Package ‘CircularDDM’

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Title Circular Drift-Diffusion Model

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Depends R (>= 3.0.2)

Description Circular drift-diffusion model for continuous reports.

License GPL-2

LazyData TRUE

Imports Rcpp (>= 0.12.3)

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RoxygenNote 6.0.1

NeedsCompilation yes

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R topics documented:

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
```

CircularDDM *Circular Drift-diffusion Model*

Description

Circular drift-diffusion model for continuous report.

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References

Smith, P. L. (2016). Diffusion Theory of Decision Making in Continuous Report, Psychological Review, 123(4), 425–451.

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

Smith, P. L. (2016). Diffusion Theory of Decision Making in Continuous Report, Psychological Review, 123 (4), 425–451.

Examples

```
## dcddm example
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)
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

Smith, P. L. (2016). Diffusion Theory of Decision Making in Continuous Report, Psychological Review, 123 (4), 425–451.

Examples

```
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);
den
```

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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

```
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

Smith, P. L. (2016). Diffusion Theory of Decision Making in Continuous Report, Psychological Review, 123 (4), 425–451.

Examples

```
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
```

`rvm` *Generate random deviates for the von Mises distribution*

Description

Generate random deviates for the von Mises distribution.

Usage

```
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:

$$f(theta; mu, kappa) = 1/(2 * pi * I0(kappa)) * exp(kappa * cos(theta - mu))$$

theta is withins 0 and 2 * pi.

`I0(kappa)` in the normalizing constant is the modified Bessel function of the first kind and order zero.

Value

a vector

Examples

```
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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