Package ‘CircularDDM’

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Author Yi-Shin Lin [aut, cre],
           Andrew Heathcote [aut],
           Peter Kvam [aut]
Maintainer Yi-Shin Lin <yishin.lin@utas.edu.au>
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besselzero

Find First k Positive Zeros for the Bessel Functions

Description

Find first k positive zeros of the Bessel function J(n,x) or Y(n,x) using Halley’s method.

Usage

besselzero(nu, k, kind)

Arguments

nu  
The order of the corresponding Bessel function.

k  
an integer for first k positive zeros.

kind  
0, 1, or 2. A switch selects besseli, besselj or besselY

Value

a vector

References

besselzero.m

Examples

nu <- seq(0, 5, length.out=10)
output <- matrix(numeric(5*length(nu)), nrow=5)
  for(i in 1:length(nu)) {
    output[,i] <- besselzero(nu[i], 5, 1)
  }
output

output <- matrix(numeric(5*length(nu)), nrow=5)
for(i in 1:length(nu)) {
  output[,i] <- besselzero(nu[i], 5, 2)
}
output
CircularDrift-diffusion Model

Description
Circular drift-diffusion model for continuous report.

Author(s)
Yi-Shin Lin <yishin.lin@utas.edu.au>
Andrew Heathcote <andrew.heathcote@utas.edu.au>
Peter Kvam <kvam.peter@gmail.com>

References

dcddm
The Circular Drift-diffusion Distribution

Description
Density function and random generation for the circular drift-diffusion model with theta vector equal to pvec. dcddm is the equation (23) on page 433 in Smith (2016).

Usage
dcddm(x, pvec, k = 141L)
rcddm(n, pvec, p = 0.15)

Arguments
x a matrix storing a first column as RT and a second column of continuous responses/reports/outcomes. Each row is a trial.
pvec a parameter vector with the order [a, vx, vy, t0, s], or [thresh, mu1, mu2, ndt, sigmasq]. The order matters.
k a precision for calculating the infinite series in dcddm. The larger the k is, the larger the memory space is required. Default is 141.
n number of observations.
p a precision for random walk step in rcddm. Default is 0.15 second
Value

dcddm gives a log-likelihood vector. rddm generates random deviates, returning a n x 3 matrix with the columns: RTs, choices and then angles.

References


Examples

```r
## dcddm example
x <- cbind(  
  RT= c(1.2595272, 0.8693937, 0.8009844, 1.0018933, 2.3640007, 1.0521304),  
  R = c(1.9217430, 1.7844653, 0.2662521, 2.1569724, 1.7277440, 0.8607271)  
)
pvec <- c(a=2.45, vx=1.5, vy=1.25, t0=.1, s=1)
dcddm(x, pvec)

## rcddm example
pVec <- c(a=2, vx=1.5, vy=1.25, t0=.25, s=1)
den <- rcddm(1e3, pvec);  
hist(den[,1], breaks = "fd", xlab="Response Time", main="Density")  
hist(den[,3], breaks = "fd", xlab="Response Angle", main="Density")
```

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### logLik_dt

**Log-Likelihood for Circular First Passage Time**

Description

Calculate circular log-likelihood of the first passage time, using equation (22) on p 432.

Usage

`logLik_dt(x, pVec, k = 141L)`

Arguments

- `x`: a matrix storing a first column as RT and a second column of continuous responses/reports/outcomes. Each row is a trial.
- `pVec`: a parameter vector with the order `[a, vx, vy, t0, s]`, a stands for response threshold, vx is the drift rate along x axis, vy is the drift rate along y axis, t0 is the non-decision time, and s is the within-trial standard deviation.
- `k`: a precision for bessel function. The larger the k is, the larger the memory space is required. Default is 141.
Value

a vector

References


Examples

```r
x <- cbind(
  RT=c(1.2595272, 0.8693937, 0.8009044, 1.0018933, 2.3640007, 1.0521304),
  R =c(1.9217430, 1.7844653, 0.2662521, 2.1569724, 1.7277440, 0.8607271)
)
pVec <- c(a=2.45, vx=1.5, vy=1.25, t0=.1, s=1)
den <- loglik_dt(x, pVec=pVec);
```

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**logLik_resp**

*Log-Likelihood for Continuous Reports*

Description

Calculate log-likelihood of the continuous reports, using part part in equation (23) on p 433.

Usage

```r
logLik_resp(x, pVec)
```

Arguments

- `x`: a matrix storing a first column as RT and a second column of continuous responses/reports/outcomes. Each row is a trial.
- `pVec`: a parameter vector with the order [a, vx, vy, t0, s], or [thresh, mu1, mu2, ndt, sigmasq], using alternative names.

Value

a vector

References

Examples

```r
x <- cbind(
    RT=c(1.2595272, 0.8693937, 0.8009044, 1.0018933, 2.3640007, 1.0521304),
    R =c(1.9217430, 1.7844653, 0.2662521, 2.1569724, 1.7277440, 0.8607271)
)
pVec <- c(a=2.45, vx=1.5, vy=1.25, t0=.1, s=1)
den <- logLik_resp(x, pVec=pVec); den
```

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rvm

*Generate random deviates for the von Mises distribution*

Description

Generate random deviates for the von Mises distribution.

Usage

```r
rvm(n, mu, k)
```

Arguments

- `n`: number of observations.
- `mu`: mean direction of the distribution.
- `k`: non-negative numeric value for the concentration parameter of the distribution.

Details

A random variable for circular normal distribution has the form:

\[ f(\theta; \mu, \kappa) = \frac{1}{2 \pi I_0(\kappa)} \exp(\kappa \cos(\theta - \mu)) \]

\(\theta\) is within 0 and 2 * \(\pi\).

\(I_0(\kappa)\) in the normalizing constant is the modified Bessel function of the first kind and order zero.

Value

- a vector

Examples

```r
n <- 100
mu <- 0
k <- 10
vm3_de <- rvm(n, mu, k)  ## in degree unit
vm3_pi <- vm3_de %*% (2 * pi)  ## in radian unit
```
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