Package 'soccermatics'

September 29, 2017

Version 0.8

Title Visualise spatial data from soccer matches

Description Provides tools to visualise x,y-coordinates of soccer players in the manner presented in David Sumpter's eponymous book. Uses ggplot to draw soccer pitch and overplot player trajectories, average player positions, heatmaps of player position, flow fields to show binned player movement or passing, and more.

Depends R (>= 3.4.1)

Imports dplyr, ggplot2, ggforce

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Encoding UTF-8

LazyData true

Collate 'data-tromso.R'
'data-tromso_extra.R'
'soccerPitchFG.R'
'soccerPitchBG.R'
'soccerDirection.R'
'soccerFlow.R'
'soccerHeatmap.R'
'soccerPositions.R'

RoxygenNote 6.0.1

R topics documented:

`data-tromso` *x,y-coordinates of 11 soccer players over 10 minutes (12000 frames each)*

Description

Data on movements of 11 soccer players (1'-10'; Tromsø IL vs. Anzhi, 2013-11-07), captured at 20 Hz using the ZXY Sport Tracking system and made available in the publication ZXY Sport Tracking.

Raw x,y data on movements of 11 soccer players (1'-10'; Tromsø IL vs. Anzhi, 2013-11-07), plus additional information on player heading, direction, energy, speed and total distance. Data captured at 20 Hz using the ZXY Sport Tracking system and made available in the publication ZXY Sport Tracking.

Usage

```
data(tromso)

data(tromso)
```

Format

A dataframe containing 12000 frames of x,y-coordinates and timestamps from 11 players.

Source

ZXY Sport Tracking

ZXY Sport Tracking

References

Pettersen et al. (2014) Proceedings of the International Conference on Multimedia Systems (MMSys) (pdf)

Pettersen et al. (2014) Proceedings of the International Conference on Multimedia Systems (MMSys) (pdf)

Examples

```
## Not run:
data(tromso)
# draw path of player #8 on a soccer pitch
soccerPitchBG(lengthPitch = 105, widthPitch = 68, grass = TRUE) +
  geom_path(data = subset(tromso, id == 8), aes(x, y), lwd = 2)

## End(Not run)
## Not run:
data(tromso)
```

```
# draw path of player #8 on a soccer pitch
soccerPitchBG(lengthPitch = 105, widthPitch = 68, grass = TRUE) +
  geom_path(data = subset(tromso, id == 8), aes(x, y), lwd = 2)

## End(Not run)
```

`soccerDirection` *Draws an arrow showing the direction of play at the top of an existing ggplot of a soccer pitch.*

Description

Draws an arrow showing the direction of play at the top of an existing ggplot of a soccer pitch.

Usage

```
soccerDirection(plot, direction = c("right", "left"), lengthPitch = 105,
  widthPitch = 68, arrow_col = "black", grass = FALSE)
```

Arguments

`plot`	an existing ggplot object to add arrow to.
`direction`	character, direction of arrow (`"right"` or `"left"`).
`lengthPitch, widthPitch`	numeric, length and width of pitch in metres.
`arrow_col`	character, colour of arrow (defaults to `"black"`).
`grass`	if TRUE, draws pitch background in green and lines in white. If FALSE, draws pitch background in white and lines in black.

Value

a ggplot object

See Also

`soccerPitchBG` and `soccerPitchFG` for drawing a soccer pitch

Examples

```
## Not run:
data(tromso)
# draw heatmap of player #9's position
p <- soccerHeatmap(subset(tromso, id == 9), bins = 15, lengthPitch = 105, widthPitch = 68)
# add arrow showing direction of play to the right
soccerDirection(p, "right", lengthPitch = 105, widthPitch = 68)

## End(Not run)
```

soccerFlow	*Draws a flow field showing the direction of passes, shots, or movement made in each sector of the pitch. Note: This function is still prototypical as there are no open-source pass event datasets to test with, but similar visualisations can be made with player movement direction instead.*

Description

Draws a flow field showing the direction of passes, shots, or movement made in each sector of the pitch. Note: This function is still prototypical as there are no open-source pass event datasets to test with, but similar visualisations can be made with player movement direction instead.

Usage

```
soccerFlow(df, bins, lengthPitch = 105, widthPitch = 68, yBins = NULL,
  grass = FALSE, plot = NULL)
```

Arguments

df	dataframe containing x,y-coordinates of player position in columns named 'x' and 'y'.
bins	integer, the number of horizontal bins (length-wise) the soccer pitch is to be divided up into. If no value for yBins is provided, this value will also be used for the number of vertical (width-wise) bins.
lengthPitch, widthPitch	numeric, length and width of pitch in metres.
yBins	integer, the number of vertical bins (width-wise) the soccer patch is to be divided up into. If NULL, the same value is used as for bins
grass	if TRUE, draws pitch background in green and lines in white. If FALSE, draws pitch background in white and lines in black.
plot	optional, adds flow arrows to an existing ggplot object if provided

Value

a ggplot object of a heatmap on a soccer pitch.

See Also

soccerHeatmap for drawing just a heatmap of player position.

Examples

```
## Not run:
data(tromso_extra)
# draw flow field showing mean direction of player #8's movement
soccerFlow(subset(tromso_extra, id == 8), bins = 5, grass = TRUE)
# draw flow field over player heatmap
p <- soccerHeatmap(subset(tromso_extra, id == 8), bins = 5)
soccerFlow(subset(tromso_extra, id == 8), bins = 5, plot = p)

## End(Not run)
```

`soccerHeatmap` *Draws a heatmap of player position frequency in each area of the pitch and adds soccer pitch outlines.*

Description

Draws a heatmap of player position frequency in each area of the pitch and adds soccer pitch outlines.

Usage

```
soccerHeatmap(df, bins = 5, lengthPitch = 105, widthPitch = 68,
  yBins = NULL, colLow = "white", colHigh = "red")
```

Arguments

`df`	dataframe containing x,y-coordinates of player position in columns named `'x'` and `'y'`.
`bins`	integer, the number of horizontal bins (length-wise) the soccer pitch is to be divided up into. If no value for `yBins` is provided, this value will also be used for the number of vertical (width-wise) bins.
`lengthPitch, widthPitch`	numeric, length and width of pitch in metres.
`yBins`	integer, the number of vertical bins (width-wise) the soccer patch is to be divided up into. If `NULL`, the same value is used as for `bins`.
`colLow, colHigh`	character, colours for the low and high ends of the heatmap gradient.

Details

uses `ggplot2::geom_bin2d` to map 2D bin counts

Value

a ggplot object of a heatmap on a soccer pitch.

See Also

soccerPitchBG for a background soccer pitch for the purpose of drawing position maps, player trajectories, etc..

Examples

```
## Not run:
data(tromso)
# draw heatmap of player #9's position
soccerHeatmap(subset(tromso, id == 8), bins = 15)

## End(Not run)
```

---

soccerPitchBG *Draws a soccer pitch as a background ggplot object.*

Description

Draws a soccer pitch as a ggplot object for the purpose of adding player positions, player trajectories, etc..

Usage

```
soccerPitchBG(lengthPitch = 105, widthPitch = 68, grass = FALSE)
```

Arguments

lengthPitch, widthPitch	numeric, length and width of pitch in metres.
grass	if TRUE, draws pitch background in green and lines in white. If FALSE, draws pitch background in white and lines in black.

Value

a ggplot object

See Also

soccerPitchFG for drawing a soccer pitch as foreground over an existing ggplot object

Examples

```
## Not run:
# get x,y-coords of player #8 during first 10 minutes
data(tromso)
dd <- subset(tromso, id == 9)[1:1200,]
# draw player path on pitch
soccerPitchBG(lengthPitch = 105, widthPitch = 68, grass = TRUE) +
```

```
  geom_path(data = dd, aes(x, y), lwd = 2)

## End(Not run)
```

`soccerPitchFG` *Draws soccer pitch outlines over an existing ggplot object*

Description

Draws soccer pitch outlines (with transparent fill) over an existing ggplot object to provide context for heatmaps, passing maps, etc..

Usage

```
soccerPitchFG(plot, lengthPitch = 105, widthPitch = 68)
```

Arguments

`plot`	an existing ggplot object to add layers to.
`lengthPitch, widthPitch`	numeric, length and width of pitch in metres.

Value

a ggplot object

See Also

`soccerPitchBG` for a background soccer pitch for the purpose of drawing position maps, player trajectories, etc..

Examples

```
## Not run:
data(tromso)
# draw heatmap of player #9's position
p <- soccerHeatmap(subset(tromso, id == 8), bins = 15, lengthPitch = 105, widthPitch = 68)
# add pitch lines to plot
soccerPitchFG(p, lengthPitch = 105, widthPitch = 68)

## End(Not run)
```

soccerPositions *Draws the average x,y-positions of all players in a dataframe and plots over a soccer pitch.*

Description

Draws the average x,y-positions of all players in a dataframe and plots over a soccer pitch.

Usage

```
soccerPositions(df, id_var = "id", lengthPitch = 105, widthPitch = 68,
  col1 = "red", col2 = "white", size = 8, grass = FALSE)
```

Arguments

df	dataframe containing x,y-coordinates of player position in columns named 'x' and 'y'.
id_var	character specifying the name of the column containing player identity. Defaults to 'id'.
lengthPitch, widthPitch	numeric, length and width of pitch in metres.
col1	character, fill colour of position points.
col2	character, border colour of position points.
size	numeric, size of position points and text.
grass	if TRUE, draws pitch background in green and lines in white. If FALSE, draws pitch background in white and lines in black.

See Also

soccerPitchBG for a background soccer pitch for the purpose of drawing position maps, player trajectories, etc..

Examples

```
## Not run:
data(tromso)
# draw average player position of players
p <- soccerPositions(tromso, lengthPitch = 105, widthPitch = 68, grass = TRUE)
# draw arrow showing direction of play
soccerDirection(p, "right", lengthPitch = 105, widthPitch = 68, grass = TRUE)

## End(Not run)
```

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