Package ‘tfer’

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(Simulation of the probability distribution of recovered glass fragments).
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**tfer-package**

*Forensic Glass Transfer Probabilities*

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**Description**

Statistical interpretation of forensic glass transfer (Simulation of the probability distribution of recovered glass fragments).

**Details**

- **Package:** `tfer`
- **Type:** Package
- **Version:** 1.1
- **Date:** 2010-11-07
- **License:** GPL-2
- **LazyLoad:** yes
- **Depends:** methods

The `tfer` package provides functions for simulating the number of recovered glass fragments given the conditions set by the user on factors affecting the transfer, persistence and recovery of glass fragments. A large simulation size will provide precise estimates of transfer probabilities to be used in the Bayesian interpretation of forensic glass evidence.

The `transfer` constructor function creates an object of class `transfer` consisting of a list of simulated number of recovered glass fragments and the input parameters set by the user. This function is based on the full graphical model in Curran et al. (1998). The user can specify arguments for simulation size, distance, transfer, persistence and recovery properties.

The `values` function extracts the simulated random variates from a `transfer` object. `para` returns the input parameters and user-specified arguments as a numeric vector. `parameters` is an alternative way of displaying the input parameters and arguments. The initial information specified by the user are concatenated and displayed as a string. Users may find this more informative than `para` as it displays what each parameter denotes.

`tprob` returns the transfer probabilities for each unique value of the simulated random variates. If the user is only interested in the probabilities of recovering a certain number of fragments, this can be specified as the second argument of `tprob`.

`summary` provides summary statistics of `transfer` objects and returns a list of input parameters, five-number summary and probabilities of transfer.

The user has three plotting options for producing a graphical view of a `transfer` object. The plot type can be specified as (0 = barplot of probabilities, 1 = barplot of frequencies or 2 = histogram). A barplot of probabilities is set as the default.

**Author(s)**

James Curran and TingYu Huang
Compar-methods

Maintainer: TingYu Huang <thua041@aucklanduni.ac.nz>

References


Examples

```
library(tfer)

## create a transfer object using default arguments
y = transfer()

## probability table
probs = tprob(y)

## extract the probabilities of recovering 8 to 15 glass fragments given the user-specified arguments
tprob(y, 8:15)

## produce a summary table for a transfer object
summary(y)

## barplot of transfer probabilities (default)
plot(y, ptype = 0)
plot(y)

## barplot of transfer frequencies
plot(y, ptype = 1)

## histogram
plot(y, ptype = 2)
```

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### Compare-methods

#### Methods for Function Compare

**Description**

Methods for function Compare

**Methods**

```
signature(e1 = "transfer", e2 = "numeric") Compares a transfer object with a numeric object.
```
Description

Displays input parameters and arguments passed to transfer.

Usage

para(object)

Arguments

object An object of class transfer

Details

para is one of the two accessor functions for a transfer object.

Value

para returns a vector of input parameters and their corresponding arguments.

Author(s)

TingYu Huang

See Also

parameters, transfer

Examples

library(tfer)

y = transfer()

para(y)
Extract Transfer and Persistence Parameters II

**Description**

The initial information specified by the user are concatenated and displayed as a string. Users may find this more informative than `para` as it displays what the parameters denote.

**Usage**

```r
generic_function(parameters(object))
```

**Arguments**

- `object` An object of class `transfer`

**Details**

`parameters` is a generic function with a default method only.

**Value**

`parameters` displays the input parameters and arguments provided by the user as a string.

**Author(s)**

TingYu Huang

**See Also**

`para`, `transfer`

**Examples**

```r
library(tfer)
y = transfer()
parameters(y)

## compare with para(y)
para(y)
```
parameters-methods  Methods for Function parameters

Description
Methods for function parameters

Methods
signature(object = "transfer") This is currently the only method for generic function parameters. It displays the input parameters and arguments provided by the user as a string.

plot-methods  Methods for Function plot

Description
Methods for function plot

Methods
signature(x = "ANY") plot methods for any R objects.
signature(x = "transfer") plot method for transfer objects. Allows histograms, barplots of frequencies and probabilities of recovered glass fragments to be plotted. The plot type can be specified as (0 = barplot of probabilities, 1 = barplot of frequencies or 2 = histogram). A barplot of probabilities is set as the default plot.

show-methods  Methods for Function show

Description
Methods for function show

Methods
signature(object = "transfer") Displays input parameters and simulated values as a list.
Methods for Function `summary`

Methods

- `signature(object = "ANY")` summary methods for any R objects.
- `signature(object = "transfer")` Returns summary statistics of a transfer object.

`tprob`  Transfer Probabilities

Description

`tprob` is a generic function which returns the probability distribution of recovered glass fragments.

Usage

```r
mprob(object, x)
```

Arguments

- `object`  A transfer object.
- `x`  A numeric object.

Value

Returns a numeric vector of glass transfer probabilities given the initial conditions set by the user.

Author(s)

TingYu Huang

See Also

`transfer`
Examples

library(tfer)

y = transfer()

# Full probability table
tprob(y)

# Probability of recovering 8 glass fragments
tprob(y, 8)

tprob-methods

Methods for Function tprob

Description

Methods for function tprob

Methods

signature(object = "transfer", x = "missing") If the second argument is not specified, tprob returns the transfer probabilities for each unique value of simulated recovered glass fragments.

signature(object = "transfer", x = "numeric") tprob returns the probabilities of recovering the specified number of glass fragments.

transfer

Glass Transfer, Persistence and Recovery Probabilities

Description

Simulate the number of glass fragments recovered given the conditions set by the user.

Usage

transfer(N = 10000, d = 0.5, defect = 1, lambda = 120, Q = 0.05, l0 = 0.8, u0 = 0.9, lstar0 = 0.1, ustar0 = 0.15, lj = 0.45, uj = 0.7, lstarj = 0.05, ustarj = 0.1, lR = 0.5, uR = 0.7, t = 1.5, r = 0.5)
Arguments

\(N\) Simulation size
\(d\) The breaker’s distance from the window
\(\text{deffect}\) Distance effect. \(\text{deffect} = 1\) when distance effect exists. Otherwise \(\text{deffect} = 0\).
\(\lambda\) The average number of glass fragments transferred to the breaker’s clothing.
Q Proportion of high persistence fragments.
\(\theta\) Lower bound on the percentage of fragments lost in the first hour
\(\psi\) Upper bound on the percentage of fragments lost in the first hour
\(\lambda^{\star\theta}\) Lower bound on the percentage of high persistence fragments lost in the first hour
\(\psi^{\star\theta}\) Upper bound on the percentage of high persistence fragments lost in the first hour
\(\lambda^{j}\) Lower bound on the percentage of fragments lost in the j’th hour
\(\psi^{j}\) Upper bound on the percentage of fragments lost in the j’th hour
\(\lambda^{\star j}\) Lower bound on the percentage of high persistence fragments lost in the j’th hour
\(\psi^{\star j}\) Upper bound on the percentage of high persistence fragments lost in the j’th hour
\(\lambda^{R}\) Lower bound on the percentage of fragments expected to be detected in the lab
\(\psi^{R}\) Upper bound on the percentage of fragments expected to be detected in the lab
\(t\) Time between commission of crime and apprehension of suspect
\(r\) Probability \(r\) in \(t \sim \text{NegBinom}(t, r)\)

Value

\(Y\) The simulated values of recovered glass fragments
\(\text{para}\) Input parameters

Author(s)

James Curran and TingYu Huang

References


Examples

```r
library(tfer)

## create a transfer object using default arguments
y = transfer()

## probability table
probs = tprob(y)

## extract the probabilities of recovering 8 to 15
## glass fragments given the user-specified arguments
tprob(y, 8:15)

## produce a summary table for a transfer object
summary(y)

## barplot of probabilities (default)
plot(y, ptype = 0)
plot(y)

## barplot of transfer frequencies
plot(y, ptype = 1)

## histogram
plot(y, ptype = 2)
```

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**transfer-class**  
Class "transfer"

---

Description

An S4 class.

Objects from the Class

Objects can be created by calls of the form `new("transfer", ...)`.

Slots

- `para`: Object of class "numeric"
- `y`: Object of class "numeric"

Methods

- `signature(x = "transfer", i = "ANY", j = "missing", drop = "missing")`: ...
- Compare `signature(e1 = "transfer", e2 = "numeric")`: ...
- `parameters signature(object = "transfer")`: ...
- `plot signature(x = "transfer")`: ...
values

show signature(object = "transfer"): ...
summary signature(object = "transfer"): ...
tprob signature(object = "transfer", x = "missing"): ...
tprob signature(object = "transfer", x = "numeric"): ...

Author(s)

TingYu Huang

Examples

showClass("transfer")

Extract Transfer Values

Description

values is a generic function which returns the number of recovered glass fragments generated by transfer.

Usage

values(object)

Arguments

object An object of class transfer

Value

values returns a numeric vector of random variates.

Author(s)

TingYu Huang

See Also

transfer

Examples

library(tfer)
y = transfer()
values(y)
Description

Methods for function 

Methods

signature(x = "transfer", i = "ANY", j = "missing", drop = "missing") Extracts elements from values(x).
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