Package 'ibmcraftr'

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Type Package

Title Toolkits to Develop Individual-Based Models in Infectious Disease

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Description It provides a generic set of tools for initializing a synthetic population with each individual in specific disease states, and making transitions between those disease states according to the rates calculated on each timestep. The new version 1.0.0 has C++ code integration to make the functions run faster. It has also a higher level function to actually run the transitions for the number of timesteps that users specify. Additional functions will follow for changing attributes on demographic, health belief and movement.

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LazyData TRUE

RoxygenNote 5.0.1

Suggests testthat

LinkingTo Rcpp

Imports Rcpp

NeedsCompilation yes

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`cumprob` *Calculate cumulative probabilities for state transitions.*

Description

This function takes in a vector of probabilities of states transitions and calculate the probability of staying in the original state and output the cumulative probabilities for all possibilities.

Usage

```
cumprob(probs, actual = FALSE)
```

Arguments

`probs`	A numeric vector of the probabilities of transition to states.
`actual`	A logical value, if TRUE, will calculate actual cumulative probabilities which may surpass 1!.

Value

A numeric vector of cumulative probabilites inclusive of the probability of having the same state in the next timestep.

Examples

```
cumprob(c(.2,.2,.9))
cumprob(c(.2,.2,.9), actual=TRUE)
cumprob(c(.2,.2,.2))
```

`rate2prob` *Miscellaneous functions to support the* `ibmcraftr` *packare are here.*

Description

Miscellaneous functions to support the `ibmcraftr` packare are here.

Usage

```
rate2prob(rates)
```

Arguments

rates	A numeric scalar or vector to be transformed into rates.

Value

A numeric scalar or vector in terms of probabilities.

Examples

```
rate2prob(c(.1, .5))
```

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run_state_trans *Run state_trans function over a given number of timesteps.*

Description

Organize population data and transition parameters to run state_trans function over the given number of timesteps.

Usage

```
run_state_trans(timesteps, param, pop, transient = "", useC = TRUE)
```

Arguments

timesteps	A numeric scalar based on which the state_trans function will run for that specific no. of timesteps and accumulate the results.
param	A list of lists. Each low-level list must contain transition parameters required by the state_trans function.
pop	A state matrix created from syn_pop function. This matrix represents the states of the population.
transient	A character vector. Each element must include formula(e)/expression(s) to evaluate dynamic parameters after each timestep.
useC	A logical value, which is TRUE by default, will run state_transition function written in RCPP, stRCPP.

Value

A summary matrix of the states all individuals in the population are in.

Examples

```
pop <- syn_pop(c(19,1,0,0,0)) #synthesizing population
b <- 2 #effective contact rate
param <- list(
list(1,c(2,5),c(NA,.1)), #transition from state 1 to 2 using FOI lambda
list(2,3,100), #transition from state 2 to 3,
list(3,4,100)  #the 3rd term ensures the transition to the next stage
)

timesteps <- 10
transient <- c("param[[1]][[3]][1] <- rate2prob(b*sum(pop[,2],pop[,3])/sum(pop))")
eval(parse(text=transient))

run_state_trans(timesteps, param, pop, transient)
run_state_trans(timesteps, param, pop, transient, useC = FALSE)
```

`state_trans` *Make state transitions.*

Description

Take in the matrix of the states of synthetic population (created by `syn_pop` function) and calculate the transitions from one state to other state(s) using the transition rate(s).

Usage

```
state_trans(origin, new.states, params, s.matrix)
```

Arguments

`origin`	A number which represents the column index `s.matrix` you want to do the transition from
`new.states`	A numeric vector or a number which represents the column index `s.matrix` you want as the destination(s) for the transition
`params`	A numeric vector of similar length to `new.states` which serves as the transition rate(s)
`s.matrix`	A state matrix created from `syn_pop` function

Value

A transition matrix of the same dimension as `s.matrix`. -1 indicates that the individual has left the corresponding state. +1 indicates that the individual has become the corresponding state.

Examples

```
pop <- syn_pop(c(19,1,0,0))
state_trans(1,2,.1,pop)
state_trans(1,4,100,pop)
```

`stRCPP` *Make state transitions using Rcpp.*

Description

Take in the matrix of the states of synthetic population (created by `syn_pop` function) and calculate the transitions from one state to other state(s) using the transition probabilities [not rate(s)]. The major difference from the R alone version was that instead of having the transition rate(s), transition probabilities are used. These probabilities will thus be calculated with another function.

Usage

```
stRCPP(origin, new.states, params, s.matrix)
```

Arguments

`origin`	A number which represents the column index `s.matrix` you want to do the transition from
`new.states`	A numeric vector or a number which represents the column index `s.matrix` you want as the destination(s) for the transition
`params`	A numeric vector of similar length to `new.states` which serves as the transition rate(s)
`s.matrix`	A state matrix created from `syn_pop` function

Value

A transition matrix of the same dimension as `s.matrix`. -1 indicates that the individual has left the corresponding state. +1 indicates that the individual has become the corresponding state.

Examples

```
pop <- syn_pop(c(19,1,0,0))
stRCPP(1,2,.1,pop)
```

syn_pop *Create a synthetic population having several states.*

Description

Populate a matrix in which columns represent the states of the individuals and rows represent the individuals.

Usage

```
syn_pop(states, shuffle = FALSE)
```

Arguments

states	A numeric vector with each element representing the number of individuals in a particular state its index corresponds to.
shuffle	A logical value to enable shuffling of the individuals (rows) in the resulting matrix.

Value

A matrix of 0s, and 1s. The rows representing the individuals and the columns representing the states the individuals are in

Examples

```
syn_pop(c(3,2,1))
syn_pop(c(0,0,1,5), shuffle=TRUE)
```

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