Package ‘unitedR’

June 23, 2020

Title  Assessment and Evaluation of Formations in United

Version  0.4

Description  United is a software tool which can be downloaded at the following website <http://www.schroepl.net/pbm/software/united/>. In general, it is a virtual manager game for football teams. This package contains helpful functions for determining an optimal formation for a virtual match in United. E.g. knowing that the opponent has a strong defensive it is advisable to beat him in the midfield. Furthermore, this package contains functions for computing the optimal usage of hardness in a game.

Depends  R (>= 3.1.2), methods, plyr

License  GPL (>= 2)

LazyData  true

Collate  'simRedCard.R' 'getLineup.R' 'formation.R' 'overtime.R'
         'penaltyGoalsProb.R' 'summary.R' 'unitedRPackage.R'
         'unitedRoverview.R' 'unitedSimClass.R' 'unitedSimResults.R'
         'unitedSimOne.R' 'unitedSim.R'

Suggests  testthat, knitr

VignetteBuilder  knitr

RoxygenNote  7.1.0

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R topics documented:

  unitedR-package ................................................. 2
  formation ...................................................... 2
  getLineup ..................................................... 3
  overtime ....................................................... 4
This package provides functionality for the assessment of lineups and formations in United. The rules for United in detail can be found under: United-rules.

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References

omido, United Software, United-Forum

Description

Represents a valid united formation.
Usage

formation(
    GK,
    SW,
    DF,
    MF,
    ST,
    hardness = c(0, 0, 0, 0, 0),
    homeAdv = c(0, 0, 0, 0, 0)
)

Arguments

GK integer for the strength goalkeeper
SW vector for the strength of the sweeper, can be NA or a numeric
DF numeric vector for the strengths of the players in the defense
MF numeric vector for the strengths of the players in the midfield
ST numeric vector of integers for the strengths of the strikers
hardness numeric vector of length five with integers for the used hardness
homeAdv numeric vector of length five with integers for the used hardness

Value

S4 object of the class formation.

getLineup

getLineup(obj)

Arguments

obj object of the class formation.

Value

vector of the used lineup
Computing overtime results

**Description**
Computes the final overtime outcome.

**Usage**
\[\text{overtime}(\text{chancesHome}, \text{chancesAway}, \text{probGoalHome}, \text{probGoalAway})\]

**Arguments**
- **chancesHome**: goalscoring chances of home team
- **chancesAway**: goalscoring chances of away team
- **probGoalHome**: probability of scoring a goal for home team
- **probGoalAway**: probability of scoring a goal for away team

**Value**
- list with probabilities of final outcome.

Overview over the parameters used in the unitedR package

**Description**
This list of parameters yields a comprehensive overview of the parameters used in the unitedR package.

**Arguments**
- **away**: away team (an object of the S4class formation)
- **chancesAway**: goalscoring chances of away team
- **chancesHome**: goalscoring chances of home team
- **DF**: numeric vector for the strengths of the players in the defense
- **formation**: object of the S4class formation
- **GK**: integer for the strength goalkeeper
- **hardness**: numeric vector of length five with integers for the used hardness
- **hardnessMatrix**: matrix matrix with eleven columns which contain the probability for yellow cards dependent on the used hardness
- **home**: home team (an object of the S4class formation)
Computing goals by united

Description
Computes the distribution function of possible goals by penalties.

Usage
penaltyGoalsProb(posPenalties, penaltyGoalProb, penaltyProb = 0.1)

Arguments
- posPenalties: number of possible penalties in a game
- penaltyGoalProb: probability of a goal by a singular penalty
- penaltyProb: occurrence probability of a penalty
**Value**

A data.frame with two columns: the possible goals and the probability for achieving this number of goals.

---

### penaltyShootout

*Computing outcome of penalty shootout*

**Description**

Computes outcome of a penalty shootout.

**Usage**

```r
penaltyShootout(probPenaltySaveHome, probPenaltySaveAway, initial = 5)
```

**Arguments**

- `probPenaltySaveHome`: probability of saving a penalty for home team
- `probPenaltySaveAway`: probability of saving a penalty for away team
- `initial`: number of initial penalties (default 5)

**Value**

list with probabilities of final outcome (`winProbabilityHome`, `winProbabilityAway`).

---

### simRedCard

*Simulate red card(s)*

**Description**

Simulates red card(s) in the united and returns the adjusted lineup.

**Usage**

```r
simRedCard(obj, lineup, Hard)
```

**Arguments**

- `obj`: object of the class `formation`
- `lineup`: lineup of the corresponding object `obj`
- `Hard`: matrix of hardness to be used
Value

list with two elements:

- vector adjusted lineup for the red card(s)
- numeric number of red cards

summary

Summary of assessments of a randomization procedure

Description

Summary of assessments of a randomization procedure

Usage

summary(object, ...)

## S4 method for signature 'unitedSim'
summary(object)

## S4 method for signature 'unitedSimResults'
summary(object)

Arguments

object object of class unitedSimResults
...
additional arguments affecting the summary that will be produced.

Value

data.frame with a summary of the assessed object.

unitedSim

Simulating a formation

Description

Simulates a formation against another formations (several formations of away are possible).
Usage

unitedSim(
  home,
  ...,  
  r,
  penaltyProb = 0.1,
  preventGoalGK = 1/14,
  preventGoalSW = 1/15,
  hardnessMatrix,
  L,
  overtime = FALSE
)

Arguments

home  home team (an object of the S4 class formation)
...
several objects of the class formation
r   number of replications for the simulation of hardness and penalties, can be
    missing (exact results will be computed)
penaltyProb occurrence probability of a penalty
preventGoalGK factor multiplicied with the strength of the GK for computing the probability of
    preventing a goal by the goalkeeper
preventGoalSW factor multiplicied with the strength of the SW for computing the probability of
    preventing a goal by the sweeper
hardnessMatrix matrix matrix with eleven columns which contain the probability for yellow
    cards dependent on the used hardness
L    list with elements of class formation
overtime logical, if True overtime win probabilites are calculated. Only available if total
    hardness is zero or one.

Value

Creates an object of the unitedSim class.

See Also

unitedSimOne

Examples

home <- formation(10, NA, c(7,5,3), c(8,8), c(10,10,8))
away <- formation(5, 8, c(8,8), c(10,10), c(10,10,10),
  hardness = c(0,0,0,0,1))
set.seed(123)
unitedSim(home, away)
# can also be simulated
unitedSim(home, away, r = 100)
# several away lineups
unitedSim(home, away, away)
# several away lineups simulated
unitedSim(home, away, away, r = 100)
# used hardness matrix (default)
# shows the probability of receiving a specified number of yellow cards
# dependent on the used points of hardness
dimNams <- list(paste(0:7, "cards"), paste(0:10, "hardness points"))
(hardnessMatrix <- matrix(c(90,10,0,0,0,0,0,0, 70,30,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0, 10,30,40,20,0,0,0,0,0, 0,10,30,40,20,0,0,0,0,0, 0,0,0,0,0,0,0,0,0, 0,0,30,50,20,0,0,0,0,0, 0,0,40,20,10,0,0,0,0,0, 10,30,40,20,0,0,0,0,0,0,0, 0,10,30,40,20,0,0,0,0,0, 10,30,40,20,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0), nrow = 8, dimnames = dimNams))

unitedSimOne Simulating a formation

Description
Simulates a formation against another formation.

Usage
unitedSimOne(
  home,
  away,
  r,
  penaltyProb = 0.1,
  preventGoalGK = 1/14,
  preventGoalSW = 1/15,
  hardnessMatrix,
  overtime = FALSE
)

Arguments
home   home team (an object of the S4class formation)
away   away team (an object of the S4class formation)
r number of replications for the simulation of hardness and penalties, can be missing (exact results will be computed)
penaltyProb occurrence probability of a penalty
preventGoalGK factor multiplied with the strength of the GK for computing the probability of preventing a goal by the goalkeeper
preventGoalSW  factor multiplied with the strength of the SW for computing the probability of preventing a goal by the sweeper

hardnessMatrix  matrix matrix with eleven columns which contain the probability for yellow cards dependent on the used hardness

overtime  logical, if True overtime win probabilities are calculated. Only available if total hardness is zero or one.

Value

Creates an object of the unitedSim class.

See Also

unitedSim

Examples

```r
home <- formation(10, NA, c(7,5,3), c(8,8), c(10,10,8))
away <- formation(5, 8, c(8,8), c(10,10), c(10,10,10),
  hardness = c(0,0,0,0,1))
set.seed(123)
unitedSimOne(home, away)
# results with overtime
# Note: Only key statistics are adjusted for overtime
unitedSimOne(home, away, overtime = TRUE)
# simulating the game
unitedSimOne(home, away, r = 100)
```
Index

formation, 2
getLineup, 3
getLineup, formation-method (getlineup), 3

overtime, 4
overview, 4

penaltyGoalsProb, 5
penaltyShootout, 6

simRedCard, 6
simRedCard, formation, numeric, matrix-method (simRedCard), 6

summary, 7
summary, unitedSim-method (summary), 7
summary, unitedSimResults-method (summary), 7

unitedR (unitedR-package), 2
unitedR-package, 2
unitedSim, 7, 10
unitedSimOne, 8, 9