\_scatter() #### ggplot2 scatterplot + lines (up to 6 overlays totally)

**# Check OK: clear to go Apollo**

**fun\_gg\_scatter <- function(**

**data1,**

**x,**

**y,**

**categ = NULL,**

**legend.name = NULL,**

**color = NULL,**

**geom = "geom\_point",**

**alpha = 0.5,**

**dot.size = 2,**

**line.size = 0.5,**

**x.lim = NULL,**

**x.lab = NULL,**

**x.log = "no",**

**x.tick.nb = NULL,**

**x.inter.tick.nb = NULL,**

**x.include.zero = FALSE,**

**x.left.extra.margin = 0.05,**

**x.right.extra.margin = 0.05,**

**x.text.angle = 0,**

**y.lim = NULL,**

**y.lab = NULL,**

**y.log = "no",**

**y.tick.nb = NULL,**

**y.inter.tick.nb = NULL,**

**y.include.zero = FALSE,**

**y.top.extra.margin = 0.05,**

**y.bottom.extra.margin = 0.05,**

**y.text.angle = 0,**

**text.size = 12,**

**title = "",**

**title.text.size = 12,**

**show.legend = TRUE,**

**legend.sector.width = 0.5,**

**classic = TRUE,**

**grid = FALSE,**

**raster = FALSE,**

**vectorial.limit = NULL,**

**return = FALSE,**

**plot = TRUE,**

**add = NULL,**

**warn.print = TRUE,**

**lib.path = NULL**

**){**

*# DEBUGGING*

*# set.seed(1) ; obs1 <- data.frame(km = rnorm(1000, 10, 3), time = rnorm(1000, 10, 3), group1 = rep(c("A1", "A2"), 500)) ; obs2 <-data.frame(km = rnorm(1000, 15, 3), time = rnorm(1000, 15, 3), group2 = rep(c("G1", "G2"), 500)) ; set.seed(NULL) ; obs1$km[2:3] <- NA ; data1 = list(L1 = obs1, L2 = obs2) ; x = list(L1 = "km", L2 = "km") ; y = list(L1 = "time", L2 = "time") ; categ = list(L1 = "group1", L2 = "group2") ; legend.name = NULL ; color = list(L1 = 4:5, L2 = 7:8) ; geom = list(L1 = "geom\_point", L2 = "geom\_point") ; alpha = list(L1 = 0.5, L2 = 0.5) ; dot.size = 3 ; line.size = 0.5 ; x.lim = NULL ; x.lab = "KM" ; x.log = "no" ; x.tick.nb = 10 ; x.inter.tick.nb = 1 ; x.left.extra.margin = 0 ; x.right.extra.margin = 0 ; y.lim = c(1, 25) ; y.lab = "TIME (s)" ; y.log = "no" ; y.tick.nb = 5 ; y.inter.tick.nb = 2 ; y.top.extra.margin = 0 ; y.bottom.extra.margin = 0 ; x.include.zero = TRUE ; y.include.zero = TRUE ; x.text.angle = 0 ; y.text.angle = 0 ; text.size = 12 ; title = "" ; title.text.size = 8 ; show.legend = TRUE ; classic = FALSE ; grid = FALSE ; raster = FALSE ; vectorial.limit = NULL ; return = FALSE ; plot = TRUE ; add = NULL ; warn.print = TRUE ; lib.path = NULL*

*# data1 <- list(L1 = data.frame(a = 1:6, b = (1:6)^2, group = c("A", "A", "A", "B", "B", "B")), L2 = data.frame(a = (1:6)\*2, b = ((1:6)^2)\*2, group = c("A1", "A1", "A1", "B1", "B1", "B1")), L3 = data.frame(a = (1:6)\*3, b = ((1:6)^2)\*3, group3 = c("A4", "A5", "A6", "A7", "B4", "B5"))) ; data1$L1$a[3] <- NA ; data1$L1$group[5] <- NA ; data1$L3$group3[4] <- NA ; x = list(L1 = names(data1$L1)[1], L2 = names(data1$L2)[1], L3 = NULL) ; y = list(L1 = names(data1$L1)[2], L2 = names(data1$L2)[2], L3 = "a") ; categ = list(L1 = "group", L2 = NULL, L3 = NULL) ; legend.name = NULL ; color = NULL ; geom = list(L1 = "geom\_point", L2 = "geom\_point", L3 = "geom\_hline") ; alpha = list(L1 = 0.5, L2 = 0.5, L3 = 0.5) ; dot.size = 1 ; line.size = 0.5 ; x.lim = c(14, 4) ; x.lab = NULL ; x.log = "log10" ; x.tick.nb = 10 ; x.inter.tick.nb = 4 ; x.left.extra.margin = 0 ; x.right.extra.margin = 0 ; y.lim = c(60, 5) ; y.lab = NULL ; y.log = "log10" ; y.tick.nb = 10 ; y.inter.tick.nb = 2 ; y.top.extra.margin = 0 ; y.bottom.extra.margin = 0 ; x.include.zero = TRUE ; y.include.zero = TRUE ; x.text.angle = 0 ; y.text.angle = 0 ; text.size = 12 ; title = "" ; title.text.size = 8 ; show.legend = TRUE ; classic = FALSE ; grid = FALSE ; raster = FALSE ; vectorial.limit = NULL ; return = FALSE ; plot = TRUE ; add = NULL ; warn.print = TRUE ; lib.path = NULL*

*# data1 <- data.frame(km = 1:2, time = (1:2)^2, group = c("A", "B")) ; data1 ; x = NULL; y = "km"; categ = "group"; legend.name = NULL ; color = NULL ; geom = "geom\_hline"; alpha = 0.1 ; dot.size = 1 ; line.size = 0.5 ; x.lim = c(1,10) ; x.lab = NULL ; x.log = "log10" ; x.tick.nb = 10 ; x.inter.tick.nb = 4 ; x.left.extra.margin = 0 ; x.right.extra.margin = 0 ; y.lim = NULL ; y.lab = expression(paste("TIME (", 10^-20, " s)")) ; y.log = "log10" ; y.tick.nb = 10 ; y.inter.tick.nb = 2 ; y.top.extra.margin = 0 ; y.bottom.extra.margin = 0 ; x.include.zero = TRUE ; y.include.zero = TRUE ; x.text.angle = 0 ; y.text.angle = 0 ; text.size = 12 ; title = "" ; title.text.size = 8 ; show.legend = TRUE ; classic = FALSE ; grid = FALSE ; raster = FALSE ; vectorial.limit = NULL ; return = FALSE ; plot = TRUE ; add = NULL ; warn.print = TRUE ; lib.path = NULL*

*# function name*

**function.name <- paste0(as.list(match.call(expand.dots=FALSE))[[1]], "()")**

*# end function name*

*# required function checking*

**req.function <- c(**

**"fun\_check",**

**"fun\_gg\_just",**

**"fun\_gg\_palette",**

**"fun\_gg\_point\_rast",**

**"fun\_pack"**

**)**

**for(i1 in req.function){**

**if(length(find(i1, mode = "function")) == 0){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": REQUIRED ", i1, "() FUNCTION IS MISSING IN THE R ENVIRONMENT\n\n================\n\n")**

**stop(tempo.cat)**

**}**

**}**

*# end required function checking*

*# reserved words to avoid bugs (used in this function)*

**reserved.words <- c("fake\_x", "fake\_y", "fake\_categ", "color")**

*# end reserved words to avoid bugs (used in this function)*

*# primary argument checking*

**arg.check <- NULL** *#*

**text.check <- NULL** *#*

**checked.arg.names <- NULL** *# for function debbuging: used by r\_debugging\_tools*

**ee <- expression(arg.check <- c(arg.check, tempo$problem) , text.check <- c(text.check, tempo$text) , checked.arg.names <- c(checked.arg.names, tempo$fun.name))**

**tempo1 <- fun\_check(data = data1, class = "data.frame", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = data1, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": data1 ARGUMENT MUST BE A DATA FRAME OR A LIST OF DATA FRAMES")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**if( ! is.null(x)){**

**tempo1 <- fun\_check(data = x, class = "vector", mode = "character", na.contain = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = x, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": x ARGUMENT MUST BE A SINGLE CHARACTER STRING OR A LIST OF CHARACTER STRINGS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(y)){**

**tempo1 <- fun\_check(data = y, class = "vector", mode = "character", na.contain = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = y, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": y ARGUMENT MUST BE A SINGLE CHARACTER STRING OR A LIST OF CHARACTER STRINGS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(categ)){**

**tempo1 <- fun\_check(data = categ, class = "vector", mode = "character", na.contain = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = categ, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": categ ARGUMENT MUST BE A SINGLE CHARACTER STRING OR A LIST OF CHARACTER STRINGS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(legend.name)){**

**tempo1 <- fun\_check(data = legend.name, class = "vector", mode = "character", na.contain = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = legend.name, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": legend.name ARGUMENT MUST BE A SINGLE CHARACTER STRING OR A LIST OF CHARACTER STRINGS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(color)){**

**tempo1 <- fun\_check(data = color, class = "vector", mode = "character", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = color, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": color ARGUMENT MUST BE A VECTOR OF CHARACTER STRING OR A LIST OF CHARACTER VECTORS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(geom)){**

**tempo1 <- fun\_check(data = geom, class = "vector", mode = "character", na.contain = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = geom, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": geom ARGUMENT MUST BE A SINGLE CHARACTER STRING OR A LIST OF CHARACTER STRINGS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**tempo1 <- fun\_check(data = alpha, prop = TRUE, length = 1, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = alpha, class = "list", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": alpha ARGUMENT MUST BE A SINGLE NUMERIC VALUE BETWEEN 0 AND 1 OR A LIST OF SUCH VALUES")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**tempo <- fun\_check(data = dot.size, class = "vector", mode = "numeric", length = 1, neg.values = FALSE, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = line.size, class = "vector", mode = "numeric", length = 1, neg.values = FALSE, fun.name = function.name) ; eval(ee)**

**if( ! is.null(x.lim)){**

**tempo <- fun\_check(data = x.lim, class = "vector", mode = "numeric", length = 2, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & any(x.lim %in% c(Inf, -Inf))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": x.lim ARGUMENT CANNOT CONTAIN -Inf OR Inf VALUES")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(x.lab)){**

**if(all(class(x.lab) %in% "expression")){** *# to deal with math symbols*

**tempo <- fun\_check(data = x.lab, class = "expression", length = 1, fun.name = function.name) ; eval(ee)**

**}else{**

**tempo <- fun\_check(data = x.lab, class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**}**

**}**

**tempo <- fun\_check(data = x.log, options = c("no", "log2", "log10"), length = 1, fun.name = function.name) ; eval(ee)**

**if( ! is.null(x.tick.nb)){**

**tempo <- fun\_check(data = x.tick.nb, class = "vector", typeof = "integer", length = 1, double.as.integer.allowed = TRUE, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & x.tick.nb < 0){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": x.tick.nb ARGUMENT MUST BE A NON NULL POSITIVE INTEGER")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(x.inter.tick.nb)){**

**tempo <- fun\_check(data = x.inter.tick.nb, class = "vector", typeof = "integer", length = 1, double.as.integer.allowed = TRUE, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & x.inter.tick.nb < 0){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": x.inter.tick.nb ARGUMENT MUST BE A NON NULL POSITIVE INTEGER")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**tempo <- fun\_check(data = x.include.zero, class = "vector", mode = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = x.left.extra.margin, prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = x.right.extra.margin, prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = x.text.angle, class = "vector", typeof = "integer", double.as.integer.allowed = TRUE, length = 1, neg.values = TRUE, fun.name = function.name) ; eval(ee)**

**if( ! is.null(y.lim)){**

**tempo <- fun\_check(data = y.lim, class = "vector", mode = "numeric", length = 2, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & any(y.lim %in% c(Inf, -Inf))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": y.lim ARGUMENT CANNOT CONTAIN -Inf OR Inf VALUES")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(y.lab)){**

**if(all(class(y.lab) %in% "expression")){** *# to deal with math symbols*

**tempo <- fun\_check(data = y.lab, class = "expression", length = 1, fun.name = function.name) ; eval(ee)**

**}else{**

**tempo <- fun\_check(data = y.lab, class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**}**

**}**

**tempo <- fun\_check(data = y.log, options = c("no", "log2", "log10"), length = 1, fun.name = function.name) ; eval(ee)**

**if( ! is.null(y.tick.nb)){**

**tempo <- fun\_check(data = y.tick.nb, class = "vector", typeof = "integer", length = 1, double.as.integer.allowed = TRUE, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & y.tick.nb < 0){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": y.tick.nb ARGUMENT MUST BE A NON NULL POSITIVE INTEGER")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if( ! is.null(y.inter.tick.nb)){**

**tempo <- fun\_check(data = y.inter.tick.nb, class = "vector", typeof = "integer", length = 1, double.as.integer.allowed = TRUE, fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE & y.inter.tick.nb < 0){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": y.inter.tick.nb ARGUMENT MUST BE A NON NULL POSITIVE INTEGER")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**tempo <- fun\_check(data = y.include.zero, class = "vector", mode = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = y.top.extra.margin, prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = y.bottom.extra.margin, prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = y.text.angle, class = "vector", typeof = "integer", double.as.integer.allowed = TRUE, length = 1, neg.values = TRUE, fun.name = function.name) ; eval(ee)**

*# inactivated because x.lim and y.lim already log transformed*

*# if(tempo$problem == FALSE & y.log == TRUE & xy.include.zero == TRUE){*

*# warn.count <- warn.count + 1 ; tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": BOTH y.log AND xy.include.zero ARGUMENTS SET TO TRUE -> xy.include.zero ARGUMENT RESET TO FALSE")*

*# warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))*

*# }*

**tempo <- fun\_check(data = text.size, class = "vector", mode = "numeric", length = 1, neg.values = FALSE, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = title, class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = title.text.size, class = "vector", mode = "numeric", length = 1, neg.values = FALSE, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = show.legend, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data =legend.sector.width, prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = classic, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = grid, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = raster, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**if( ! is.null(vectorial.limit)){**

**tempo <- fun\_check(data = vectorial.limit, class = "vector", typeof = "integer", neg.values = FALSE, double.as.integer.allowed = TRUE, fun.name = function.name) ; eval(ee)**

**}**

**tempo <- fun\_check(data = return, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = plot, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**if( ! is.null(add)){**

**tempo <- fun\_check(data = add, class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**}**

**tempo <- fun\_check(data = warn.print, class = "logical", length = 1, fun.name = function.name) ; eval(ee)**

**if( ! is.null(lib.path)){**

**tempo <- fun\_check(data = lib.path, class = "vector", mode = "character", fun.name = function.name) ; eval(ee)**

**if(tempo$problem == FALSE){**

**if( ! all(dir.exists(lib.path))){** *# separation to avoid the problem of tempo$problem == FALSE and lib.path == NA*

**tempo.cat <- paste0("ERROR IN ", function.name, ": DIRECTORY PATH INDICATED IN THE lib.path ARGUMENT DOES NOT EXISTS:\n", paste(lib.path, collapse = "\n"))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**}**

**if(any(arg.check) == TRUE){**

**stop(paste0("\n\n================\n\n", paste(text.check[arg.check], collapse = "\n"), "\n\n================\n\n"), call. = FALSE)** *#*

**}**

*# source("C:/Users/Gael/Documents/Git\_versions\_to\_use/debugging\_tools\_for\_r\_dev-v1.2/r\_debugging\_tools-v1.2.R") ; eval(parse(text = str\_basic\_arg\_check\_dev)) ; eval(parse(text = str\_arg\_check\_with\_fun\_check\_dev)) # activate this line and use the function (with no arguments left as NULL) to check arguments status and if they have been checked using fun\_check()*

*# end primary argument checking*

*# second round of checking and data preparation*

*# check list lengths (and names of data1 compartments if non name present)*

**warn <- NULL**

**warn.count <- 0**

**if(all(class(data1) == "list")){**

**if(length(data1) > 6){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": data1 ARGUMENT MUST BE A LIST OF 6 DATA FRAMES MAXIMUM (6 OVERLAYS MAX)\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**if(is.null(names(data1))){**

**names(data1) <- paste0("L", 1:length(data1))**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL NAME COMPARTMENT OF data1 LIST -> NAMES RESPECTIVELY ATTRIBUTED TO EACH COMPARTMENT:\n", paste(names(data1), collapse = " "))**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**if( ! is.null(x)){**

**if( ! (all(class(x) == "list") & length(data1) == length(x))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": x ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}else{**

**x <- vector("list", length(data1))**

**}**

**if( ! is.null(y)){**

**if( ! (all(class(y) == "list") & length(data1) == length(y))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": y ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}else{**

**y <- vector("list", length(data1))**

**}**

**if( ! is.null(categ)){**

**if( ! (all(class(categ) == "list") & length(data1) == length(categ))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": categ ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**if( ! is.null(legend.name)){**

**if( ! (all(class(legend.name) == "list") & length(data1) == length(legend.name))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": legend.name ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**if( ! is.null(color)){**

**if( ! (all(class(color) == "list") & length(data1) == length(color))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": color ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**if( ! (all(class(geom) == "list") & length(data1) == length(geom))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": geom ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**if( ! (all(class(alpha) == "list") & length(data1) == length(alpha))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": alpha ARGUMENT MUST BE A LIST OF SAME LENGTH AS data1 IF data1 IS A LIST\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

*# end check list lengths (and names of data1 compartments if non name present)*

*# conversion into lists*

**if(all(is.data.frame(data1))){**

**data1 <- list(L1 = data1)**

**if(all(class(x) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": x ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**x <- list(L1 = x)**

**}**

**if(all(class(y) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": y ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**y <- list(L1 = y)**

**}**

**if( ! is.null(categ)){**

**if(all(class(categ) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": categ ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**categ <- list(L1 = categ)**

**}**

**}**

**if( ! is.null(legend.name)){**

**if(all(class(legend.name) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": legend.name ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**legend.name <- list(L1 = legend.name)**

**}**

**}**

**if( ! is.null(color)){**

**if(all(class(color) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": color ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**color <- list(L1 = color)**

**}**

**}**

**if(all(class(geom) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": geom ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**geom <- list(L1 = geom)**

**}**

**if(all(class(alpha) == "list")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": alpha ARGUMENT CANNOT BE A LIST IF data1 IS A DATA FRAME\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**alpha <- list(L1 = alpha)**

**}**

**}else if( ! all(sapply(data1, FUN = "class") == "data.frame")){** *# if not a data frame, data1 can only be a list, as tested above*

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": data1 ARGUMENT MUST BE A DATA FRAME OR A LIST OF DATA FRAMES\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**# data, x, y, geom, alpha are list now**

**# if non NULL, categ, legend.name, color are list now**

*# end conversion into lists*

*# legend name filling*

**if(is.null(legend.name) & ! is.null(categ)){**

**legend.name <- categ**

**}else if(is.null(legend.name) & is.null(categ)){**

**legend.name <- vector("list", length(data1))** *# null list*

**}**

**# legend.name not NULL anymore (list)**

*# end legend name filling*

*# ini categ for legend display*

**fin.lg.disp <- vector("list", 6)** *# will be used at the end to display or not legends*

**fin.lg.disp[] <- FALSE**

**legend.disp <- vector("list", length(data1))**

**if(is.null(categ) | show.legend == FALSE){**

**legend.disp[] <- FALSE**

**}else{**

**for(i2 in 1:length(data1)){**

**if(is.null(categ[[i2]])){**

**legend.disp[[i2]] <- FALSE**

**}else{**

**legend.disp[[i2]] <- TRUE**

**}**

**}**

**}**

*# end ini categ for legend display*

*# integer colors into gg\_palette*

**tempo.check.color <- NULL**

**for(i1 in 1:length(data1)){**

**if(any(is.na(color[[i1]]))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ": color ARGUMENT CANNOT CONTAIN NA\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**tempo.check.color <- c(tempo.check.color, fun\_check(data = color[[i1]], data.name = ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), class = "integer", double.as.integer.allowed = TRUE, na.contain = TRUE, fun.name = function.name, print = FALSE)$problem)**

**}**

**tempo.check.color <- ! tempo.check.color** *# invert TRUE and FALSE because if integer, then problem = FALSE*

**if(any(tempo.check.color == TRUE)){** *# convert integers into colors*

**tempo.integer <- unlist(color[tempo.check.color])**

**tempo.color <- fun\_gg\_palette(max(tempo.integer, na.rm = TRUE))**

**for(i1 in 1:length(data1)){**

**if(tempo.check.color[i1] == TRUE){**

**color[[i1]] <-tempo.color[color[[i1]]]**

**}**

**}**

**}**

*# end integer colors into gg\_palette*

*# second round of argument checking*

**arg.check <- NULL** *#*

**text.check <- NULL** *#*

**checked.arg.names <- NULL** *# for function debbuging: used by r\_debugging\_tools*

*# ee <- expression(arg.check <- c(arg.check, tempo$problem) , text.check <- c(text.check, tempo$text) , checked.arg.names <- c(checked.arg.names, tempo$fun.name)) # inactivated here because already defined above*

**compart.null.color <- 0** *# will be used to attribute a color when color is non NULL but a compartment of color is NULL*

**data1.ini <- data1** *# to report NA removal*

**removed.row.nb <- vector("list", length = length(data1))** *# to report NA removal*

**removed.rows <- vector("list", length = length(data1))** *# to report NA removal*

**for(i1 in 1:length(data1)){**

**tempo <- fun\_check(data = data1[[i1]], data.name = ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), class = "data.frame", na.contain = TRUE, fun.name = function.name) ; eval(ee)**

*# reserved word checking*

**if(any(names(data1[[i1]]) %in% reserved.words)){** *# I do not use fun\_name\_change() because cannot control y before creating "fake\_y". But ok because reserved are not that common*

**tempo.cat <- paste0("ERROR IN ", function.name, ": COLUMN NAMES OF ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), " ARGUMENT CANNOT BE ONE OF THESE WORDS\n", paste(reserved.words, collapse = " "), "\nTHESE ARE RESERVED FOR THE ", function.name, " FUNCTION")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

*# end reserved word checking*

*# check of geom now because required for y argument*

**tempo <- fun\_check(data = geom[[i1]], data.name = ifelse(length(geom) == 1, "geom", paste0("geom NUMBER ", i1)), options = c("geom\_point", "geom\_line", "geom\_path", "geom\_hline", "geom\_vline"), length = 1, fun.name = function.name) ; eval(ee)**

*# end check of geom now because required for y argument*

**if(is.null(x[[i1]])){**

**if(all(geom[[i1]] != "geom\_hline")){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ": x ARGUMENT CANNOT BE NULL EXCEPT IF ", ifelse(length(geom) == 1, "x", paste0("geom NUMBER ", i1)), " ARGUMENT IS \"geom\_hline\"\nHERE geom ARGUMENT IS: ", paste(geom[[i1]], collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else{**

**x[[i1]] <- "fake\_x"**

**data1[[i1]] <- cbind(data1[[i1]], fake\_x = NA)**

**data1[[i1]][, "fake\_x"] <- as.numeric(data1[[i1]][, "fake\_x"])**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL ", ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), " ARGUMENT ASSOCIATED TO ", ifelse(length(geom) == 1, "geom", paste0("geom NUMBER ", i1)), " ARGUMENT ", geom[[i1]], " -> FAKE COLUMN ADDED TO DATA FRAME ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", NAMED \"fake\_x\" FOR FINAL DRAWING")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}else{**

**if(all(geom[[i1]] == "geom\_hline")){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ": x ARGUMENT MUST BE NULL IF ", ifelse(length(geom) == 1, "geom", paste0("geom NUMBER ", i1)), " ARGUMENT IS \"geom\_hline\"")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**tempo <- fun\_check(data = x[[i1]], data.name = ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**}**

**if(is.null(y[[i1]])){**

**if(all(geom[[i1]] != "geom\_vline")){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ": y ARGUMENT CANNOT BE NULL EXCEPT IF ", ifelse(length(geom) == 1, "y", paste0("geom NUMBER ", i1)), " ARGUMENT IS \"geom\_vline\"\nHERE geom ARGUMENT IS: ", paste(geom[[i1]], collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else{**

**y[[i1]] <- "fake\_y"**

**data1[[i1]] <- cbind(data1[[i1]], fake\_y = NA)**

**data1[[i1]][, "fake\_y"] <- as.numeric(data1[[i1]][, "fake\_y"])**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL ", ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), " ARGUMENT ASSOCIATED TO ", ifelse(length(geom) == 1, "geom", paste0("geom NUMBER ", i1)), " ARGUMENT ", geom[[i1]], " -> FAKE COLUMN ADDED TO DATA FRAME ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", NAMED \"fake\_y\" FOR FINAL DRAWING")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}else{**

**if(all(geom[[i1]] == "geom\_vline")){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ": y ARGUMENT MUST BE NULL IF ", ifelse(length(geom) == 1, "geom", paste0("geom NUMBER ", i1)), " ARGUMENT IS \"geom\_vline\"")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**tempo <- fun\_check(data = y[[i1]], data.name = ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), class = "vector", mode = "character", length = 1, fun.name = function.name) ; eval(ee)**

**}**

**if( ! (x[[i1]] %in% names(data1[[i1]]))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), " ARGUMENT MUST BE A COLUMN NAME OF ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**if( ! (y[[i1]] %in% names(data1[[i1]]))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), " ARGUMENT MUST BE A COLUMN NAME OF ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

*# na detection and removal (done now to be sure of the correct length of categ)*

**if(x[[i1]] == "fake\_x" & y[[i1]] == "fake\_y"){** *# because the code cannot accept to be both "fake\_x" and "fake\_y" at the same time*

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 2\nTHE CODE CANNOT ACCEPT x AND y TO BE \"fake\_x\" AND \"fake\_y\" IN THE SAME DATA FRAME ", i1, " \n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**if(any(is.na(data1[[i1]][, c(if(x[[i1]] == "fake\_x"){NULL}else{x[[i1]]}, if(y[[i1]] == "fake\_y"){NULL}else{y[[i1]]})]))){**

**tempo.removed.row.nb <- unlist(lapply(lapply(c(data1[[i1]][c(if(x[[i1]] == "fake\_x"){NULL}else{x[[i1]]}, if(y[[i1]] == "fake\_y"){NULL}else{y[[i1]]})]), FUN = is.na), FUN = which))**

**removed.row.nb[[i1]] <- c(removed.row.nb[[i1]], tempo.removed.row.nb)**

*# report of removed rows will be performed at the very end*

**data1[[i1]] <- data1[[i1]][-tempo.removed.row.nb, ]**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NA DETECTED IN COLUMN ", if(x[[i1]] == "fake\_x"){""}else{ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1))}, if(x[[i1]] != "fake\_x" & y[[i1]] != "fake\_y"){" AND "}, if(y[[i1]] == "fake\_y"){""}else{ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1))}, " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ". CORRESPONDING ROWS HAVE BEEN REMOVED (SEE $removed.row.nb AND $removed.rows)")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

*# end na detection and removal (done now to be sure of the correct length of categ)*

**tempo <- fun\_check(data = data1[[i1]][, x[[i1]]], data.name = ifelse(length(x) == 1, "x OF data1", paste0("x NUMBER ", i1, " OF data1 NUMBER ", i1)), class = "vector", mode = "numeric", na.contain = ifelse(x[[i1]] == "fake\_x", TRUE, FALSE), fun.name = function.name) ; eval(ee)**

**tempo <- fun\_check(data = data1[[i1]][, y[[i1]]], data.name = ifelse(length(y) == 1, "y OF data1", paste0("y NUMBER ", i1, " OF data1 NUMBER ", i1)), class = "vector", mode = "numeric", na.contain = ifelse(y[[i1]] == "fake\_y", TRUE, FALSE), fun.name = function.name) ; eval(ee)**

**if(( ! is.null(categ)) & ( ! is.null(categ[[i1]]))){** *# if categ[[i1]] = NULL, fake\_categ will be created later on*

**tempo <- fun\_check(data = categ[[i1]], data.name = ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)),, class = "vector", mode = "character", length = 1, fun.name = function.name)**

**if( ! (categ[[i1]] %in% names(data1[[i1]]))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " ARGUMENT MUST BE A COLUMN NAME OF ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

*# na detection and removal (done now to be sure of the correct length of categ)*

**if(any(is.na(data1[[i1]][, categ[[i1]]]))){**

**tempo.removed.row.nb <- unlist(lapply(lapply(c(data1[[i1]][categ[[i1]]]), FUN = is.na), FUN = which))**

**removed.row.nb[[i1]] <- c(removed.row.nb[[i1]], tempo.removed.row.nb)**

*# report of removed rows will be performed at the very end*

**data1[[i1]] <- data1[[i1]][-tempo.removed.row.nb, ]**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": IN ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", THE CATEGORY COLUMN:\n", paste(categ[[i1]], collapse = " "), "\nCONTAINS NA")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

*# end na detection and removal (done now to be sure of the correct length of categ)*

**tempo1 <- fun\_check(data = data1[[i1]][, categ[[i1]]], data.name = ifelse(length(categ) == 1, "categ OF data1", paste0("categ NUMBER ", i1, " OF data1 NUMBER ", i1)), class = "vector", mode = "character", na.contain = FALSE, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = data1[[i1]][, categ[[i1]]], data.name = ifelse(length(categ) == 1, "categ OF data1", paste0("categ NUMBER ", i1, " OF data1 NUMBER ", i1)), class = "factor", na.contain = FALSE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(categ) == 1, "categ OF data1", paste0("categ NUMBER ", i1, " OF data1 NUMBER ", i1)), " MUST BE A FACTOR OR CHARACTER VECTOR")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if(tempo1$problem == FALSE){**

**data1[[i1]][, categ[[i1]]] <- factor(data1[[i1]][, categ[[i1]]])** *# if already a factor, change nothing, if characters, levels according to alphabetical order*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": IN ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", THE CHARACTER COLUMN HAS BEEN CONVERTED TO FACTOR")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**# OK: all the non NULL categ columns of data1 are factors from here**

**if(geom[[i1]] == "geom\_vline" | geom[[i1]] == "geom\_hline"){**

**if(length(unique(data1[[i1]][, categ[[i1]]])) != nrow(data1[[i1]])){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(geom) == 1, "geom OF data1", paste0("geom NUMBER ", i1, " OF data1 NUMBER ", i1)), " ARGUMENT IS ", geom[[i1]], ", MEANING THAT ", ifelse(length(categ) == 1, "categ OF data1", paste0("categ NUMBER ", i1, " OF data1 NUMBER ", i1)), " MUST HAVE A DIFFERENT CLASS PER LINE OF data1 (ONE x VALUE PER CLASS)")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**}else if(( ! is.null(categ)) & is.null(categ[[i1]])){** *# if categ[[i1]] = NULL, fake\_categ will be created. BEWARE: is.null(categ[[i1]]) means no legend display (see above), because categ has not been precised. This also means a single color for data1[[i1]]*

**if(length(color[[i1]]) > 1){** *# 0 means is.null(color[[i1]]) and 1 is ok -> single color for data1[[i1]]*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " ARGUMENT BUT CORRESPONDING COLORS IN ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " HAS LENGTH OVER 1\n", paste(color[[i1]], collapse = " "), "\nWHICH IS NOT COMPATIBLE WITH NULL CATEG -> COLOR RESET TO A SINGLE COLOR")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**color[[i1]] <- NULL** *# will provide a single color below*

**}**

**categ[[i1]] <- "fake\_categ"**

**data1[[i1]] <- cbind(data1[[i1]], fake\_categ = "")**

*# inactivated because give a different color to different "Line\_" categ while a single color for all the data1[[i1]] required. Thus, put back after the color management*

*# if(geom[[i1]] == "geom\_hline" | geom[[i1]] == "geom\_vline"){*

*# data1[[i1]][, "fake\_categ"] <- paste0("Line\_", 1:nrow(data1[[i1]]))*

*# }else{*

**data1[[i1]][, "fake\_categ"] <- data1[[i1]][, "fake\_categ"]** *# as.numeric("") create a vector of NA but class numeric*

*# }*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " ARGUMENT -> FAKE COLUMN ADDED TO DATA FRAME ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", NAMED \"fake\_categ\" FOR FINAL DRAWING")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**if( ! is.null(legend.name[[i1]])){**

**tempo <- fun\_check(data = legend.name[[i1]], data.name = ifelse(length(legend.name) == 1, "legend.name", paste0("legend.name NUMBER ", i1)),, class = "vector", mode = "character", length = 1, fun.name = function.name)**

**}**

**if( ! is.null(color)){** *# if color is NULL, will be filled later on*

*# check the nature of color*

**if(is.null(color[[i1]])){**

**compart.null.color <- compart.null.color + 1**

**color[[i1]] <- grey(compart.null.color / 8)** *# cannot be more than 7 overlays. Thus 7 different greys. 8/8 is excluded because white dots*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL COLOR IN ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", SINGLE COLOR ", paste(color[[i1]], collapse = " "), " HAS BEEN ATTRIBUTED")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**tempo1 <- fun\_check(data = color[[i1]], data.name = ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), class = "vector", mode = "character", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**tempo2 <- fun\_check(data = color[[i1]], data.name = ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), class = "factor", na.contain = TRUE, fun.name = function.name, print = FALSE)**

**if(tempo1$problem == TRUE & tempo2$problem == TRUE){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " MUST BE A FACTOR OR CHARACTER VECTOR OR INTEGER VECTOR")** *# integer possible because dealt above*

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if( ! (all(color[[i1]] %in% colors() | grepl(pattern = "^#", color[[i1]])))){** *# check that all strings of low.color start by #*

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST BE A HEXADECIMAL COLOR VECTOR STARTING BY # AND/OR COLOR NAMES GIVEN BY colors(): ", paste(unique(color[[i1]]), collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**if(any(is.na(color[[i1]]))){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": IN ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", THE COLORS:\n", paste(unique(color[[i1]]), collapse = " "), "\nCONTAINS NA")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

*# end check the nature of color*

*# check the length of color*

**if(is.null(categ) & length(color[[i1]]) != 1){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST BE A SINGLE COLOR IF categ IS NULL")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if( ! is.null(categ)){**

*# No problem of NA management by ggplot2 because already removed*

**if(categ[[i1]] == "fake\_categ" & length(color[[i1]]) != 1){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST BE A SINGLE COLOR IF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IS NULL")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if(length(color[[i1]]) == length(unique(data1[[i1]][, categ[[i1]]]))){** *# here length(color) is equal to the different number of categ*

**data1[[i1]][, categ[[i1]]] <- factor(data1[[i1]][, categ[[i1]]])** *# if already a factor, change nothing, if characters, levels according to alphabetical order*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": IN ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", THE FOLLOWING COLORS:\n", paste(color[[i1]], collapse = " "), "\nHAVE BEEN ATTRIBUTED TO THESE CLASSES:\n", paste(levels(factor(data1[[i1]][, categ[[i1]]])), collapse = " "))**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}else if(length(color[[i1]]) == length(data1[[i1]][, categ[[i1]]])){***# here length(color) is equal to nrow(data1[[i1]]) -> Modif to have length(color) equal to the different number of categ (length(color) == length(levels(data1[[i1]][, categ[[i1]]])))*

**data1[[i1]] <- cbind(data1[[i1]], color = color[[i1]])**

**tempo.check <- unique(data1[[i1]][ , c(categ[[i1]], "color")])**

**if( ! (nrow(data1[[i1]]) == length(color[[i1]]) & nrow(tempo.check) == length(unique(data1[[i1]][ , categ[[i1]]])))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT HAS THE LENGTH OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), " COLUMN VALUES\nBUT IS INCORRECTLY ASSOCIATED TO EACH CLASS OF THIS categ:\n", paste(unique(mapply(FUN = "paste", data1[[i1]][ ,categ[[i1]]], data1[[i1]][ ,"color"])), collapse = "\n"))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else{**

**data1[[i1]][, categ[[i1]]] <- factor(data1[[i1]][, categ[[i1]]])** *# if already a factor, change nothing, if characters, levels according to alphabetical order*

**color[[i1]] <- unique(color[[i1]][order(data1[[i1]][, categ[[i1]]])])** *# Modif to have length(color) equal to the different number of categ (length(color) == length(levels(data1[[i1]][, categ[[i1]]])))*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count, ") FROM FUNCTION ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT HAS THE LENGTH OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), " COLUMN VALUES\nCOLORS HAVE BEEN RESPECTIVELY ASSOCIATED TO EACH CLASS OF categ AS:\n", paste(levels(factor(data1[[i1]][, categ[[i1]]])), collapse = " "), "\n", paste(color[[i1]], collapse = " "))**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}else if(length(color[[i1]]) == 1){**

**data1[[i1]][, categ[[i1]]] <- factor(data1[[i1]][, categ[[i1]]])** *# if already a factor, change nothing, if characters, levels according to alphabetical order*

**color[[i1]] <- rep(color[[i1]], length(levels(data1[[i1]][, categ[[i1]]])))**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": IN ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), ", COLOR HAS LENGTH 1 MEANING THAT ALL THE DIFFERENT CLASSES OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), "\n", paste(levels(factor(data1[[i1]][, categ[[i1]]])), collapse = " "), "\nWILL HAVE THE SAME COLOR\n", paste(color[[i1]], collapse = " "))**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}else{**

**tempo.cat <- paste0("ERROR IN ", function.name, ": ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST BE (1) LENGTH 1, OR (2) THE LENGTH OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), " COLUMN VALUES, OR (3) THE LENGTH OF THE CLASSES IN THIS COLUMN. HERE IT IS COLOR LENGTH ", length(color[[i1]]), " VERSUS CATEG LENGTH ", length(data1[[i1]][, categ[[i1]]]), " AND CATEG CLASS LENGTH ", length(unique(data1[[i1]][, categ[[i1]]])))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**}**

**if((geom[[i1]] == "geom\_hline" | geom[[i1]] == "geom\_vline") & ! is.null(categ[[i1]])){** *# add here after the color management, to deal with the different lines to plot inside any data[[i1]]*

**if(categ[[i1]] == "fake\_categ"){**

**data1[[i1]][, "fake\_categ"] <- paste0("Line\_", 1:nrow(data1[[i1]]))**

**}**

**}**

**tempo <- fun\_check(data = alpha[[i1]], data.name = ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), prop = TRUE, length = 1, fun.name = function.name) ; eval(ee)**

**}**

**if(length(data1) > 1){**

**if(length(unique(unlist(x))) > 1){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": THE x ARGUMENT DOES NOT CONTAIN IDENTICAL COLUMN NAMES:\n", paste(unlist(x), collapse = " "), "\nX-AXIS OVERLAYING DIFFERENT VARIABLES?")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}**

**if(length(data1) > 1){**

**if(length(unique(unlist(y))) > 1){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": THE y ARGUMENT DOES NOT CONTAIN IDENTICAL COLUMN NAMES:\n", paste(unlist(y), collapse = " "), "\nY-AXIS OVERLAYING DIFFERENT VARIABLES?")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}**

**if(sum(geom %in% "geom\_point") > 3){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": geom ARGUMENT CANNOT HAVE MORE THAN THREE \"geom\_point\" ELEMENTS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if(length(geom) - sum(geom %in% "geom\_point") > 3){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": geom ARGUMENT CANNOT HAVE MORE THAN THREE LINE ELEMENTS")**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**if(x.log != "no"){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": x.log ARGUMENT SET TO ", x.log, ".\nVALUES FROM THE x ARGUMENT COLUMN OF THE data1 DATA FRAME MUST BE ALREADY ", toupper(x.log), " TRANSFORMED, AS THE x.log ARGUMENT JUST MODIFIES THE AXIS SCALE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**if( ! is.null(x.lim)){**

**if(any(x.lim <= 0)){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": x.lim ARGUMENT CAN SPAN ZERO OR NEGATIVE VALUES IF x.log ARGUMENT IS SET TO ", x.log, " BECAUSE THIS LATTER ARGUMENT DOES NOT TRANSFORM DATA, JUST MODIFIES THE AXIS SCALE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}else if(any( ! is.finite(if(x.log == "log10"){10^x.lim}else{2^x.lim}))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": x.lim ARGUMENT RETURNS INF WITH THE x.log ARGUMENT SET TO ", x.log, "\nAS SCALE COMPUTATION IS ", ifelse(x.log == "log10", 10, 2), "^x.lim:\n", paste(ifelse(x.log == "log10", 10, 2)^x.lim, collapse = " "), "\nARE YOU SURE THAT x.lim ARGUMENT HAS BEEN SPECIFIED WITH VALUES ALREADY IN LOG SCALE?\n", paste(x.lim, collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**}**

**if(y.log != "no"){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": y.log ARGUMENT SET TO ", y.log, ".\nVALUES FROM THE y ARGUMENT COLUMN OF THE data1 DATA FRAME MUST BE ALREADY ", toupper(y.log), " TRANSFORMED, AS THE y.log ARGUMENT JUST MODIFIES THE AXIS SCALE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**if( ! is.null(y.lim)){**

**if(any(y.lim <= 0)){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": y.lim ARGUMENT CAN SPAN ZERO OR NEGATIVE VALUES IF y.log ARGUMENT IS SET TO ", y.log, " BECAUSE THIS LATTER ARGUMENT DOES NOT TRANSFORM DATA, JUST MODIFIES THE AXIS SCALE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}else if(any( ! is.finite(if(y.log == "log10"){10^y.lim}else{2^y.lim}))){**

**tempo.cat <- paste0("ERROR IN ", function.name, ": y.lim ARGUMENT RETURNS INF WITH THE y.log ARGUMENT SET TO ", y.log, "\nAS SCALE COMPUTATION IS ", ifelse(y.log == "log10", 10, 2), "^y.lim:\n", paste(ifelse(y.log == "log10", 10, 2)^y.lim, collapse = " "), "\nARE YOU SURE THAT y.lim ARGUMENT HAS BEEN SPECIFIED WITH VALUES ALREADY IN LOG SCALE?\n", paste(y.lim, collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**}**

**if( ! is.null(add)){**

**if( ! grepl(pattern = "^\\+", add)){** *# check that the add string start by +*

**tempo.cat <- paste0("ERROR IN ", function.name, ": add ARGUMENT MUST START WITH \"+\": ", paste(unique(add), collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if( ! grepl(pattern = "ggplot2::", add)){** *#*

**tempo.cat <- paste0("ERROR IN ", function.name, ": add ARGUMENT MUST CONTAIN \"ggplot2::\" IN FRONT OF EACH GGPLOT2 FUNCTION: ", paste(unique(add), collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}else if( ! grepl(pattern = ")$", add)){** *# check that the add string finished by )*

**tempo.cat <- paste0("ERROR IN ", function.name, ": add ARGUMENT MUST FINISH BY \")\": ", paste(unique(add), collapse = " "))**

**text.check <- c(text.check, tempo.cat)**

**arg.check <- c(arg.check, TRUE)**

**}**

**}**

**if(any(arg.check) == TRUE){**

**stop(paste0("\n\n================\n\n", paste(text.check[arg.check], collapse = "\n"), "\n\n================\n\n"), call. = FALSE)** *#*

**}**

*# end second round of argument checking*

*# end second round of checking and data preparation*

*# package checking*

**fun\_pack(req.package = c("ggplot2", "gridExtra"), lib.path = lib.path)**

*# packages Cairo and grid tested by fun\_gg\_point\_rast()*

*# end package checking*

*# internal functions*

**get\_legend\_fun <- function(myggplot){** *# from https://stackoverflow.com/questions/12539348/ggplot-separate-legend-and-plot*

**tmp <- ggplot2::ggplot\_gtable(myggplot)**

**leg <- which(sapply(tmp$grobs, function(x) x$name) == "guide-box")**

**legend <- tmp$grobs[[leg]]**

**return(legend)**

**}**

*# end internal functions*

*# main code*

*# axes management*

**if(is.null(x.lim)){**

**if(any(unlist(mapply(FUN = "[[", data1, x, SIMPLIFY = FALSE)) %in% c(Inf, -Inf))){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": THE x COLUMN IN data1 CONTAINS -Inf OR Inf VALUES THAT WILL NOT BE CONSIDERED IN THE PLOT RANGE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**x.lim <- suppressWarnings(range(unlist(mapply(FUN = "[[", data1, x, SIMPLIFY = FALSE)), na.rm = TRUE, finite = TRUE))** *# finite = TRUE removes all the -Inf and Inf except if only this. In that case, whatever the -Inf and/or Inf present, output -Inf;Inf range. Idem with NA only. x.lim added here. If NULL, ok if x argument has values*

**if(suppressWarnings(all(x.lim %in% c(Inf, -Inf)))){**

**if(all(unlist(geom) == "geom\_hline")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " NOT POSSIBLE TO ONLY DRAW geom\_hline KIND OF LINES IF x.lim ARGUMENT IS SET TO NULL, SINCE NO X-AXIS DEFINED (", ifelse(length(x) == 1, "x", paste0("x NUMBER ", i1)), " ARGUMENT MUST BE NULL FOR THESE KIND OF LINES)\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " x.lim ARGUMENT MADE OF NA, -Inf OR Inf ONLY: ", paste(x.lim, collapse = " "), "\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**}**

**x.lim.order <- order(x.lim)** *# to deal with inverse axis*

**# print(x.lim.order)**

**x.lim <- sort(x.lim)**

**x.lim[1] <- x.lim[1] - abs(x.lim[2] - x.lim[1]) \* ifelse(diff(x.lim.order) > 0, x.right.extra.margin, x.left.extra.margin)** *# diff(x.lim.order) > 0 means not inversed axis*

**x.lim[2] <- x.lim[2] + abs(x.lim[2] - x.lim[1]) \* ifelse(diff(x.lim.order) > 0, x.left.extra.margin, x.right.extra.margin)** *# diff(x.lim.order) > 0 means not inversed axis*

**if(x.include.zero == TRUE){** *# no need to check x.log != "no" because done before*

**x.lim <- range(c(x.lim, 0), na.rm = TRUE, finite = TRUE)** *# finite = TRUE removes all the -Inf and Inf except if only this. In that case, whatever the -Inf and/or Inf present, output -Inf;Inf range. Idem with NA only*

**}**

**x.lim <- x.lim[x.lim.order]**

**if(any(is.na(x.lim))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 3\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**if(is.null(y.lim)){**

**if(any(unlist(mapply(FUN = "[[", data1, y, SIMPLIFY = FALSE)) %in% c(Inf, -Inf))){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": THE y COLUMN IN data1 CONTAINS -Inf OR Inf VALUES THAT WILL NOT BE CONSIDERED IN THE PLOT RANGE")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**y.lim <- suppressWarnings(range(unlist(mapply(FUN = "[[", data1, y, SIMPLIFY = FALSE)), na.rm = TRUE, finite = TRUE))** *# finite = TRUE removes all the -Inf and Inf except if only this. In that case, whatever the -Inf and/or Inf present, output -Inf;Inf range. Idem with NA only. y.lim added here. If NULL, ok if y argument has values*

**if(suppressWarnings(all(y.lim %in% c(Inf, -Inf)))){** *# happen when y is only NULL*

**if(all(unlist(geom) == "geom\_vline")){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " NOT POSSIBLE TO ONLY DRAW geom\_vline KIND OF LINES IF y.lim ARGUMENT IS SET TO NULL, SINCE NO Y-AXIS DEFINED (", ifelse(length(y) == 1, "y", paste0("y NUMBER ", i1)), " ARGUMENT MUST BE NULL FOR THESE KIND OF LINES)\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else{**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " y.lim ARGUMENT MADE OF NA, -Inf OR Inf ONLY: ", paste(y.lim, collapse = " "), "\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**}**

**y.lim.order <- order(y.lim)** *# to deal with inverse axis*

**y.lim <- sort(y.lim)**

**y.lim[1] <- y.lim[1] - abs(y.lim[2] - y.lim[1]) \* ifelse(diff(y.lim.order) > 0, y.bottom.extra.margin, y.top.extra.margin)** *# diff(y.lim.order) > 0 means not inversed axis*

**y.lim[2] <- y.lim[2] + abs(y.lim[2] - y.lim[1]) \* ifelse(diff(y.lim.order) > 0, y.top.extra.margin, y.bottom.extra.margin)** *# diff(y.lim.order) > 0 means not inversed axis*

**if(y.include.zero == TRUE){** *# no need to check y.log != "no" because done before*

**y.lim <- range(c(y.lim, 0), na.rm = TRUE, finite = TRUE)** *# finite = TRUE removes all the -Inf and Inf except if only this. In that case, whatever the -Inf and/or Inf present, output -Inf;Inf range. Idem with NA only*

**}**

**y.lim <- y.lim[y.lim.order]**

**if(any(is.na(y.lim))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 4\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

*# end axes management*

*# create a fake categ if NULL to deal with legend display*

**if(is.null(categ)){**

**categ <- vector("list", length(data1))**

**categ[] <- "fake\_categ"**

**for(i2 in 1:length(data1)){**

**data1[[i2]] <- cbind(data1[[i2]], fake\_categ = "")**

**if(geom[[i2]] == "geom\_hline" | geom[[i2]] == "geom\_vline"){**

**data1[[i2]][, "fake\_categ"] <- paste0("Line\_", 1:nrow(data1[[i2]]))**

**}**

**}**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL categ ARGUMENT -> FAKE COLUMN ADDED TO EACH DATA FRAME IN data1, NAMED \"fake\_categ\" AND FILLED WITH \"\"")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

*# end create a fake categ if NULL to deal with legend display*

*# vector of color with length as in data1*

**if(is.null(color)){**

**color <- vector("list", length(data1))**

**length.categ.list <- lapply(lapply(mapply(FUN = "[[", data1, categ, SIMPLIFY = FALSE), FUN = unique), FUN = function(x){length(x[ ! is.na(x)])})**

**length.categ.list[sapply(categ, FUN = "==", "fake\_categ")] <- 1** *# when is.null(color), a single color for all the dots or lines of data[[i1]] that contain "fake\_categ" category*

**total.categ.length <- sum(unlist(length.categ.list), na.rm = TRUE)**

**tempo.color <- fun\_gg\_palette(total.categ.length)**

**tempo.count <- 0**

**for(i3 in 1:length(data1)){**

**color[[i3]] <- tempo.color[(1:length.categ.list[[i3]]) + tempo.count]**

**tempo.count <- tempo.count + length.categ.list[[i3]]**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": NULL color ARGUMENT -> COLORS RESPECTIVELY ATTRIBUTED TO EACH CLASS OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i3)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i3)), ":\n", paste(unlist(color), collapse = " "), "\n", paste(names(data1), collapse = " "))**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}**

*# end vector of color with length as in data1*

*# last check*

**for(i1 in 1:length(data1)){**

**if(categ[[i1]] != "fake\_categ" & length(color[[i1]]) != length(unique(data1[[i1]][, categ[[i1]]]))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " LAST CHECK: ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST HAVE THE LENGTH OF LEVELS OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), "\nHERE IT IS COLOR LENGTH ", length(color[[i1]]), " VERSUS CATEG LEVELS LENGTH ", length(unique(data1[[i1]][, categ[[i1]]])), "\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}else if(categ[[i1]] == "fake\_categ" & length(color[[i1]]) != 1){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " LAST CHECK: ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST HAVE LENGTH 1 WHEN ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IS NULL\nHERE IT IS COLOR LENGTH ", length(color[[i1]]), "\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

*# end last check*

*# conversion of geom\_hline and geom\_vline*

**for(i1 in 1:length(data1)){**

**if(geom[[i1]] == "geom\_hline" | geom[[i1]] == "geom\_vline"){**

**final.data.frame <- data.frame()**

**for(i3 in 1:nrow(data1[[i1]])){**

**tempo.data.frame <- rbind(data1[[i1]][i3, ], data1[[i1]][i3, ])**

**if(geom[[i1]] == "geom\_hline"){**

**tempo.data.frame[, x[[i1]]] <- x.lim**

**}else if(geom[[i1]] == "geom\_vline"){**

**tempo.data.frame[, y[[i1]]] <- y.lim**

**}else{**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 5\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**# if(is.null(categ[[i1]])){**

**# data1[, "fake\_categ"] <- paste0("Line\_", i3)**

**# } #I put that up**

**final.data.frame <- rbind(final.data.frame, tempo.data.frame)**

**}**

**data1[[i1]] <- final.data.frame**

**geom[[i1]] <- "geom\_line"**

**if(length(color[[i1]]) == 1){**

**color[[i1]] <- rep(color[[i1]], length(unique(data1[[i1]][ , categ[[i1]]])))**

**}else if(length(color[[i1]]) != length(unique(data1[[i1]][ , categ[[i1]]]))){**

**tempo.cat <- paste0("\n\n================\n\nERROR IN ", function.name, " geom\_hline AND geom\_vline CONVERSION TO FIT THE XLIM AND YLIM LIMITS OF THE DATA: ", ifelse(length(color) == 1, "color", paste0("color NUMBER ", i1)), " ARGUMENT MUST HAVE THE LENGTH OF LEVELS OF ", ifelse(length(categ) == 1, "categ", paste0("categ NUMBER ", i1)), " IN ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i1)), "\nHERE IT IS COLOR LENGTH ", length(color[[i1]]), " VERSUS CATEG LEVELS LENGTH ", length(unique(data1[[i1]][, categ[[i1]]])), "\n\n================\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**}**

**}**

*# end conversion of geom\_hline and geom\_vline*

*# kind of geom\_point (vectorial or raster)*

**scatter.kind <- vector("list", length = length(data1))** *# list of same length as data1, that will be used to use either ggplot2::geom\_point() (vectorial dot layer) or fun\_gg\_point\_rast() (raster dot layer)*

**fix.ratio <- FALSE**

**if(is.null(vectorial.limit)){**

**if(raster == TRUE){**

**scatter.kind[] <- "fun\_gg\_point\_rast"** *# not important to fill everything: will be only used when geom == "geom\_point"*

**fix.ratio <- TRUE**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": RASTER PLOT GENERATED -> ASPECT RATIO OF THE PLOT REGION SET TO 1/1 TO AVOID A BUG OF ELLIPSOID DOT DRAWING")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}else{**

**scatter.kind[] <- "ggplot2::geom\_point"**

**}**

**}else{**

**for(i2 in 1:length(data1)){**

**if(geom[[i2]] == "geom\_point"){**

**if(nrow(data1[[i2]]) <= vectorial.limit){**

**scatter.kind[[i2]] <- "ggplot2::geom\_point"**

**}else{**

**scatter.kind[[i2]] <- "fun\_gg\_point\_rast"**

**fix.ratio <- TRUE**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": ", ifelse(length(data1) == 1, "data1", paste0("data1 NUMBER ", i2)), " LAYER AS RASTER (NOT VECTORIAL)")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}**

**}**

**if(any(unlist(scatter.kind) == "fun\_gg\_point\_rast")){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": RASTER PLOT GENERATED -> ASPECT RATIO OF THE PLOT REGION SET TO 1/1 TO AVOID A BUG OF ELLIPSOID DOT DRAWING")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**}**

*# end kind of geom\_point (vectorial or raster)*

*# no need loop part*

**tempo.gg.name <- "gg.indiv.plot."**

**tempo.gg.count <- 0**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::ggplot())**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::xlab(if(is.null(x.lab)){x[[1]]}else{x.lab}))**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::ylab(if(is.null(y.lab)){y[[1]]}else{y.lab}))**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::ggtitle(title))**

*# text angle management*

**x.tempo.just <- fun\_gg\_just(angle = x.text.angle, axis = "x")**

**y.tempo.just <- fun\_gg\_just(angle = y.text.angle, axis = "y")**

*# end text angle management*

**add.check <- TRUE**

**if( ! is.null(add)){** *# if add is NULL, then = 0*

**if(grepl(pattern = "ggplot2::theme", add) == TRUE){**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": \"ggplot2::theme\" STRING DETECTED IN THE add ARGUMENT -> INTERNAL GGPLOT2 THEME FUNCTIONS theme() AND theme\_classic() HAVE BEEN INACTIVATED, TO BE USED BY THE USER.**

**\nIT IS RECOMMENDED TO USE \"+ theme(aspect.ratio = 1)\" IF RASTER MODE IS ACTIVATED")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**add.check <- FALSE**

**}**

**}**

**if(add.check == TRUE & classic == TRUE){**

*# BEWARE: not possible to add several times theme(). NO message but the last one overwrites the others*

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::theme\_classic(base\_size = text.size))**

**if(grid == TRUE){**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), m.gg <- ggplot2::theme(**

**text = ggplot2::element\_text(size = text.size),**

**plot.title = ggplot2::element\_text(size = title.text.size),** *# stronger than text*

**legend.key = ggplot2::element\_rect(color = "white", size = 1.5), # size of the frame of the legend**

**line = ggplot2::element\_line(size = 0.5),**

**axis.line.y.left = ggplot2::element\_line(colour = "black"),** *# draw lines for the y axis*

**axis.line.x.bottom = ggplot2::element\_line(colour = "black"),** *# draw lines for the x axis*

**panel.grid.major.x = ggplot2::element\_line(colour = "grey75"),**

**panel.grid.major.y = ggplot2::element\_line(colour = "grey75"),**

**axis.text.x = ggplot2::element\_text(angle = x.tempo.just$angle, hjust = x.tempo.just$hjust, vjust = x.tempo.just$vjust),**

**axis.text.y = ggplot2::element\_text(angle = y.tempo.just$angle, hjust = y.tempo.just$hjust, vjust = y.tempo.just$vjust),**

**aspect.ratio = if(fix.ratio == TRUE){1}else{NULL}**

**))**

**}else{**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), m.gg <- ggplot2::theme(**

**text = ggplot2::element\_text(size = text.size),**

**plot.title = ggplot2::element\_text(size = title.text.size),** *# stronger than text*

**line = ggplot2::element\_line(size = 0.5),**

**legend.key = ggplot2::element\_rect(color = "white", size = 1.5), # size of the frame of the legend**

**axis.line.y.left = ggplot2::element\_line(colour = "black"),**

**axis.line.x.bottom = ggplot2::element\_line(colour = "black"),**

**axis.text.x = ggplot2::element\_text(angle = x.tempo.just$angle, hjust = x.tempo.just$hjust, vjust = x.tempo.just$vjust),**

**axis.text.y = ggplot2::element\_text(angle = y.tempo.just$angle, hjust = y.tempo.just$hjust, vjust = y.tempo.just$vjust),**

**aspect.ratio = if(fix.ratio == TRUE){1}else{NULL}**

**))**

**}**

**}else if(add.check == TRUE & classic == FALSE){**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), m.gg <- ggplot2::theme(**

**text = ggplot2::element\_text(size = text.size),**

**plot.title = ggplot2::element\_text(size = title.text.size),** *# stronger than text*

**line = ggplot2::element\_line(size = 0.5),**

**legend.key = ggplot2::element\_rect(color = "white", size = 1.5), # size of the frame of the legend**

**panel.background = ggplot2::element\_rect(fill = "grey95"),**

**axis.line.y.left = ggplot2::element\_line(colour = "black"),**

**axis.line.x.bottom = ggplot2::element\_line(colour = "black"),**

**panel.grid.major.x = ggplot2::element\_line(colour = "grey75"),**

**panel.grid.major.y = ggplot2::element\_line(colour = "grey75"),**

**panel.grid.minor.x = ggplot2::element\_blank(),**

**panel.grid.minor.y = ggplot2::element\_blank(),**

**strip.background = ggplot2::element\_rect(fill = "white", colour = "black"),**

**axis.text.x = ggplot2::element\_text(angle = x.tempo.just$angle, hjust = x.tempo.just$hjust, vjust = x.tempo.just$vjust),**

**axis.text.y = ggplot2::element\_text(angle = y.tempo.just$angle, hjust = y.tempo.just$hjust, vjust = y.tempo.just$vjust),**

**aspect.ratio = if(fix.ratio == TRUE){1}else{NULL}**

*# do not work -> legend.position = "none" # to remove the legend completely: https://www.datanovia.com/en/blog/how-to-remove-legend-from-a-ggplot/*

**))**

**}**

*# end no need loop part*

*# loop part*

**point.count <- 0**

**line.count <- 0**

**lg.order <- vector(mode = "list", length = 6)** *# order of the legend*

**lg.order <- lapply(lg.order, as.numeric)** *# order of the legend*

**lg.color <- vector(mode = "list", length = 6)** *# color of the legend*

**lg.alpha <- vector(mode = "list", length = 6)** *# order of the legend*

**lg.alpha <- lapply(lg.alpha, as.numeric)** *# alpha of the legend*

**for(i1 in 1:length(data1)){**

**if(geom[[i1]] == "geom\_point"){**

**point.count <- point.count + 1**

**if(point.count == 1){**

**fin.lg.disp[[1]] <- legend.disp[[point.count + line.count]]**

**lg.order[[1]] <- point.count + line.count**

**lg.color[[1]] <- color[[i1]]**

**lg.alpha[[1]] <- alpha[[i1]]**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = scatter.kind[[i1]]))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], fill = categ[[i1]]), size = dot.size, color = color[[i1]][i5], alpha = alpha[[i1]]))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_fill\_manual(name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = as.character(color[[i1]]), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], linetype = 0))))** *# values are the values of fill. order determines the order in the legend*

**}**

**if(point.count == 2){**

**fin.lg.disp[[2]] <- legend.disp[[point.count + line.count]]**

**lg.order[[2]] <- point.count + line.count**

**lg.color[[2]] <- color[[i1]]**

**lg.alpha[[2]] <- alpha[[i1]]**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = scatter.kind[[i1]]))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], shape = categ[[i1]]), size = dot.size, color = color[[i1]][i5], alpha = alpha[[i1]]))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_shape\_manual(name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = rep(19, length(color[[i1]])), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], linetype = 0))))** *# values are the values of shape*

**}**

**if(point.count == 3){**

**fin.lg.disp[[3]] <- legend.disp[[point.count + line.count]]**

**lg.order[[3]] <- point.count + line.count**

**lg.color[[3]] <- color[[i1]]**

**lg.alpha[[3]] <- alpha[[i1]]**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = scatter.kind[[i1]]))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], stroke = categ[[i1]]), size = dot.size, color = color[[i1]][i5], alpha = alpha[[i1]]))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_discrete\_manual(aesthetics = "stroke", name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = rep(0.5, length(color[[i1]])), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], linetype = 0))))** *# values are the values of stroke*

**}**

**}else{**

**line.count <- line.count + 1**

**if(line.count == 1){**

**fin.lg.disp[[4]] <- legend.disp[[point.count + line.count]]**

**lg.order[[4]] <- point.count + line.count**

**lg.color[[4]] <- color[[i1]]**

**if(plot == TRUE & fin.lg.disp[[4]] == TRUE & ((length(dev.list()) > 0 & names(dev.cur()) == "windows") | (length(dev.list()) == 0 & Sys.info()["sysname"] == "Windows"))){** *# if any Graph device already open and this device is "windows", or if no Graph device opened yet and we are on windows system -> prevention of alpha legend bug on windows using value 1*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": GRAPHIC DEVICE USED ON A WINDOWS SYSTEM ->\nTRANSPARENCY OF THE LINES IS INACTIVATED IN THE LEGEND TO PREVENT A WINDOWS DEPENDENT BUG (SEE** *https://github.com/tidyverse/ggplot2/issues/2452***)\nTO OVERCOME THIS ON WINDOWS, USE ANOTHER DEVICE (pdf() FOR INSTANCE)")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**lg.alpha[[4]] <- 1** *# to avoid a bug on windows: if alpha argument is different from 1 for lines (transparency), then lines are not correctly displayed in the legend when using the R GUI (bug https://github.com/tidyverse/ggplot2/issues/2452). No bug when using a pdf*

**}else{**

**lg.alpha[[4]] <- alpha[[i1]]**

**}**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = paste("ggplot2::", geom[[i1]], sep ="")))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], linetype = categ[[i1]]), color = color[[i1]][i5], size = line.size, lineend = "round", alpha = alpha[[i1]]))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_discrete\_manual(aesthetics = "linetype", name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = rep(1, length(color[[i1]])), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], shape = NA))))** *# values are the values of linetype. 1 means solid. Regarding the alpha bug, I have tried different things without success: alpha in guide alone, in geom alone, in both, with different values*

**}**

**if(line.count == 2){**

**fin.lg.disp[[5]] <- legend.disp[[point.count + line.count]]**

**lg.order[[5]] <- point.count + line.count**

**lg.color[[5]] <- color[[i1]]**

**if(plot == TRUE & fin.lg.disp[[5]] == TRUE & ((length(dev.list()) > 0 & names(dev.cur()) == "windows") | (length(dev.list()) == 0 & Sys.info()["sysname"] == "Windows"))){** *# if any Graph device already open and this device is "windows", or if no Graph device opened yet and we are on windows system -> prevention of alpha legend bug on windows using value 1*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": GRAPHIC DEVICE USED ON A WINDOWS SYSTEM ->\nTRANSPARENCY OF THE LINES IS INACTIVATED IN THE LEGEND TO PREVENT A WINDOWS DEPENDENT BUG (SEE** *https://github.com/tidyverse/ggplot2/issues/2452***)\nTO OVERCOME THIS ON WINDOWS, USE ANOTHER DEVICE (pdf() FOR INSTANCE)")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**lg.alpha[[5]] <- 1** *# to avoid a bug on windows: if alpha argument is different from 1 for lines (transparency), then lines are not correctly displayed in the legend when using the R GUI (bug https://github.com/tidyverse/ggplot2/issues/2452). No bug when using a pdf*

**}else{**

**lg.alpha[[5]] <- alpha[[i1]]**

**}**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = paste("ggplot2::", geom[[i1]], sep ="")))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], alpha = categ[[i1]]), color = color[[i1]][i5], size = line.size, lineend = "round"))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_discrete\_manual(aesthetics = "alpha", name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = rep(alpha[[i1]], length(color[[i1]])), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], shape = NA))))** *# values are the values of linetype. 1 means solid. Regarding the alpha bug, I have tried different things without success: alpha in guide alone, in geom alone, in both, with different values*

**}**

**if(line.count == 3){**

**fin.lg.disp[[6]] <- legend.disp[[point.count + line.count]]**

**lg.order[[6]] <- point.count + line.count**

**lg.color[[6]] <- color[[i1]]**

**if(plot == TRUE & fin.lg.disp[[6]] == TRUE & ((length(dev.list()) > 0 & names(dev.cur()) == "windows") | (length(dev.list()) == 0 & Sys.info()["sysname"] == "Windows"))){** *# if any Graph device already open and this device is "windows", or if no Graph device opened yet and we are on windows system -> prevention of alpha legend bug on windows using value 1*

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": GRAPHIC DEVICE USED ON A WINDOWS SYSTEM ->\nTRANSPARENCY OF THE LINES IS INACTIVATED IN THE LEGEND TO PREVENT A WINDOWS DEPENDENT BUG (SEE** *https://github.com/tidyverse/ggplot2/issues/2452***)\nTO OVERCOME THIS ON WINDOWS, USE ANOTHER DEVICE (pdf() FOR INSTANCE)")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**lg.alpha[[6]] <- 1** *# to avoid a bug on windows: if alpha argument is different from 1 for lines (transparency), then lines are not correctly displayed in the legend when using the R GUI (bug https://github.com/tidyverse/ggplot2/issues/2452). No bug when using a pdf*

**}else{**

**lg.alpha[[6]] <- alpha[[i1]]**

**}**

**class.categ <- levels(factor(data1[[i1]][, categ[[i1]]]))**

**for(i5 in 1:length(color[[i1]])){** *# or length(class.categ). It is the same because already checked that lengths are the same*

**tempo.data.frame <- data1[[i1]][data1[[i1]][, categ[[i1]]] == class.categ[i5], ]**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), eval(parse(text = paste("ggplot2::", geom[[i1]], sep ="")))(data = tempo.data.frame, mapping = ggplot2::aes\_string(x = x[[i1]], y = y[[i1]], size = categ[[i1]]), color = color[[i1]][i5], alpha = alpha[[i1]], lineend = "round"))** *# beware: a single color allowed for color argument outside aesthetic, hence the loop # show.legend option do not remove the legend, only the aesthetic of the legend (dot, line, etc.)*

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_discrete\_manual(aesthetics = "size", name = if(is.null(legend.name)){NULL}else{legend.name[[i1]]}, values = rep(line.size, length(color[[i1]])), guide = ggplot2::guide\_legend(override.aes = list(colour = color[[i1]], shape = NA))))** *# values are the values of linetype. 1 means solid. Regarding the alpha bug, I have tried different things without success: alpha in guide alone, in geom alone, in both, with different values*

**}**

**}**

**}**

*# end loop part*

*# legend display*

**tempo.legend.final <- ggplot2::guides(fill = if(fin.lg.disp[[1]] == TRUE){ggplot2::guide\_legend(order = lg.order[[1]], override.aes = list(alpha = lg.alpha[[1]], color = lg.color[[1]]))}else{FALSE}, shape = if(fin.lg.disp[[2]] == TRUE){ggplot2::guide\_legend(order = lg.order[[2]], override.aes = list(alpha = lg.alpha[[2]], color = lg.color[[2]]))}else{FALSE}, stroke = if(fin.lg.disp[[3]] == TRUE){ggplot2::guide\_legend(order = lg.order[[3]], override.aes = list(alpha = lg.alpha[[2]], color = lg.color[[3]]))}else{FALSE}, linetype = if(fin.lg.disp[[4]] == TRUE){ggplot2::guide\_legend(order = lg.order[[4]], override.aes = list(alpha = lg.alpha[[4]], color = lg.color[[4]]))}else{FALSE}, alpha = if(fin.lg.disp[[5]] == TRUE){ggplot2::guide\_legend(order = lg.order[[5]], override.aes = list(alpha = lg.alpha[[5]], color = lg.color[[5]]))}else{FALSE}, size = if(fin.lg.disp[[6]] == TRUE){ggplot2::guide\_legend(order = lg.order[[6]], override.aes = list(alpha = lg.alpha[[6]], color = lg.color[[6]]))}else{FALSE})** *# clip = "off" to have secondary ticks outside plot region does not work*

**if(show.legend == TRUE){**

**tempo.graph.info <- ggplot2::ggplot\_build(eval(parse(text = paste0(paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "), ' + tempo.legend.final'))))** *# will be recovered later again, when ylim will be considered*

**legend.final <- get\_legend\_fun(tempo.graph.info) # get legend**

**fin.lg.disp[] <- FALSE # remove all the legends**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::guides(fill = if(fin.lg.disp[[1]] == TRUE){ggplot2::guide\_legend(order = lg.order[[1]], override.aes = list(alpha = lg.alpha[[1]], color = lg.color[[1]]))}else{FALSE}, shape = if(fin.lg.disp[[2]] == TRUE){ggplot2::guide\_legend(order = lg.order[[2]], override.aes = list(alpha = lg.alpha[[2]], color = lg.color[[2]]))}else{FALSE}, stroke = if(fin.lg.disp[[3]] == TRUE){ggplot2::guide\_legend(order = lg.order[[3]], override.aes = list(alpha = lg.alpha[[2]], color = lg.color[[3]]))}else{FALSE}, linetype = if(fin.lg.disp[[4]] == TRUE){ggplot2::guide\_legend(order = lg.order[[4]], override.aes = list(alpha = lg.alpha[[4]], color = lg.color[[4]]))}else{FALSE}, alpha = if(fin.lg.disp[[5]] == TRUE){ggplot2::guide\_legend(order = lg.order[[5]], override.aes = list(alpha = lg.alpha[[5]], color = lg.color[[5]]))}else{FALSE}, size = if(fin.lg.disp[[6]] == TRUE){ggplot2::guide\_legend(order = lg.order[[6]], override.aes = list(alpha = lg.alpha[[6]], color = lg.color[[6]]))}else{FALSE})) # without legend (added later)**

**}else{**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), tempo.legend.final)**

**}**

*# end legend display*

*# scale management*

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::coord\_cartesian(xlim = x.lim, ylim = y.lim))** *# clip = "off" to have secondary ticks outside plot region does not work*

*# x-axis ticks and inv*

**tempo.coord <- ggplot2::ggplot\_build(eval(parse(text = paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "))))$layout$panel\_params[[1]]**

**tempo.scale <- fun\_scale(lim = x.lim, n = ifelse(is.null(x.tick.nb), length(tempo.coord$x.major\_source), x.tick.nb))**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_x\_continuous(**

**breaks = tempo.scale,**

**labels = if(x.log == "log10"){scales::trans\_format("identity", scales::math\_format(10^.x))}else if(x.log == "log2"){scales::trans\_format("identity", scales::math\_format(2^.x))}else if(x.log == "no"){ggplot2::waiver()}else{tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 6\n\n============\n\n") ; stop(tempo.cat, call. = FALSE)},**

**expand = c(0, 0),**

**limits = NA,**

**trans = ifelse(diff(x.lim) < 0, "reverse", "identity")** *# equivalent to ggplot2::scale\_x\_reverse()*

**))**

*# end x-axis ticks and inv*

*# y-axis ticks and inv*

**tempo.coord <- ggplot2::ggplot\_build(eval(parse(text = paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "))))$layout$panel\_params[[1]]**

**tempo.scale <- fun\_scale(lim = y.lim, n = ifelse(is.null(y.tick.nb), length(tempo.coord$y.major\_source), y.tick.nb))**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::scale\_y\_continuous(**

**breaks = tempo.scale,**

**labels = if(y.log == "log10"){scales::trans\_format("identity", scales::math\_format(10^.x))}else if(y.log == "log2"){scales::trans\_format("identity", scales::math\_format(2^.x))}else if(y.log == "no"){ggplot2::waiver()}else{tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 7\n\n============\n\n") ; stop(tempo.cat, call. = FALSE)},**

**expand = c(0, 0),**

**limits = NA,**

**trans = ifelse(diff(y.lim) < 0, "reverse", "identity")** *# equivalent to ggplot2::scale\_y\_reverse()*

**))**

*# end y-axis ticks and inv*

*# x-axis secondary ticks (after ggplot2::coord\_cartesian() or ggplot2::coord\_flip())*

**tempo.coord <- ggplot2::ggplot\_build(eval(parse(text = paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "))))$layout$panel\_params[[1]]**

**x.lim.order <- order(x.lim)** *# to deal with inverse axis*

**y.lim.order <- order(y.lim)** *# to deal with inverse axis*

*# no secondary ticks for log2. Play with x.lim*

**if(x.log == "log10"){**

**y.range <- tempo.coord$y.range**

**if(diff(y.lim.order) < 0){y.range <- -(y.range)}**

**ini.scipen <- options()$scipen**

**options(scipen = -1000)** *# force scientific format*

**power10.exp <- as.integer(substring(text = 10^x.lim, first = (regexpr(pattern = "\\+|\\-", text = 10^x.lim))))** *# recover the power of 10. Example recover 08 from 1e+08*

**# print(x.lim)**

**mantisse <- as.numeric(substr(x = 10^x.lim, start = 1, stop = (regexpr(pattern = "\\+|\\-", text = 10^x.lim) - 2)))** *# recover the mantisse. Example recover 1.22 from 1.22e+08*

**options(scipen = ini.scipen)** *# restore the initial scientific penalty*

**# print(power10.exp)**

**tempo.tick.pos <- as.vector(outer(log10(2:10), 10^((power10.exp[1] - ifelse(diff(x.lim.order) > 0, 1, -1)):(power10.exp[2] + ifelse(diff(x.lim.order) > 0, 1, -1)))))**

**tempo.tick.pos <- sort(tempo.tick.pos, decreasing = ifelse(diff(x.lim.order) > 0, FALSE, TRUE))**

**tempo.tick.pos <- log10(tempo.tick.pos[tempo.tick.pos >= min(10^x.lim) & tempo.tick.pos <= max(10^x.lim)])**

**if(any(is.na(tempo.tick.pos) | ! is.finite(tempo.tick.pos))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 8\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::annotate(geom = "segment", x = tempo.tick.pos, xend = tempo.tick.pos, y = y.range[1], yend = y.range[1] + diff(y.range) / 80))**

**}else if(( ! is.null(x.inter.tick.nb)) & x.log == "no"){**

**if(x.inter.tick.nb > 0){**

**x.ticks.pos <- suppressWarnings(as.numeric(tempo.coord$x.labels))** *# too difficult to predict the behavior of tempo.coord$x.major\_source depending on x.lim neg or not, inv or not. Inv is respected*

**if(any(is.na(x.ticks.pos))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 9\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**y.range <- tempo.coord$y.range**

**if(diff(y.lim.order) < 0){y.range <- -(y.range)}**

**tick.dist <- mean(diff(x.ticks.pos), na.rm = TRUE)**

**minor.tick.dist <- tick.dist / (x.inter.tick.nb + 1)**

**minor.tick.pos <- seq(x.ticks.pos[1] - tick.dist, x.ticks.pos[length(x.ticks.pos)] + tick.dist, by = minor.tick.dist)**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::annotate(geom = "segment", x = minor.tick.pos, xend = minor.tick.pos, y = y.range[1], yend = y.range[1] + diff(y.range) / 80))**

**}**

**}**

*# end x-axis secondary ticks (after ggplot2::coord\_cartesian() or ggplot2::coord\_flip())*

*# y-axis secondary ticks (after ggplot2::coord\_cartesian() or ggplot2::coord\_flip())*

**tempo.coord <- ggplot2::ggplot\_build(eval(parse(text = paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "))))$layout$panel\_params[[1]]**

*# no secondary ticks for log2. Play with y.lim*

**if(y.log == "log10"){**

**x.range <- tempo.coord$x.range**

**if(diff(x.lim.order) < 0){x.range <- -(x.range)}**

**ini.scipen <- options()$scipen**

**options(scipen = -1000)** *# force scientific format*

**power10.exp <- as.integer(substring(text = 10^y.lim, first = (regexpr(pattern = "\\+|\\-", text = 10^y.lim))))** *# recover the power of 10. Example recover 08 from 1e+08*

**mantisse <- as.numeric(substr(x = 10^y.lim, start = 1, stop = (regexpr(pattern = "\\+|\\-", text = 10^y.lim) - 2)))** *# recover the mantisse. Example recover 1.22 from 1.22e+08*

**options(scipen = ini.scipen)** *# restore the initial scientific penalty*

**tempo.tick.pos <- as.vector(outer(log10(2:10), 10^((power10.exp[1] - ifelse(diff(y.lim.order) > 0, 1, -1)):(power10.exp[2] + ifelse(diff(y.lim.order) > 0, 1, -1)))))**

**tempo.tick.pos <- sort(tempo.tick.pos, decreasing = ifelse(diff(y.lim.order) > 0, FALSE, TRUE))**

**tempo.tick.pos <- log10(tempo.tick.pos[tempo.tick.pos >= min(10^y.lim) & tempo.tick.pos <= max(10^y.lim)])**

**if(any(is.na(tempo.tick.pos) | ! is.finite(tempo.tick.pos))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 10\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::annotate(geom = "segment", y = tempo.tick.pos, yend = tempo.tick.pos, x = x.range[1], xend = x.range[1] + diff(x.range) / 80))**

**}else if(( ! is.null(y.inter.tick.nb)) & y.log == "no"){**

**if(y.inter.tick.nb > 0){**

**y.ticks.pos <- suppressWarnings(as.numeric(tempo.coord$y.labels))** *# too difficult to predict the behavior of tempo.coord$y.major\_source depending on y.lim neg or not, inv or not. Inv is respected*

**if(any(is.na(y.ticks.pos))){**

**tempo.cat <- paste0("\n\n============\n\nERROR IN ", function.name, ": CODE INCONSISTENCY 11\n\n============\n\n")**

**stop(tempo.cat, call. = FALSE)**

**}**

**x.range <- tempo.coord$x.range**

**if(diff(x.lim.order) < 0){x.range <- -(x.range)}**

**tick.dist <- mean(diff(y.ticks.pos), na.rm = TRUE)**

**minor.tick.dist <- tick.dist / (y.inter.tick.nb + 1)**

**minor.tick.pos <- seq(y.ticks.pos[1] - tick.dist, y.ticks.pos[length(y.ticks.pos)] + tick.dist, by = minor.tick.dist)**

**assign(paste0(tempo.gg.name, tempo.gg.count <- tempo.gg.count + 1), ggplot2::annotate(geom = "segment", y = minor.tick.pos, yend = minor.tick.pos, x = x.range[1], xend = x.range[1] + diff(x.range) / 80))**

**}**

**}**

*# end y-axis secondary ticks (after ggplot2::coord\_cartesian() or ggplot2::coord\_flip())*

*# end scale management*

**if(plot == TRUE){**

**if(show.legend == TRUE){**

**suppressWarnings(gridExtra::grid.arrange(eval(parse(text = paste(paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "),if(is.null(add)){NULL}else{add}))), legend.final, ncol=2, widths=c(1, legend.sector.width)))**

**}else{**

**suppressWarnings(print(eval(parse(text = paste(paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "),if(is.null(add)){NULL}else{add})))))**

**}**

**}else{**

**warn.count <- warn.count + 1**

**tempo.warn <- paste0("(", warn.count,") FROM FUNCTION ", function.name, ": PLOT NOT SHOWN AS REQUESTED")**

**warn <- paste0(ifelse(is.null(warn), tempo.warn, paste0(warn, "\n\n", tempo.warn)))**

**}**

**if(warn.print == TRUE & ! is.null(warn)){**

**warning(paste0("FROM ", function.name, " FUNCTION:\n\n", warn), call. = FALSE)** *# to recover the warning messages, use return = TRUE*

**}**

**if(return == TRUE){**

**output <- ggplot2::ggplot\_build(eval(parse(text = paste(paste0(tempo.gg.name, 1:tempo.gg.count), collapse = " + "))))**

**if(is.null(unlist(removed.row.nb))){**

**removed.row.nb <- NULL**

**removed.rows <- NULL**

**}else{**

**for(i3 in 1:length(data1)){**

**if( ! is.null(removed.row.nb[[i3]])){**

**removed.row.nb[[i3]] <- sort(removed.row.nb[[i3]])**

**removed.rows[[i3]] <- data1.ini[[i3]][removed.row.nb[[i3]], ]**

**}**

**}**

**}**

**output <- list(data = output$data, removed.row.nb = removed.row.nb, removed.rows = removed.rows, axes = output$layout$panel\_params[[1]], warn = paste0("\n", warn, "\n\n"))**

**return(output)**

**}**

**}**