Package 'RSSOP'

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Type Package

Title Simulation of Supply Reservoir Systems using Standard Operation Policy

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Description Reservoir Systems Standard Operation Policy. A system for simulation of supply reservoirs. It proposes functionalities for plotting and evaluation of supply reservoirs systems.

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RSSOP-package *Tools for Operation of Reservoirs Systems using Standard Operation Policy*

Description

RSSOP

Details

Package:	RSSOP
Type:	Package
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The package provides functions to establish the reservoirs systems elements and build up an operation standard operation policy (SOP) releases. The package include S3 classes for reservoir(s) system operation. Methods such as plot and yield is available for standard objects inherited from class SOP for results illustration and visualization.

Author(s)

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References

Loucks, Daniel P., et al. Water resources systems planning and management: an introduction to methods, models and applications. Paris: UNESCO, 2005. Araghinejad, S. (2013). Data-Driven Modeling: Using MATLAB, in Water Resources and Environmental Engineering (Vol. 67). Springer Science & Business Media.

addObjectToArea *Adds An Object To The Area*

Description

Adds an object to the an object inherited from class createArea

Usage

```
addObjectToArea(area, object, type)
```

Arguments

area	an object inherited from creatArea class
object	an object to be added to area
type	type of the object to added to area: "reservoir", "demand", "hydrometeorology"

Value

an object inherited from class of creatArea

Author(s)

Rezgar Arabzadeh, Parisa Aberi, Kaveh Panaghi

Examples

```
# Create an area
object<-createArea(name    ="Zarineh"  ,
                   location="kurdistan",
                   start   =c(1900,1)  ,
                   end     =c(1962,1))

# Create an Agricultural demand site
var<-sin(seq(0.2,pi-0.2,length.out=12))*100/sum(sin(seq(0.2,pi-0.2,length.out=12)))
dem<-createDemandSite(type="agricultural"       ,
                          demandName="Agri"     ,
                          demandCode=1          ,
                          annualUseRate=1.3084  ,
                          annualVariation=var   ,
                          area=1000             ,
                          cycle=TRUE            ,
                          numberOfCycles=62     ,
                          supplierCode=1        ,
                          downstreamCode=0      ,
                          priority=1)
# Create a Reservoir
AV<-data.frame(A=seq(2  ,30 ,length.out=10),
               V=seq(100,700,length.out=10))
res<-createReservoir(type                  ="storage",
                     name                  ="Bukan" ,
                     reservoirCode         =1       ,
                     downstreamReservoirCode=0      ,
                     geometry              =list(sMin      =100 ,
                                                 sMax      =700 ,
                                                 volumeArea=AV))

# Creat a meteorological object
met<-hydrometeorology(Inflow       =rlnorm(744,2,0.2),
```

```
                      netEvaporation=runif(744,0,0.2) ,
                      reservoirCode =1)
# add object to The area
object<-addObjectToArea(area  =object,
                        object=met   ,
                        type  ="hydrometeorology")
object<-addObjectToArea(area  =object,
                        object=dem   ,
                        type  ="demand")
object<-addObjectToArea(area  =object,
                        object=res   ,
                        type  ="reservoir")
```

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createArea *A Function To Create The Reservoirs System Area*

Description

it creates an area to operate reservoirs inside it

Usage

```
createArea(name = "unknown", location = "unknown", start = c(), end = c())
```

Arguments

name	a string representing the name of the operating area
location	a string representing the location of the operating area
start	a vector whose first number presents the number of start month of simulation time and second number shows the start year of of simulation time
end	a vector whose first number presents the number of end month of simulation time and second number shows the end year of of simulation time

Value

an object of class of createArea

Author(s)

Rezgar Arabzadeh, Parisa Aberi

createDemandSite *Creates A Demand Site*

Description

A function to create a demand site using demand pattern variation or time series

Usage

```
createDemandSite(type = "agricultural",
                 demandName = "Agri1",
                 demandCode,
                 annualUseRate,
                 annualVariation,
                 area,
                 cycle = FALSE,
                 numberOfCycles = NULL,
                 supplierCode,
                 downstreamCode,
                 priority = 1,
                 start = 1900)
```

Arguments

type	domestic, agricultural, and environmental. the hydropower is not available in this version
demandName	a string name of the desired demand site
demandCode	a uniqe integer number
annualUseRate	the amount of water consumption per unit of area during a year
annualVariation	a vector, in percent, of demand site variation during a year. the summation of vector's ellemnt should be equal to 100
area	for agricultual type: the area of demand site
cycle	logical, cycle the time series?
numberOfCycles	if cycle is TRUE, number of cycles
supplierCode	the code of reservoir which is going to supply this demand site
downstreamCode	the downstream of demand site
priority	the priority of supply
start	the start year

Value

an object inherited from class create DemandSite

Author(s)

Rezgar Arabzadeh, Parisa Aberi

`createReservoir` *Creates A Reservoir Object*

Description

this function creates a reservoir object usning geometrical specifications

Usage

```
createReservoir(type = "storage",
                name = "resrvoir1",
                reservoirCode = 1,
                downstreamReservoirCode,
                geometry = list(sMin=NULL, sMax=NULL, volumeArea=NULL))
```

Arguments

`type`	the type of reservoir, "storage" and "hydropower". hydropower is not available in this version
`name`	a string representing the name of reservoir object
`reservoirCode`	an unique integer code
`downstreamReservoirCode`	the code of reservoir downstream
`geometry`	a list, include maximum and minimum volumes of reservoir and a data frame for volume-area rating curve whose first column includes area (square KM) and the second column is Volume (MCM)

Value

an object inherited from class createReservoir

Author(s)

Rezgar Arabzadeh, Parisa Aberi, Kaveh Panaghi

hydrometeorology *Creates A Meteorological Object*

Description

this function creates an hydrometeorological object include stream flow and evaporation time series

Usage

```
hydrometeorology(Inflow,
                 netEvaporation,
                 cycleEvaporation = FALSE,
                 numberOfCycles = NULL,
                 startDate = c(1900, 1),
                 reservoirCode)
```

Arguments

Inflow	Inflow time series (MCM)
netEvaporation	Net evaporation in (m)
cycleEvaporation	logicl, the net evaporation should be cycled or not
numberOfCycles	an integer nuber: if cycleEvaporation is TRUE, the number of cycles. if is not specified it would be calculated based on the Inflow time serires
startDate	a vector of two elemnts whose elements include start year and strart month respectively
reservoirCode	the code of reservoir which this hydrometeorological object belongs to that

Value

an object from class of hydrometeorology

Author(s)

Rezgar Arabzadeh, Parisa Aberi

object *An Object From Class Of creatArea*

Description

an object from the class of createArea which includes the specifications of a cascde reservoir system in Kurdistan, ZerineRud basin. "object" includes two inflow time series in the Bukan and Sonata dam sites, there demands sites time series and geometrical specifications of mentioned dams

Usage

```
data("object")
```

References

Water Resources Management Company, Ministry of Energy, Iran, 2015

plot.SOP *A Plot Function for Object Inherited From Class Of SOP*

Description

a plot function for an object inherited from class SOP

Usage

```
## S3 method for class 'SOP'
plot(x , ...)
```

Arguments

x	an object inherited from class SOP
...	other objects that can passed to plot function

Author(s)

Rezgar Arabzadeh, Parisa Aberi, Kaveh Panaghi

SOP *Standard Operation Policy*

Description

function for reservoir(s) system(s) operation using Standard Operation Policy

Usage

```
SOP(object)
```

Arguments

object	an object from class of createArea

Value

an object inherited from class SOP

Author(s)

Parisa Aberi, Rezgar Arabzadeh, Shahab Araghinejad

References

Yeh, W. W. G. (1985). Reservoir management and operations models: A state of the art review. Water resources research, 21(12), 1797-1818.

Examples

```
# loading an area
data (object)
## Not run: res<-SOP(object)
## Not run: plot(res)
## Not run: Yeild(res)
```

SOP.base *Base Function For Class SOP*

Description

SOP base function for class SOP

Usage

```
## S3 method for class 'base'
SOP(object)
```

Arguments

object	an object inherited from class creatArea

Author(s)

Rezgar Arabzadeh, Parisa Aberi

SOP.default *Default Function Closs Of SOP*

Description

SOP default function of class SOP

Usage

```
## Default S3 method:
SOP(object)
```

Arguments

object	an object inherited from class createArea

Author(s)

Rezgar Arabzadeh, Parisa Aberi

Yeild *Reservoir Performance Indices*

Description

a function for evaluation and calculation of reservoir performance indices based on Hashimoto et al. (1982)

Usage

```
Yeild(object, s.const = 0.95)
```

Arguments

object	an object inherited from class SOP
s.const	satisfactory constant of supplying

Value

a matrix presenting Reliability, resiliency, and vulnerability criterion for water resource system performance evaluation

Author(s)

Rezgar Arabzdadeh, Parisa Aberi

References

Hashimoto, T., Stedinger, J. R., & Loucks, D. P. (1982). Reliability, resiliency, and vulnerability criteria for water resource system performance evaluation. Water resources research, 18(1), 14-20.

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