

Package ‘rsml’

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Type Package

Title Plant Root System Markup Language (RSML) File Processing

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Description Read and analyse Root System Markup Language (RSML) files, used to store plant root system architecture data. More information can be found here: <http://rootssystemml.github.io/>

License GPL-2

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addChildToRoot	<i>Add a child root (lateral) to an existing root</i>
----------------	---

Description

Add a child root (lateral) to an existing root

Usage

```
addChildToRoot(current, child)
```

Arguments

current	= the current root
child	= the child root to attach

Value

the current root, with the additional child attached

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
current <- lupin$roots[[1]]
child <- current$children[[1]]
current <- addChildToRoot(current, child)
```

addNodeToRoot *Add a node to an existing root*

Description

Add a node to an existing root

Usage

```
addNodeToRoot(ro, no)
```

Arguments

ro = the current root
no = the current node

Value

the root, with the added node

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
n <- node(1, 1)
r <- root()
r <- addNodeToRoot(r, n)
```

addRootToPlant	<i>Add a root to an existing plant. Returns the plant with the added root</i>
----------------	---

Description

Add a root to an existing plant. Returns the plant with the added root

Usage

```
addRootToPlant(pl, ro)
```

Arguments

pl	the plant to add the root to
ro	the root object to add to the plant.

Value

the new plant, with the added root

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- root()
lupin <- addRootToPlant(lupin, r)
```

anagallis	<i>Root system of a anagallis plant in 3D</i>
-----------	---

Description

Root system of a anagallis plant in 3D

Usage

```
data(anagallis)
```

coords	<i>Get the coordinates of the root nodes</i>
--------	--

Description

Get the coordinates of the root nodes

Usage

```
coords(obj)
```

Arguments

obj of class root

Value

a dataframe containing the node coordinates (x, y, z)

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

getInsertionAngle	<i>Compute the insertion angle of the root on its parent</i>
-------------------	--

Description

Compute the insertion angle of the root on its parent

Usage

```
getInsertionAngle(parent, current)
```

Arguments

parent = the parent root
current = the current root

Value

the insertion angle, in degree

Examples

```
data(lupin)
r <- lupin$roots[[1]]
r1 <- r$children[[1]]
getInsertionAngle(r, r1)
```

getInsertionPosition *Compute the insertion of the root on its parent*

Description

Compute the insertion of the root on its parent

Usage

```
getInsertionPosition(parent, current)
```

Arguments

parent = the parent root
current = the current root

Value

the insertion position

Examples

```
data(lupin)
r <- lupin$roots[[1]]
r1 <- r$children[[1]]
getInsertionPosition(r, r1)
```

latLength *Compute the length of the lateral root based on the coordinates of its nodes*

Description

Compute the length of the lateral root based on the coordinates of its nodes

Usage

```
latLength(obj)
```

length.plant

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Arguments

obj of class plant

Value

the total length of the lateral roots

Examples

```
data(lupin)
latLength(lupin)
```

length.plant

Compute the length of the root based on the coordinates of its nodes

Description

Compute the length of the root based on the coordinates of its nodes

Usage

```
## S3 method for class 'plant'
length(x)
```

Arguments

x object of class plant

Value

the total length of the plant roots

Examples

```
data(lupin)
length(lupin)
```

`length.root`*Compute the length of the root based on the coordinates of its nodes*

Description

Compute the length of the root based on the coordinates of its nodes

Usage

```
## S3 method for class 'root'  
length(x)
```

Arguments

x object of class root

Value

the length of the root

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)  
r <- lupin$roots[[1]]  
length(r)
```

`lupin`*Root system of a lupin plant in 2D*

Description

Root system of a lupin plant in 2D

Usage

```
data(lupin)
```

maize

Root system of a maize plant in 3D

Description

Root system of a maize plant in 3D

Usage

```
data(maize)
```

meanInsertionAngle

Compute the mean insertion angle of the children (lateral) roots

Description

Compute the mean insertion angle of the children (lateral) roots

Usage

```
meanInsertionAngle(obj)
```

Arguments

obj of class root

Value

the mean lateral angle

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- lupin$roots[[1]]
meanInsertionAngle(r)
```

`meanInsertionAnglePlant`*Compute the mean insertion angle of all the laterals in the plant*

Description

Compute the mean insertion angle of all the laterals in the plant

Usage

```
meanInsertionAnglePlant(obj)
```

Arguments

`obj` of class `plant`

Value

the mean insertion angle of the root system

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
meanInsertionAnglePlant(lupin)
```

`meanInterbranch`*Compute the mean interbranch distance of the children (lateral) roots*

Description

Compute the mean interbranch distance of the children (lateral) roots

Usage

```
meanInterbranch(obj, allroot = F)
```

Arguments

`obj` of class `root`

`allroot` if true, compute the interbranch distance on the whole root

Value

the mean interbranch distance

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- lupin$roots[[1]]
meanInterbranch(r)
```

`meanInterbranchPlant` *Compute the mean interbranch distance of all the primary roots in the image*

Description

Compute the mean interbranch distance of all the primary roots in the image

Usage

```
meanInterbranchPlant(obj, allroot = F)
```

Arguments

`obj` of class `plant`
`allroot` if true, compute the interbranch distance on the whole root

Value

the mean interbranch distance of the root system

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
meanInterbranchPlant(lupin)
```

nChild *Get the number of children in a root*

Description

Get the number of children in a root

Usage

```
nChild(obj)
```

Arguments

obj of class root

Value

the number of child root in the current root

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- lupin$roots[[1]]
nChild(r)
```

nLatRoot *Compute the number of lateral roots in the plant*

Description

Compute the number of lateral roots in the plant

Usage

```
nLatRoot(obj)
```

Arguments

obj of class plant

Value

the number of lateral root in the plant

Examples

```
data(lupin)
nLatRoot(lupin)
```

nNode	<i>Get the number of nodes in a root</i>
-------	--

Description

Get the number of nodes in a root

Usage

```
nNode(obj)
```

Arguments

obj of class root

Value

the number of nodes in the root

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- lupin$roots[[1]]
nNode(r)
```

node	<i>Node constructor</i>
------	-------------------------

Description

Node constructor

Usage

```
node(x, y, z = 0, diameter = 0, orientation = 0, bLength = 0)
```

Arguments

x	= x coordinate of the node. Mandatory
y	= y coordinate of the node. Mandatory
z	= z coordinate of the root. Optional
diameter	= diameter of the node. Optional
orientation	= orientation of the node. Optional
bLength	= length from the node position in the root from the base of the root. Optional

Value

the node

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
n <- node(1, 1)
```

nPrimRoot

Compute the number of primary roots in the plant

Description

Compute the number of primary roots in the plant

Usage

```
nPrimRoot(obj)
```

Arguments

obj of class plant

Value

the number of primary root in the plant

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
nPrimRoot(lupin)
```

nRoot	<i>Compute the total number of roots in the plant</i>
-------	---

Description

Compute the total number of roots in the plant

Usage

```
nRoot(obj)
```

Arguments

obj of class plant

Value

the number of root in the plant

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
nRoot(lupin)
```

plant	<i>Plant object, containing a root system, composed of roots</i>
-------	--

Description

Plant object, containing a root system, composed of roots

Usage

```
plant(roots = NULL)
```

Arguments

roots the root object contained in the plant. Can be null and incremented afterward

Value

the plant

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
pl <- plant()
```

plot.plant

Plot the root system

Description

Plot the root system

Usage

```
## S3 method for class 'plant'  
plot(x, threed = F, ...)
```

Arguments

x	object of class plant
threed	make a 3D plot for the plant
...	plot options

Value

null

Examples

```
# Plot 2D plant  
data(lupin)  
plot(lupin, threed=FALSE)  
  
# Plot 3D plant  
data(anagallis)  
plot(anagallis, threed=TRUE)
```

primLength	<i>Compute the length of the primary root based on the coordinates of its nodes</i>
------------	---

Description

Compute the length of the primary root based on the coordinates of its nodes

Usage

```
primLength(obj)
```

Arguments

obj of class plant

Value

the total length of the primary roots

Examples

```
data(lupin)
primLength(lupin)
```

print.node	<i>Print the node</i>
------------	-----------------------

Description

Print the node

Usage

```
## S3 method for class 'node'
print(x, ...)
```

Arguments

x object of class node
... print options

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
n <- node(1, 1)
print(n)
```

print.plant	<i>Print the plant</i>
-------------	------------------------

Description

Print the plant

Usage

```
## S3 method for class 'plant'
print(x, ...)
```

Arguments

x	object of class node
...	print options

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
print(lupin)
```

root	<i>Root constructor</i>
------	-------------------------

Description

Root constructor

Usage

```
root(nodes = NULL, parent = "", children = NULL, id = "",
      insertion = NULL, insertion_angle = NULL)
```

Arguments

nodes = the nodes composing the root. Can be null
parent = the identifier of the root parent. Can be null
children = vector of children roots (root objects)
id = root unique identifier
insertion = insertion position of the root on its parent. Can be null is no parent
insertion_angle = insertion angle of the root on its parent. Can be null is no parent

Value

the root

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```

r <- root()

n <- node(1, 1)
r <- root(n)
  
```

rsmlToList	<i>Import a single RSML file into a List. Work only if the roots in the rsml file have properties associated with them.</i>
------------	---

Description

Import a single RSML file into a List. Work only if the roots in the rsml file have properties associated with them.

Usage

```
rsmlToList(rsml.path)
```

Arguments

rsml.path The path to the .rsml file. Mandatory.

Examples

```

path <- "http://rootsystemml.github.io/images/examples/arabidopsis-simple.rsml"
pl.list <- rsmlToList(path) # import the file as a list
write.csv(pl.list$processed, "rsml-table.csv") # save it as a csv table
  
```

 rsm1ToPlant

Import a single RSML file into a Plant object

Description

Import a single RSML file into a Plant object

Usage

```
rsm1ToPlant(rsml.path, threed = FALSE)
```

Arguments

rsml.path	The path to the .rsml file. Mandatory.
threed	Does the RSML file contains a 3D root system?

Examples

```
# 2D example
path <- "http://rootssystemml.github.io/images/examples/arabidopsis-simple.rsml"
pl <- rsm1ToPlant(path) # import the file as a 2D plant
plot(pl) # plot the plant

# 3D example
path <- "http://rootssystemml.github.io/images/examples/anagallis.rsml"
pl <- rsm1ToPlant(path, threed=TRUE) # import the file as a 2D plant
plot(pl, threed=TRUE) # plot the plant
```

 summary.plant

Summary of the plant

Description

Summary of the plant

Usage

```
## S3 method for class 'plant'
summary(object, ...)
```

Arguments

object	object of class node
...	summary options

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
sum.lup <- summary(lupin)
sum.lup$total.length$value # Get total length
```

<code>totalLength</code>	<i>Compute the length of the root and its children based on the coordinates of its nodes</i>
--------------------------	--

Description

Compute the length of the root and its children based on the coordinates of its nodes

Usage

```
totalLength(obj)
```

Arguments

`obj` of class `root`

Value

the total length of the root and children

Author(s)

Guillaume Lobet - guillaume.lobet(at)ulg.ac.be

Examples

```
data(lupin)
r <- lupin$roots[[1]]
totalLength(r)
```

xrange *Compute the xrange of the root*

Description

Compute the xrange of the root

Usage

```
xrange(obj)
```

Arguments

obj of class root

Value

c(x1,x2) where x1 and x2 are the x limits of the root

Examples

```
data(lupin)
r <- lupin$roots[[1]]
xrange(r)
```

xrangePlant *Compute the xrange of the plant*

Description

Compute the xrange of the plant

Usage

```
xrangePlant(obj)
```

Arguments

obj of class plant

Value

c(x1,x2) where x1 and x2 are the x limits of the plant

Examples

```
data(lupin)
xrangePlant(lupin)
```

yrange *Compute the xrange of the root*

Description

Compute the xrange of the root

Usage

```
yrange(obj)
```

Arguments

obj of class root

Value

c(y1,y2) where y1 and y2 are the y limits of the root

Examples

```
data(lupin)
r <- lupin$roots[[1]]
yrange(r)
```

yrangePlant *Compute the yrange of the plant*

Description

Compute the yrange of the plant

Usage

```
yrangePlant(obj)
```

Arguments

obj of class plant

Value

c(y1,y2) where y1 and y2 are the y limits of the plant

Examples

```
data(lupin)
yrangePlant(lupin)
```

zrange *Compute the xrange of the root*

Description

Compute the xrange of the root

Usage

```
zrange(obj)
```

Arguments

obj of class root

Value

c(y1,y2) where y1 and y2 are the y limits of the root

Examples

```
data(lupin)
r <- lupin$roots[[1]]
zrange(r)
```

zrangePlant *Compute the zrange of the plant*

Description

Compute the zrange of the plant

Usage

```
zrangePlant(obj)
```

Arguments

obj of class plant

Value

c(z1,z2) where z1 and z2 are the z limits of the plant

Examples

```
data(lupin)
zrangePlant(lupin)
```


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