Package ‘qrlabelr’

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Type Package
Title Generate Machine- And Human-Readable Plot Labels for Experiments
Version 0.1.1
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Description A no-frills open-source solution for designing plot labels affixed with QR codes. It features 'EasyQrlabelr', a 'shiny' app that simplifies the process of plot label design for non-R users. This software builds on the methods described by Wu 'et al.' (2020) <doi:10.1111/2041-210X.13405>.
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add_border

Make an enhanced field layout plot with border rows.

Description

A helper function that adds border rows to the entire perimeter of a field laid out in a rectangular or square grid. Each experimental plot must have a coordinate that is specified by row and column numbers in the grid layout.

Usage

```r
add_border(
  x,
  row_id = "ROW",
  col_id = "COLUMN",
  rep_id = "REP",
  trt_id = "TREATMENT",
  title = "Field layout",
  text_sz = 3,
  axis_title_sz = 12,
)```

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add_border

xlab = "Column",
ylab = "Row",
border_bg = "grey80",
text_col = "grey10"
)

Arguments

x The input data frame of field book that has row and column coordinates of each plot.

row_id The string column identifier for ROW in the input field book.

col_id The string column identifier for COLUMN in the input field book.

rep_id The string column identifier for REP in the input field book.

trt_id The string column identifier for TREATMENT in the input field book.

title The title of the field layout plot.

text_sz The text size to print treatment names on the tiles.

axis_title_sz The text size for axis titles.

xlab A string to label x axis; default is 'Column'.

ylab A string to label y axis; default is 'Row'.

border_bg A string specifying the background color for the border rows.

text_col A string specifying the text color for the border rows.

Value

A 'ggplot2' graphical object of field layout with border rows around the entire perimeter.

Note

This function works best with input field books generated with the 'FielDHub' package

Examples

# Plot a field layout with border rows
library(qrlabelr)
set.seed(123)
add_border(x = data.frame(LOCATION = rep("BAMBEY", 12),

PLOT = c(1001:1012),
ROW = c(rep(1, 6), rep(2, 6)),
COLUMN = c(1:6, 1:6),
REP = rep(1, 12),
TREATMENT = sample(paste0("G-", 1:12)),

text_sz = 3)
create_label

Create custom machine- and human-readable rectangular plot labels

Description

Create print-ready customized plot labels affixed with QR codes given the page setup, label dimensions, the number of rows and columns of labels to print per page.

Usage

```r
create_label(
  wdt = 2,
  hgt = 1,
  page_wdt = 8.5,
  page_hgt = 11,
  top_mar = 0.625,
  bot_mar = 0.625,
  left_mar = 0.625,
  right_mar = 0.625,
  numrow = 8L,
  numcol = 3L,
  filename = "PlotLabel",
  font_sz = 8,
  Treetag = FALSE,
  family = "sans",
  rounded = TRUE,
  print_across = TRUE,
  rect = TRUE,
  top_left_1 = NULL,
  top_left_2 = NULL,
  top_right_1 = NULL,
  top_right_2 = NULL,
  center_right_1 = NULL,
  center_right_2 = NULL,
  center_right_3 = NULL,
  bottom_left_1 = NULL,
  bottom_left_2 = NULL,
  unique_id = NULL,
  ec_level = 3,
  ...
)
```

Arguments

- **wdt** The label width in inches.
- **hgt** The label height in inches.
create_label

page_wdt  The page width in inches.
page_hgt  The page height in inches.
top_mar   The page top margin in inches.
bot_mar   The page bottom margin in inches.
left_mar  The page left margin in inches.
right_mar The page right margin in inches.
numrow   The number of label rows per page. It should be an integer.
numcol   The number of label columns per page. It should be an integer.
filename A character prefix or path for the pdf file to be created. Default path is working
directory.
font_sz   The font size to use.
Treetag   Set to TRUE if creating a treetag label.
family   The font style to use to print labels.
rounded  Set to TRUE if label has round corners; set to false if label has square corners.
print_across Set to TRUE to print labels across rows, left to right; else set to FALSE to print
              labels down columns, top to bottom. Default is TRUE.
rect      Set to TRUE to draw rectangles around labels, else set to FALSE. Default is
              TRUE.
top_left_1 String for top-left row 1 position on a rectangular label.
top_left_2 String for top-left row 2 position on a rectangular label.
top_right_1 String for top-right row 1 position on a rectangular label.
top_right_2 String for top-right row 2 position on a rectangular label.
center_right_1 String for center-right row 1 position on a rectangular label.
center_right_2 String for center-right row 2 position on a rectangular label.
center_right_3 String for center-right row 3 position on a rectangular label.
bottom_left_1 String for bottom-left row 1 position on a rectangular label.
bottom_left_2 String for bottom-left row 2 position on a rectangular label.
unique_id A vector containing unique identifiers or strings to generate QR codes.
ec_level  The error correction level (‘0’ - ‘3’, lowest to highest) for QR codes.
...      Additional optional arguments to be supplied.

Value
A PDF file containing experimental plot labels affixed with QR codes, saved to the default or work-
ding directory.

See Also
field_label and gp_label
field_label

Create field plot labels embossed with QR codes

Description

Create machine- and human-readable plot labels that are well-suited for field experiments.

Usage

field_label(dat,
           get_unique_id = c("ruid", "uuid", "custom"),
           unique_id = NULL,
           filename = "PlotLabel",
           Year = NULL,
           rname = NULL,
           Trial = "PYT",
           seed_source = FALSE,
           IBlock = FALSE,
           rep_id = "REP",
           )
plot_id = "PLOT",
row_id = "ROW",
col_id = "COLUMN",
loc_id = "LOCATION",
entry_id = "TREATMENT",
IBlock_id = "IBLOCK",
seed_source_id = NULL,
...
)

Arguments

dat        An input data frame of field book that contains plot attributes. To design field
plot labels, the imported field book must have LOCATION, PLOT, ROW, COLUMN/RANGE, REP, TREATMENT columns. The order of the columns in the
field book is not important, and the columns can be any name the user desires.

get_unique_id Set to 'ruid' if reproducible and informative unique ids are to be generated from
imported field book. Set to 'uuid' if universal unique ids are to be generated
from imported field book. Set to 'custom' if imported field book already has
unique IDs for each plot.

unique_id   The column identifier for UNIQUE_ID in the imported field book.
filename    A character prefix or path for the pdf file to be created. Default path is working
directory.
Year        The year of experiment or trial.
rname       The researcher’s name. Initials or initials of first and middle names and the last
name.
Trial       The name of the trial to use.
seed_source Set to TRUE if seed source is included in the imported field book, FALSE if
otherwise.
IBlock      Set to TRUE if dat contains incomplete blocks within replications.
rep_id      The column identifier for REP in the imported field book.
plot_id     The column identifier for PLOT in the imported field book.
row_id      The column identifier for ROW in the imported field book.
col_id      The column identifier for COLUMN in the imported field book.
loc_id      The column identifier for LOCATION in the imported field book.
entry_id    The column identifier for ENTRY/TREATMENT in the imported field book.
IBlock_id   The column identifier for IBLOCK in the imported field book. It must be pro-
vided if IBlock is set to TRUE.
seed_source_id The column identifier for SEED_SOURCE in the imported field book. It must
be provided if seed_source is set to TRUE.
...
Additional arguments passed to the create_label() function.
Details

The default column identifiers for LOCATION, PLOT, ROW, COLUMN/RANGE, REP, TREATMENT are based on the column IDs of a field book generated using the 'FieldHub' package. If user imports any field book generated with other programs, the user must specify the equivalent column identifiers used for LOCATION, PLOT, REP, ROW, COLUMN, and TREATMENT/ENTRY in the imported field book.

if get_unique_id = 'ruid' (i.e. Reproducible Unique IDs), the function concatenates location, year, trial name, plot, row and column IDs. if get_unique_id = 'uuid' (i.e. Universal Unique IDs), the function generates UUIDs by time randomly. Note that UUIDs are uninformative and not reproducible.

If input field book already has unique IDs for each plot, the get_unique_id argument should be set to 'custom'; and the unique_id argument must be specified as a string using the column name in the input field book that denotes plot unique IDs.

if Year is NULL, the function uses the current year as defined in the 'sys.time()'.

If the user is printing labels for any incomplete block design, the imported field book must include an IBLOCK column if the users wishes to display intra-blocking information for experimental plots on the label.

Set the IBlock argument to TRUE if the field layout has incomplete blocks within replications. The imported field book must include an IBLOCK column if the IBlock argument is set to TRUE.

Value

A PDF file containing field plot labels affixed with QR codes, and a data frame of an updated field book; all saved to the default or working directory.

See Also

create_label and gp_label

Examples

library(qrlabelr)

df <- data.frame(LOCATION = rep("BAMBEY", 5),
                 PLOT = 1001:1005,
                 ROW = c(rep(1, 3), rep(2, 2)),
                 COLUMN = c(1:3, 1:2),
                 REP = rep(1, 5),
                 IBLOCK = c(rep(1, 3), rep(2, 2)),
                 TREATMENT = paste0("G-", 1:5),
                 SEED_SOURCE = rep("OFF_NUR", 5))

df$ids <- paste0(df$LOCATION, '2023', '_PYT', '_', df$PLOT, '_', df$ROW, '_',
                 df$COLUMN)

file <- tempfile()

if(file.exists(file))
  field_label(
    dat = df,
Create a general-purpose (gp) label with text aligned in a landscape orientation.

Description

This is a wrapper that gives more flexibility to the user to design any general-purpose label affixed with QR codes. It gives nine(9) text positions in landscape orientation that can be filled with human-readable text items as specified by the user. Arguments are passed to the `create_label()` function.

Usage

```r
gp_label(
  dat,
  get_unique_id = c("uuid", "custom"),
  unique_id = NULL,
  filename = "PlotLabel",
  top_left_txt1 = NULL,
  top_left_txt2 = NULL,
  top_right_txt1 = NULL,
  top_right_txt2 = NULL,
  center_right_txt1 = NULL,
  center_right_txt2 = NULL,
  center_right_txt3 = NULL,
  wdt = 5,
  hgt = 2,
  page_wdt = 8.5,
  page_hgt = 11,
  top_mar = 0.75,
  bot_mar = 0.75,
  left_mar = 1.75,
  right_mar = 1.75,
  numrow = 4L,
  numcol = 1L,
  filename = file,
  font_sz = 20,
  Trial = "PYT",
  Year = 2023,
  family = "sans",
  rounded = TRUE,
  IBlock = TRUE,
  get_unique_id = "ruid",
  rname = "AW Kena",
  seed_source = TRUE,
  seed_source_id = "SEED_SOURCE",
  ec_level = 1)
```
Arguments

dat
An input data frame or field book that contains plot or label attributes. The order of the columns is not important, and the columns can be any name the user desires.

get_unique_id
Set to 'uuid' if universal unique ids are to be generated.

unique_id
The column identifier in dat containing unique identifiers or strings to generate QR codes. Set to 'custom' if imported field book already has unique IDs for each plot.

filename
A character prefix or path for the pdf file to be created. Default path is working directory.

top_left_txt1
The prefix text for top-left row 1.
top_left_txt2
The prefix text for top-left row 2.
top_right_txt1
The prefix text for the top-right row 1.
top_right_txt2
The prefix text for the top-right row 2.
center_right_txt1
The prefix text for center-right row 1.
center_right_txt2
The prefix text for center-right row 2.
center_right_txt3
The prefix text for center-right row 3.
bottom_left_txt1
The column identifier in dat containing text for bottom-left row 1.
bottom_left_txt2
The column identifier in dat containing text for bottom-left row 2.
top_left_id1
The column identifier in dat containing text for top-left row 1.
top_left_id2
The column identifier in dat containing text for top-left row 2.
top_right_id1
The column identifier in dat containing text for top-right row 1.
top_right_id2
The column identifier in dat containing text for top-right row 2.
center_right_id1
The column identifier in dat containing text for center-right row 1.
gp_label

center_right_id2
The column identifier in dat containing text for center-right row 2.

center_right_id3
The column identifier in dat containing text for center-right row 3.

bottom_left_id1
The column identifier in dat containing text for bottom-left row 1.

bottom_left_id2
The column identifier in dat containing text for bottom-left row 2.

... Additional arguments passed to the create_label function.

Value
A PDF file containing plot labels affixed with QR codes, and a data frame of an updated field book; all saved to the default or working directory.

See Also
create_label and field_label

Examples

library(qrlabelr)

df <- data.frame(LOCATION = rep("BAMBEY", 5),
    PLOT = 1001:1005,
    ROW = c(rep(1, 3), rep(2, 2)),
    COLUMN = c(1:3, 1:2),
    REP = rep(1, 5),
    IBLOCK = c(rep(1, 3), rep(2, 2)),
    TREATMENT = paste0("G-", 1:5),
    SEED_SOURCE = rep("OFF_NUR", 5))

df$ids <- paste0(df$LOCATION, '2023', '_PYT', '_', df$PLOT, '_', df$ROW, '_',
    df$COLUMN)

file <- tempfile()

if(file.exists(file))
    gp_label(dat = df,
        wdt = 5,
        hgt = 2,
        page_wdt = 8.5,
        page_hgt = 11,
        top_mar = 0.75,
        bot_mar = 0.75,
        left_mar = 1.75,
        right_mar = 1.75,
        numrow = 4L,
        numcol = 1L,
        filename = file,
        font_sz = 20,
        rname = "Adoma",
        get_unique_id = "custom",
        ...)
Create a general-purpose (gp) label with text aligned in a portrait orientation.

Description

This is a standalone function that gives more flexibility to the user to design any general-purpose label affixed with QR codes. It gives 10 text positions in portrait orientation that can be filled with human-readable text items as specified by the user.

This function creates print-ready customized plot labels affixed with QR codes given the page setup, label dimensions, the number of rows and columns of labels to print per page.

Usage

```r
gp_label_portrait(
  dat,
  wdt = 2,
  hgt = 1,
  page_wdt = 8.5,
  page_hgt = 11,
  top_mar = 0.625,
  bot_mar = 0.625,
  left_mar = 0.625,
  right_mar = 0.625,
  numrow = 8L,
  numcol = 3L,
  filename = "PlotLabel",
  unique_id = 'ids',
  family = "sans”,
  top_left_txt1 = 'Plot:',
  top_left_txt2 = 'Row:',
  top_right_txt1 = 'Rep:',
  top_right_txt2 = 'Col:',
  center_right_txt1 = 'IBlock:',
  center_right_txt2 = 'Seed:',
  center_right_txt3 = 'Adoma',
  top_left_id1 = 'PLOT',
  top_left_id2 = 'ROW',
  top_right_id1 = 'REP',
  top_right_id2 = 'COLUMN',
  center_right_id1 = 'IBLOCK',
  center_right_id2 = 'SEED_SOURCE',
  bottom_left_id1 = 'ids',
  bottom_left_id2 = 'TREATMENT',
  ec_level = 1)
```
font_sz = 8,
family = "sans",
rounded = TRUE,
print_across = TRUE,
rect = TRUE,
bot_txt1 = NULL,
bot_txt2 = NULL,
bot_txt3 = NULL,
cent_txt1 = NULL,
cent_txt2 = NULL,
cent_txt3 = NULL,
cent_txt4 = NULL,
top_txt1 = NULL,
top_txt2 = NULL,
top_txt3 = NULL,
bot_txt1_id = NULL,
bot_txt2_id = NULL,
bot_txt3_id = NULL,
cent_txt1_id = NULL,
cent_txt2_id = NULL,
cent_txt3_id = NULL,
cent_txt4_id = NULL,
top_txt1_id = NULL,
top_txt2_id = NULL,
top_txt3_id = NULL,
unique_id = NULL,
ec_level = 3
}

Arguments

dat An input data frame or field book that contains plot attributes. The order of the columns is not important, and the columns can be any name the user desires.

wdt The label width in inches.

hgt The label height in inches.

page_wdt The page width in inches.

page_hgt The page height in inches.

top_mar The page top margin in inches.

bot_mar The page bottom margin in inches.

left_mar The page left margin in inches.

right_mar The page right margin in inches.

numrow The number of label rows per page. It should be an integer.

numcol The number of label columns per page. It should be an integer.

filename A character prefix or path for the pdf file to be created. Default path is working directory.
font_sz  The font size to use.
family  The font style to use to print labels.
rounded  Set to TRUE if label has round corners; set to false if label has square corners.
print_across  Set to TRUE to print labels across rows, left to right; else set to FALSE to print labels down columns, top to bottom. Default is TRUE.
rect  Set to TRUE to draw rectangles around labels, else set to FALSE. Default is TRUE.
bot_txt1  The prefix text for bottom text position 1.
bot_txt2  The prefix text for bottom text position 2.
bot_txt3  The prefix text for bottom text position 3.
cent_txt1  The prefix text for center text position 1.
cent_txt2  The prefix text for center text position 2.
cent_txt3  The prefix text for center text position 3.
cent_txt4  The prefix text for center text position 4.
top_txt1  The prefix text for top text position 1.
top_txt2  The prefix text for top text position 2.
top_txt3  The prefix text for top text position 3.
bot_txt1_id  The column identifier in dat containing text for bottom text position 1.
bot_txt2_id  The column identifier in dat containing text for bottom text position 2.
bot_txt3_id  The column identifier in dat containing text for bottom text position 3.
cent_txt1_id  The column identifier in dat containing text for center text position 1.
cent_txt2_id  The column identifier in dat containing text for center text position 2.
cent_txt3_id  The column identifier in dat containing text for center text position 3.
cent_txt4_id  The column identifier in dat containing text for center text position 4.
top_txt1_id  The column identifier in dat containing text for top text position 1.
top_txt2_id  The column identifier in dat containing text for top text position 2.
top_txt3_id  The column identifier in dat containing text for top text position 3.
unique_id  The column identifier in dat containing unique identifiers or strings to generate QR codes.
ec_level  The error correction level (‘0’ - ‘3’, lowest to highest) for QR codes.

Value

A PDF file containing labels affixed with QR codes, saved to the default or working directory.

See Also

field_label and gp_label
Examples

# Create a general-purpose label in a portrait text orientation based on the
# 2 x 1 inch Avery 94220 template for laser-jet printers
library(qrlabelr)
df <- data.frame(LOCATION = rep("BAMBEY", 5),
    PLOT = 1001:1005,
    ROW = c(rep(1, 3), rep(2, 2)),
    COLUMN = c(1:3, 1:2),
    REP = rep(1, 5),
    IBLOCK = c(rep(1, 3), rep(2, 2)),
    TREATMENT = paste0("G-", 1:5),
    SEED_SOURCE = rep("OFF_NUR", 5))

df$ids <- paste0(df$LOCATION, "2023", "_PYT", 
    df$PLOT, ",", df$ROW, ",", df$COLUMN)
file <- tempfile()
if(file.exists(file))
gp_label_portrait(
    dat = df,
    wdt = 2,
    hgt = 1,
    page_wdt = 8.5,
    page_hgt = 11,
    top_mar = 0.625,
    bot_mar = 0.625,
    left_mar = 0.625,
    right_mar = 0.625,
    numrow = 8L,
    numcol = 3L,
    filename = file,
    font_sz = 10,
    family = 'sans',
    rounded = TRUE,
    print_across = TRUE,
    rect = TRUE,
    bot_txt1 = 'Rubi',
    cent_txt2 = 'Rep:',
    cent_txt3 = 'R:',
    cent_txt4 = 'r:',
    top_txt1 = 'P:',
    top_txt2 = 'B:',
    bot_txt2_id = 'ids',
    bot_txt3_id = 'LOCATION',
    cent_txt1_id = 'TREATMENT',
    cent_txt2_id = 'REP',
    cent_txt3_id = 'COLUMN',
    cent_txt4_id = 'ROW',
    top_txt1_id = 'PLOT',
    top_txt2_id = 'IBLOCK',
    top_txt3_id = 'SEED_SOURCE',
    unique_id = 'ids',
    print_across = TRUE,
Description

A helper function for QR code generation using the 'qrencoder' library for faster QR code generation. It converts the generated QR code into a raster grob image that can be plotted using the 'grid.draw()' function in the 'grid' package.

Usage

make_qrcode(my_id, ec_level = 3)

Arguments

my_id Unique ID string to be encoded to QR code.
ec_level The error correction level ('0' - '3', lowest to highest).

Value

A QR code as a raster grob image object that can be plotted with the 'grid.draw()' function in the 'grid' package.

Examples

library(qrlabelr)
qr <- make_qrcode("KUMASI2023_PYT_101_1", ec_level = 1)

# Plot QR code using the grid package
grid::pushViewport(grid::viewport(x = grid::unit(0.5, "npc"),
                                 y = grid::unit(0.5, "npc"),
                                 width = grid::unit(1, "in"),
                                 height = grid::unit(1, "in")))
grid::grid.draw(qr)
# clean up any open graphical device
# grDevices::graphics.off()
Generate Machine- And Human-Readable Plot Labels for Experiments.

Description

A no-frills open-source solution for designing experimental or trial plot labels affixed with QR codes. 'qrlabelr' is an R package that features 'EasyQrlabelr', a Shiny app that simplifies the complicated process of plot label design for non-R users. It also offers easily customizable functions that enable plot label generation outside the Shiny app. It generates field plot labels that are compatible with the widely used digital data collection mobile app, Field Book. Our software builds on the foundation of an existing open-source program to offer more flexibility in plot label creation steps; guarantees true string fidelity after QR encoding; and provides faster label generation to users.

Available vignettes

This package comes with one vignette to get users up to speed as soon as possible. It provides a more thorough guide on how to use qrlabelr, from the data import stage to the generation of labels and saving it for printing. To access the vignette, run the command: browseVignettes("qrlabelr")

Author(s)

Alexander Kена | Ebenezer Ogoe

Description

A sample field book generated with the 'FielDHub' package based on a Randomized Complete Block Design layout at two locations.

Usage

data(rcbd)

Format

A data frame with 144 observations and 7 variables:

- **SN** double contains observation serial numbers.
- **LOCATION** character contains information on plot location.
- **PLOT** double contains the plot number.
- **ROW** double contains the row number.
- **COLUMN** double contains the column number.
- **REP** double contains the replication number.
- **TREATMENT** character contains the treatment identifier.
run_app  

Launch 'EasyQrlabelr'.

Description
An interface function to launch the 'EasyQrlabelr' 'shiny' app.

Usage
run_app()

Value
No return value, called for side effects. Opens the 'EasyQrlabelr' 'shiny' app in your default browser.

Examples
library(qrlabelr)
if(interactive())
qrlabelr::run_app()

square_lattice  

Square Lattice

Description
A sample data set to create field plot and general_purpose labels.

Usage
data(square_lattice)

Format
A data frame with 216 observations and 11 variables:

SN double contains observation serial numbers.
LOCATION character contains information on plot location.
PLOT double contains the plot number.
ROW double contains the row number.
COLUMN double contains the column number.
REP double contains the replication number.
IBLOCK double contains the incomplete block number.
UNIT double contains the unit number.
ENTRY double contains the entry number.
TREATMENT character contains the treatment identifier.
SEED_SOURCE character contains the seed source identifier.
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