Package 'CytoML'

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Type Package

Title A GatingML Interface for Cross Platform Cytometry Data Sharing

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Author Mike Jiang

Maintainer Mike Jiang <wjiang2@fhcrc.org>

Description Uses platform-specific implemenations of the GatingML2.0 standard to exchange gated cytometry data with other software platforms.

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LazyData TRUE

Imports flowCore (>= 1.43.10), flowWorkspace (>= 3.31.17), openCyto (>= 1.11.3), XML, data.table, flowUtils (>= 1.35.7), jsonlite, RBGL, ncdfFlow, Rgraphviz, Biobase, methods, graph, graphics, utils, base64enc, plyr, dplyr, grDevices, methods, ggcyto (>= 1.11.4), yaml, lattice

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Suggests testthat, flowWorkspaceData (>= 2.11.1), knitr, parallel

VignetteBuilder knitr

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BugReports https://github.com/RGLab/CytoML/issues

URL https://github.com/RGLab/CytoML

Collate 'GatingSet2cytobank.R' 'GatingSet2flowJo.R' 'RcppExports.R' 'cytobank2GatingSet.R' 'cytobankExperiment.R' 'flowJoWorkspace_Methods.R' 'diva2GatingSet.R' 'flowUtils_functions.R' 'read.gatingML.cytobank.R' 'graphGML_methods.R' 'parseDivaWorkspace_old.R' 'utils.R' 'zzz.R'

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R topics documented:

addCustomInfo *add customInfo nodes to each gate node and add BooleanAndGates*

Description

add customInfo nodes to each gate node and add BooleanAndGates

Usage

```
addCustomInfo(root, gs, flowEnv, cytobank.default.scale = TRUE,
  showHidden)
```

Arguments

root	the root node of the XML
gs	a GatingSet object
flowEnv	the environment that stores the information parsed by 'read.GatingML'.
cytobank.default.scale	logical flag indicating whether to use the default Cytobank asinhtGml2 settings. Currently it should be set to TRUE in order for gates to be displayed properly in Cytobank because cytobank currently does not parse the global scale settings from GatingML.
showHidden	whether to include the hidden population nodes in the output

Value

XML root node

compare.counts *compare the counts to cytobank's exported csv so that the parsing result can be verified.*

Description

compare the counts to cytobank's exported csv so that the parsing result can be verified.

Usage

```
compare.counts(gs, file, id.vars = c("FCS Filename", "population"), ...)
```

Arguments

gs	parsed GatingSet
file	the stats file (contains the populatio counts) exported from cytobank.
id.vars	either "population" or "FCS filename" that tells whether the stats file format is one population per row or FCS file per row.
...	arguments passed to data.table::fread function

Value

a data.table (in long format) that contains the counts from openCyto and Cytobank side by side.

Examples

```
acsfile <- system.file("extdata/cytobank_experiment.acs", package = "CytoML")
ce <- cytobankExperiment(acsfile)
gs <- cytobank2GatingSet(ce)
## verify the stats are correct
statsfile <- ce$attachments[1]
dt_merged <- compare.counts(gs, statsfile, id.vars = "population", skip = "FCS Filename")
all.equal(dt_merged[, count.x], dt_merged[, count.y], tol = 5e-4)
```

---

compensate,GatingSet,graphGML-method

compensate a GatingSet based on the compensation information stored in graphGML object

---

Description

compensate a GatingSet based on the compensation information stored in graphGML object

Usage

```
## S4 method for signature 'GatingSet,graphGML'
compensate(x, spillover, ...)
```

Arguments

x	GatingSet
spillover	graphGML
...	unused.

Value

compensated GatingSet

constructTree *Reconstruct the population tree from the GateSets*

Description

Reconstruct the population tree from the GateSets

Usage

```
constructTree(flowEnv, gateInfo)
```

Arguments

flowEnv	the enivornment contains the elements parsed by read.gatingML function
gateInfo	the data.frame contains the gate name, fcs filename parsed by parse.gateInfo function

Value

a graphNEL represent the population tree. The gate and population name are stored as nodeData in each node.

---

cytobank2GatingSet.default *A wrapper that parse the gatingML and FCS files (or cytobankExperiment object) into GatingSet*

Description

A wrapper that parse the gatingML and FCS files (or cytobankExperiment object) into GatingSet

Usage

```
## Default S3 method:
cytobank2GatingSet(x, FCS, ...)

cytobank2GatingSet(x, ...)

## S3 method for class 'cytobankExperiment'
cytobank2GatingSet(x, ...)
```

Arguments

x	the cytobankExperiment object or the full path of gatingML file
FCS	FCS files to be loaded
...	other arguments

Value

a GatingSet

Examples

```
## Not run:
acsfile <- system.file("extdata/cytobank_experiment.acs", package = "CytoML")
ce <- cytobankExperiment(acsfile)
xmlfile <- ce$gatingML
fcsFiles <- list.files(ce$fcsdir, full.names = TRUE)
gs <<- cytobank2GatingSet(xmlfile, fcsFiles)
library(ggcyto)
autoplot(gs[[1]])

## End(Not run)
```

`cytobankExperiment` *Construct cytobankExperiment object from ACS file*

Description

Construct cytobankExperiment object from ACS file

Usage

```
cytobankExperiment(acs, exdir = tempfile())

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

## S3 method for class 'cytobankExperiment'
getCompensationMatrices(x)

## S4 method for signature 'cytobankExperiment'
markernames(object)

## S4 method for signature 'cytobankExperiment'
colnames(x, do.NULL = "missing",
  prefix = "missing")

## S3 method for class 'cytobankExperiment'
getTransformations(x, ...)

## S4 method for signature 'cytobankExperiment'
sampleNames(object)

## S4 method for signature 'cytobankExperiment'
pData(object)
```

Arguments

`acs`	ACS file exported from Cytobank
`exdir`	he directory to extract files to
`x`	cytobankExperiment object
`...`	not used

`object`	cytobankExperiment object
`do.NULL, prefix`	not used

Value

cytobankExperiment object

`CytoML.par.init` *workspace version is parsed from xml node '/Workspace/version' in flowJo workspace and matched with this list to dispatch to the one of the three workspace parsers*

Description

workspace version is parsed from xml node '/Workspace/version' in flowJo workspace and matched with this list to dispatch to the one of the three workspace parsers

Usage

```
CytoML.par.init()
```

`CytoML.par.set` *CytoML.par.set sets a set of parameters in the CytoML package namespace.*

Description

CytoML.par.get gets a set of parameters in the CytoML package namespace.

Usage

```
CytoML.par.set(name, value)

CytoML.par.get(name = NULL)
```

Arguments

`name`	The name of a parameter category to get or set.
`value`	A named list of values to set for category name or a list of such lists if name is missing.

Details

It is currently used to add/remove the support for a specific flowJo versions (parsed from xml node '/Workspace/version' in flowJo workspace)

Examples

```
#get the flowJo versions currently supported
old <- CytoML.par.get("flowJo_versions")

#add the new version
old[["win"]] <- c(old[["win"]], "1.7")
CytoML.par.set("flowJo_versions", old)

CytoML.par.get("flowJo_versions")
```

`divaWorkspace-class` *divaWorkspace class Inherited from flowJoWorkspace-class*

Description

divaWorkspace class Inherited from flowJoWorkspace-class

Usage

```
## S4 method for signature 'divaWorkspace'
getSamples(x)

## S4 method for signature 'divaWorkspace'
getSampleGroups(x)

## S4 method for signature 'divaWorkspace'
show(object)

## S4 method for signature 'divaWorkspace'
parseWorkspace(obj, ...)
```

Arguments

`x`	divaWorkspace
`object`	divaWorkspace
`obj`	divaWorkspace
`...`	other arguments

`extend` *extend the gate to the minimum and maximum limit of both dimensions based on the bounding information.*

Description

It is equivalent to the behavior of shifting the off-scale boundary events into the gate boundary that is described in bounding transformation section of gatingML standard.

Usage

```
extend(gate, bound, data.range = NULL, plot = FALSE,
  limits = c("original", "extended"))

## S3 method for class 'polygonGate'
extend(gate, bound, data.range = NULL,
  plot = FALSE, limits = c("original", "extended"))

## S3 method for class 'rectangleGate'
extend(gate, ...)

## S3 method for class 'ellipsoidGate'
extend(gate, ...)
```

Arguments

gate	a flowCore filter/gate
bound	numeric matrix representing the bouding information parsed from gatingML. Each row corresponds to a channel. rownames should be the channel names. colnames should be c("min", "max")
data.range	numeric matrix specifying the data limits of each channel. It is used to set the extended value of vertices and must has the same structure as 'bound'. when it is not supplied, c(-.Machine$integer.max, - .Machine$integer.max) is used.
plot	whether to plot the extended polygon.
limits	character whether to plot in "extended" or "original" gate limits. Default is "original".
...	other arguments

Details

The advantage of extending gates instead of shifting data are two folds: 1. Avoid the extra computation each time applying or plotting the gates 2. Avoid changing the data distribution caused by adding the gates

Normally this function is not used directly by user but invoked when parsing GatingML file exported from Cytobank.

Value

a flowCore filter/gate

Examples

```
library(flowCore)
sqrcut <- matrix(c(300,300,600,600,50,300,300,50),ncol=2,nrow=4)
colnames(sqrcut) <- c("FSC-H","SSC-H")
pg <- polygonGate(filterId="nonDebris", sqrcut)
pg
bound <- matrix(c(100,3e3,100,3e3),
    byrow = TRUE, nrow = 2,
   dimnames = list(c("FSC-H", "SSC-H"),
     c("min", "max")))
bound
pg.extened <- extend(pg, bound, plot = TRUE)
```

flowJoWorkspace-class *An R representation of a flowJo workspace.*

Description

Objects can be created by calls of the form `new("flowJoWorkspace.xml",...)`.

Slots

`version`: Object of class `"character"`. The version of the XML workspace.

`file`: Object of class `"character"`. The file name.

`.cache`: Object of class `"environment"`. An environment for internal use.

`path`: Object of class `"character"`. The path to the file.

`doc`: Object of class `"XMLInternalDocument"`. The XML document object.

`options`: Object of class `"integer"`. The XML parsing options passed to `xmlTreeParse`.

See Also

`GatingSet` `GatingHierarchy`

Examples

```
require(flowWorkspaceData)
d<-system.file("extdata",package="flowWorkspaceData")
wsfile<-list.files(d,pattern="A2004Analysis.xml",full=TRUE)
ws <- openWorkspace(wsfile);
ws
getSamples(ws)
```

gating,graphGML,GatingSet-method *Apply the gatingML graph to a GatingSet*

Description

It applies the gates to the GatingSet based on the population tree described in graphGML.

Usage

```
## S4 method for signature 'graphGML,GatingSet'
gating(x, y, ...)
```

Arguments

`x`	graphGML
`y`	GatingSet
`...`	other arguments

Value

Nothing. As the side effect, gates generated by gating methods are saved in `GatingSet`.

`GatingSet,character,character-method` *constructors for GatingSet*

Description

construct object from xml workspace file and a list of sampleIDs (not intended to be called by user.)

Usage

```
## S4 method for signature 'character,character'
GatingSet(x, y, guids,
  includeGates = FALSE, sampNloc = "keyword", xmlParserOption, wsType)
```

Arguments

`x`	`character` or `flowSet` or `GatingHierarchy`
`y`	`character` ormissing
`guids`	`character` vectors to uniquely identify each sample (Sometime FCS file names alone may not be unique)
`includeGates`	`logical` whether to parse the gates or just simply extract the flowJo stats
`sampNloc`	`character` scalar indicating where to get sampleName(or FCS filename) within xml workspace. It is either from "keyword" or "sampleNode".
`xmlParserOption`	`integer` option passed to `xmlTreeParse`
`wsType`	`character` workspace type, can be value of "win", "macII", "vX", "macIII".

`GatingSet2cytobank` *Convert a GatingSet to a Cytobank-compatible gatingML*

Description

this function retrieves the gates from GatingSet and writes a customed GatingML-2.0 file that can be imported into cytobank.

Usage

```
GatingSet2cytobank(gs, outFile, showHidden = FALSE,
  cytobank.default.scale = TRUE, ...)
```

Arguments

gs	a GatingSet object
outFile	a file name
showHidden	whether to include the hidden population nodes in the output
cytobank.default.scale	logical flag indicating whether to use the default Cytobank asinhtGml2 settings. Currently it should be set to TRUE in order for gates to be displayed properly in Cytobank because cytobank currently does not parse the global scale settings from GatingML.
...	rescale.gate default is TRUE. which means the gate is rescaled to the new scale that is understandable by cytobank. It is recommended not to change this behavior unless user wants to export to a gatingML file used for other purpose other than being imported into cytobank.

Details

The process can be divided into four steps: 1. Read in gate geometry, compensation and transformation from gatingSet 2. Rescale gate boundaries with flowJoTrans() so gates can be displayed properly in Cytobank 3. Save gates and hierarchy structure to R environment 4. Write environment out to gatingML using write.GatingML()

Value

nothing

Examples

```
library(flowWorkspace)

dataDir <- system.file("extdata",package="flowWorkspaceData")
gs <- load_gs(list.files(dataDir, pattern = "gs_manual",full = TRUE))

Rm("CD8", gs)

#output to cytobank
outFile <- tempfile(fileext = ".xml")
GatingSet2cytobank(gs, outFile) #type by default is 'cytobank'
```

GatingSet2flowJo *Convert a GatingSet to flowJo workspace*

Description

Convert a GatingSet to flowJo workspace

Usage

```
GatingSet2flowJo(gs, outFile, ...)
```

Arguments

gs	a GatingSet object
outFile	the workspace file path to write
...	other arguments showHidden whether to include the hidden population nodes in the output

Value

nothing

Examples

```
library(flowWorkspace)

dataDir <- system.file("extdata",package="flowWorkspaceData")
gs <- load_gs(list.files(dataDir, pattern = "gs_manual",full = TRUE))

#output to flowJo
outFile <- tempfile(fileext = ".wsp")
GatingSet2flowJo(gs, outFile)
```

---

getChildren,graphGML,character-method
get children nodes

Description

get children nodes

Usage

```
## S4 method for signature 'graphGML,character'
getChildren(obj, y)
```

Arguments

obj	graphGML
y	character parent node path

Value

a graphNEL node

Examples

```
## Not run:
xmlfile <- system.file("extdata/cytotrol_tcell_cytobank.xml", package = "CytoML")
g <- read.gatingML.cytobank(xmlfile)
getChildren(g, "GateSet_722326")
getParent(g, "GateSet_722326")

## End(Not run)
```

`getCompensationMatrices.graphGML` *Extract compensation from graphGML object.*

Description

Extract compensation from graphGML object.

Usage

```
## S3 method for class 'graphGML'
getCompensationMatrices(x)
```

Arguments

x	graphGML

Value

compensation object or "FCS" when compensation comes from FCS keywords

---

`getFJWSubsetIndices` *Fetch the indices for a subset of samples in a flowJo workspace, based on a keyword value pair*

Description

This function will calculate the indices of a subset of samples in a flowJoWorkspace, based on a keyword/value filter. It is applied to a specific group of samples in the workspace. The output is meant to be passed to the subset= argument of parseWorkspace.

Usage

```
getFJWSubsetIndices(ws, key = NULL, value = NULL, group,
  requiregates = TRUE)
```

Arguments

ws	flowJoWorkspace object
key	character The name of the keyword.
value	character The value of the keyword.
group	numeric The group of samples to subset.
requiregates	TRUE or FALSE, specifying whether we include only samples that have gates attached or whether we include any sample in the workspace.

Details

Returns an index vector into the samples in a flowJo workspace for use with parseWorkspace(subset=), based on a keyword/value filter in a specific group of samples.

Value

A numeric vector of indices.

See Also

parseWorkspace

---

getGate,graphGML,character-method

get gate from the node

Description

get gate from the node

Usage

```
## S4 method for signature 'graphGML,character'
getGate(obj, y)
```

Arguments

obj	graphGML
y	character node path

Value

the gate information associated with the node

getKeywords,flowJoWorkspace,character-method
Get Keywords

Description

Retrieve keywords associated with a workspace

Usage

```
## S4 method for signature 'flowJoWorkspace,character'
getKeywords(obj, y, ...)

## S4 method for signature 'flowJoWorkspace,numeric'
getKeywords(obj, y, ...)
```

Arguments

obj	A flowJoWorkspace
y	ccharacter or numeric specifying the sample name or sample ID
...	other arguments sampNloc a character the location where the sample name is specified. See parseWorkspace for more details.

Details

Retrieve a list of keywords from a flowJoWorkspace

Value

A list of keyword - value pairs.

Examples

```
require(flowWorkspaceData)
d<-system.file("extdata",package="flowWorkspaceData")
wsfile<-list.files(d,pattern="manual.xml",full=TRUE)
ws <- openWorkspace(wsfile);

getSamples(ws)
res <- try(getKeywords(ws,"CytoTrol_CytoTrol_1.fcs"), silent = TRUE)
print(res[[1]])
getKeywords(ws, 1)
```

getNodes,graphGML-method
get nodes from graphGML object

Description

get nodes from graphGML object

Usage

```
## S4 method for signature 'graphGML'
getNodes(x, y, order = c("default", "bfs", "dfs",
  "tsort"), only.names = TRUE)
```

Arguments

x	graphGML
y	character node index. When missing, return all the nodes
order	character specifying the order of nodes. options are "default", "bfs", "dfs", "tsort"
only.names	logical specifiying whether user wants to get the entire nodeData or just the name of the population node

Value

It returns the node names and population names by default. Or return the entire nodeData associated with each node.

Examples

```
## Not run:
xmlfile <- system.file("extdata/cytotrol_tcell_cytobank.xml", package = "CytoML")
g <- read.gatingML.cytobank(xmlfile)
getNodes(g)
getNodes(g, only.names = FALSE)

## End(Not run)
```

getParent,graphGML,character-method
get parent nodes

Description

get parent nodes

Usage

```
## S4 method for signature 'graphGML,character'
getParent(obj, y)
```

Arguments

obj	graphGML
y	character child node path

Value

a graphNEL node

---

getSampleGroups,flowJoWorkspace-method

Get a table of sample groups from a flowJo workspace

Description

Return a data frame of sample group information from a flowJo workspace

Usage

```
## S4 method for signature 'flowJoWorkspace'
getSampleGroups(x)
```

Arguments

x	A flowJoWorkspace object.

Details

Returns a table of samples and groups defined in the flowJo workspace

Value

A data.frame containing the groupName, groupID, and sampleID for each sample in the workspace. Each sample may be associated with multiple groups.

See Also

flowJoWorkspace-class openWorkspace

Examples

```
  ## Not run:
    #ws is a flowJoWorkspace
    getSampleGroups(ws);

## End(Not run)
```

getSamples,flowJoWorkspace-method

Get a list of samples from a flowJo workspace

Description

Return a data frame of samples contained in a flowJo workspace

Usage

```
## S4 method for signature 'flowJoWorkspace'
getSamples(x, sampNloc = "keyword")
```

Arguments

x	A flowJoWorkspace
sampNloc	character either "keyword" or "sampleNode". see parseWorkspace

Details

Returns a data.frame of samples in the flowJoWorkspace, including their sampleID, name, and compID (compensation matrix ID).

Value

A data.frame with columns sampleID, name, and compID if x is a flowJoWorkspace.

Examples

```
## Not run:
  #ws is a flowJoWorkspace
  getSamples(ws);

## End(Not run)
```

getTransformations.graphGML

Extract transformations from graphGML object.

Description

Extract transformations from graphGML object.

Usage

```
## S3 method for class 'graphGML'
getTransformations(x, ...)
```

Arguments

x	graphGML
...	not used

Value

transformerList object

---

graphGML-class *A graph object returned by 'read.gatingML.cytobank' function.*

Description

Each node corresponds to a population(or GateSet) defined in gatingML file. The actual gate object (both global and tailored gates) is associated with each node as nodeData. Compensation and transformations are stored in graphData slot.

Details

The class simply extends the graphNEL class and exists for the purpose of method dispatching.

---

matchPath *Given the leaf node, try to find out if a collection of nodes can be matched to a path in a graph(tree) by the bottom-up searching*

Description

Given the leaf node, try to find out if a collection of nodes can be matched to a path in a graph(tree) by the bottom-up searching

Usage

```
matchPath(g, leaf, nodeSet)
```

Arguments

g	graphNEL
leaf	the name of leaf(terminal) node
nodeSet	a set of node names

Value

TRUE if path is found, FALSE if not path is matched.

openDiva *open Diva xml workspace*

Description

open Diva xml workspace

Usage

```
openDiva(file, options = 0, ...)
```

Arguments

file	xml file
options	argument passed to xmlTreeParse
...	arguments passed to xmlTreeParse

Value

a divaWorkspace object

Examples

```
## Not run:
library(flowWorkspace)
library(CytoML)
ws <- openDiva(system.file('extdata/diva/PE_2.xml', package = "flowWorkspaceData"))
ws
getSampleGroups(ws)
getSamples(ws)
gs <- parseWorkspace(ws, name = 2, subset = 1)
sampleNames(gs)
getNodes(gs)
plotGate(gs[[1]])

## End(Not run)
```

openWorkspace.character *Open/Close a flowJo workspace*

Description

Open a flowJo workspace and return a flowJoWorkspace object. Close a flowJoWorkspace, destroying the internal representation of the XML document, and freeing the associated memory.

Usage

```
## S3 method for class 'character'
openWorkspace(file, options = 0, ...)

## S4 method for signature 'flowJoWorkspace'
closeWorkspace(workspace)
```

Arguments

file	Full path to the XML flowJo workspace file.
options	xml parsing options passed to xmlTreeParse
...	other arguments passed to xmlTreeParse
workspace	A flowJoWorkspace

Details

Open an XML flowJo workspace file and return a flowJoWorkspace object. The workspace is represented using a XMLInternalDocument object. Close a flowJoWorkpsace after finishing with it. This is necessary to explicitly clean up the C-based representation of the XML tree. (See the XML package).

Value

a flowJoWorkspace object.

Examples

```
## Not run:
file<-"myworkspace.xml"
ws<-openWorkspace(file);
class(ws); #flowJoWorkspace
closeWorkspace(ws);

## End(Not run)
```

---

parse.gateInfo *Parse the cytobank custom_info for each gate*

Description

Fcs filename and gate name stored in 'custom_info' element are beyong the scope of the gatingML standard and thus not covered by the default 'read.gatingML'.

Usage

```
parse.gateInfo(file, ...)
```

Arguments

file	xml file path
...	additional arguments passed to the handlers of 'xmlTreeParse'

Value

a data.frame that contains three columns: id (gateId), name (gate name), fcs (fcs_file_filename).

`parseWorkspace,flowJoWorkspace-method`
Parse a flowJo Workspace

Description

Function to parse a flowJo Workspace, generate a `GatingHierarchy` or `GatingSet` object, and associated flowCore gates. The data are not loaded or acted upon until an explicit call to `recompute()` is made on the `GatingHierarchy` objects in the `GatingSet`.

Usage

```
## S4 method for signature 'flowJoWorkspace'
parseWorkspace(obj, ...)
```

Arguments

`obj`	A `flowJoWorkspace` to be parsed.
`...`	• name `numeric` or `character`. The name or index of the group of samples to be imported. If `NULL`, the groups are printed to the screen and one can be selected interactively. Usually, multiple groups are defined in the flowJo workspace file. • execute `TRUE|FALSE` a logical specifying if the gates, transformations, and compensation should be immediately calculated after the flowJo workspace have been imported. TRUE by default. • isNcdf `TRUE|FALSE` logical specifying if you would like to use netcdf to store the data, or if you would like to keep all the flowFrames in memory. For a small data set, you can safely set this to FALSE, but for larger data, we suggest using netcdf. You will need the netcdf C library installed. • subset `numeric` vector specifying the subset of samples in a group to import. Or a `character` specifying the FCS filenames to be imported. Or an `expression` to be passed to 'subset' function to filter samples by 'pData' (Note that the columns referred by the expression must also be explicitly specified in 'keywords' argument) • requiregates `logical` Should samples that have no gates be included? • includeGates `logical` Should gates be imported, or just the data with compensation and transformation? • path either a `character` scalar or `data.frame`. When `character`, it is a path to the fcs files that are to be imported. The code will search recursively, so you can point it to a location above the files. When it is a `data.frame`, it is expected to contain two columns:'sampleID' and 'file', which is used as the mapping between 'sampleID' and FCS file (absolute) path. When such mapping is provided, the file system searching is avoided. • sampNloc a `character` scalar indicating where to get sampleName(or FCS filename) within xml workspace. It is either from "keyword" or "sampleNode".

- compensation=NULL: a `compensation` or a list of `compensations` that allow the customized compensation matrix to be used instead of the one specified in flowJo workspace.
- options=0: a `integer` option passed to `xmlTreeParse`
- channel.ignore.case a `logical` flag indicates whether the colnames(channel names) matching needs to be case sensitive (e.g. compensation, gating..)
- extend_val `numeric` the threshold that determine wether the gates need to be extended. default is 0. It is triggered when gate coordinates are below this value.
- extend_to `numeric` the value that gate coordinates are extended to. Default is -4000. Usually this value will be automatically detected according to the real data range. But when the gates needs to be extended without loading the raw data (i.e. `execute` is set to FALSE), then this hard-coded value is used.
- leaf.bool a `logical` whether to compute the leaf boolean gates. Default is TRUE. It helps to speed up parsing by turning it off when the statistics of these leaf boolean gates are not important for analysis. (e.g. COMPASS package will calculate them by itself.) If needed, they can be calculated by calling `recompute` method at later stage.
- additional.keys `character` vector: The keywords (parsed from FCS header) to be combined(concatenated with "_") with FCS filename to uniquely identify samples. Default is '$TOT' (total number of cells) and more keywords can be added to make this GUID.
- additional.sampleID `boolean`: A boolean specifying whether to include the flowJo sample ID in a GUID to uniquely identify samples. This can be helpful when the filename or other keywords are not enough to differentiate between samples. Default is FALSE.
- keywords `character` vector specifying the keywords to be extracted as pData of GatingSet
- keywords.source `character` the place where the keywords are extracted from, can be either "XML" or "FCS"
- keyword.ignore.case a `logical` flag indicates whether the keywords matching needs to be case sensitive.
- ...: Additional arguments to be passed to read.ncdfFlowSet or read.flowSet.

Details

A flowJoWorkspace is generated with a call to `openWorkspace()`, passing the name of the xml workspace file. This returns a `flowJoWorkspace`, which can be parsed using the `parseWorkspace()` method. The function can be called non-interactively by passing the index or name of the group of samples to be imported via `parseWorkspace(obj,name=x)`, where `x` is either the numeric index, or the name. The `subset` argument allows one to select a set of files from the chosen sample group. The routine will take the intersection of the files in the sample group, the files specified in `subset` and the files available on disk, and import them.

Value

a `GatingSet`, which is a wrapper around a list of `GatingHierarchy` objects, each representing a single sample in the workspace. The `GatingHierarchy` objects contain `graphNEL` trees that represent the gating hierarchy of each sample. Each node in the `GatingHierarchy` has associated data, including the population counts from flowJo, the parent population counts, the `flowCore`

gates generated from the flowJo workspace gate definitions. Data are not yet loaded or acted upon at this stage. To execute the gating of each data file, a call to `execute()` must be made on each `GatingHierarchy` object in the `GatingSet`. This is done automatically by default, and there is no more reason to set this argument to FALSE.

See Also

`getSampleGroups`,`GatingSet`

Examples

```
## Not run:
 #f is a xml file name of a flowJo workspace
ws <- openWorkspace(f)
 #parse the second group
gs <- parseWorkspace(ws, name = 2); #assume that the fcs files are under the same folder as workspace


 gs <- parseWorkspace(ws, name = 4
                         , path = dataDir     #specify the FCS path
                , subset = "CytoTrol_CytoTrol_1.fcs"    #subset the parsing by FCS filename
                , isNcdf = FALSE)#turn off cdf storage mode (normally you don't want to do this for parsing larg



 gs <- parseWorkspace(ws, path = dataDir, name = 4
                 , keywords = c("PATIENT ID", "SAMPLE ID", "$TOT", "EXPERIMENT NAME") #tell the parser to extrac
                 , keywords.source = "XML" # keywords are extracted from xml workspace (alternatively can be set
                 , additional.keys = c("PATIENT ID") #use additional keywords together with FCS filename to uni
                 , execute = F) # parse workspace without the actual gating (can save time if just want to get th

#subset by pData (extracted from keywords)
gs <- parseWorkspace(ws, path = dataDir, name = 4
                         , subset = `TUBE NAME` %in% c("CytoTrol_1", "CytoTrol_2")
                         , keywords = "TUBE NAME")


#overide the default compensation defined in xml with the customized compenstations
gs <- parseWorkspace(ws, name = 2, compensation = comps); #comp is either a compensation object or a list of comp

## End(Not run)
```

`plot,graphGML,missing-method`

plot the population tree stored in graphML.

Description

The node with dotted order represents the population that has tailored gates (sample-specific gates) defined.

Usage

```
## S4 method for signature 'graphGML,missing'
plot(x, y = "missing",
  label = c("popName", "gateName"))
```

Arguments

x	a graphNEL generated by constructTree function
y	not used
label	specifies what to be dispaled as node label. Can be either 'popName' (population name parsed from GateSets) or 'gateName'(the name of the actual gate associated with each node)

Value

nothing

Examples

```
## Not run:
xmlfile <- system.file("extdata/cytotrol_tcell_cytobank.xml", package = "CytoML")
g <- read.gatingML.cytobank(xmlfile)
plot(g)

## End(Not run)
```

---

range.GatingHierarchy *the parameter range from the flow data associated with GatingHierarchy*

Description

the parameter range from the flow data associated with GatingHierarchy

Usage

```
## S3 method for class 'GatingHierarchy'
range(..., na.rm = FALSE,
  type = c("instrument", "data"), raw.scale = FALSE)
```

Arguments

...	GatingHierarchy object
na.rm	not used
type	character of "instrument" or "data" indicating whether to retrieve the instrument or the actual data range
raw.scale	logical whether convert the range from transformed scale to raw scale

Value

matrix

Examples

```
## Not run:
 range(gh, type = "data")#return data range
 range(gh) #return instrument range
 range(gh, raw.scale = TRUE) #inverse transform the range to the raw scale

## End(Not run)
```

`read.gatingML.cytobank` *Parser for gatingML exported by Cytobank*

Description

The Default parser (flowUtils::read.gatingML) does not parse the population tree as well as the custom information from cytobank. (e.g. gate name, fcs filename).

Usage

```
read.gatingML.cytobank(file, ...)
```

Arguments

`file`	Gating-ML XML file
`...`	additional arguments passed to the handlers of 'xmlTreeParse'

Value

a graphGML that represents the population tree. The gate and population name are stored in nodeData of each node. Compensation and transformations are stored in graphData.

Examples

```
## Not run:
xml <- system.file("extdata/cytotrol_tcell_cytobank.xml", package = "CytoML")
g <- read.gatingML.cytobank(xml) #parse the population tree
#plot(g) #visualize it

## End(Not run)
```

show,graphGML-method *show method for graphGML*

Description

show method for graphGML

Usage

```
## S4 method for signature 'graphGML'
show(object)
```

Arguments

object	graphGML

Value

nothing

Index