Package ‘flowWorkspace’

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**Type** Package

**Title** Infrastructure for representing and interacting with gated and un gated cytometry data sets.

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**Description** This package is designed to facilitate comparison of automated gating methods against manual gating done in flowJo. This package allows you to import basic flowJo workspaces into BioConductor and replicate the gating from flowJo using the flowCore functionality. Gating hierarchies, groups of samples, compensation, and transformation are performed so that the output matches the flowJo analysis.

**License** Artistic-2.0

**LazyLoad** yes

**Imports** Biobase, BiocGenerics, graph, graphics, grDevices, lattice, methods, stats, stats4, utils, RBGL, tools, gridExtra, Rgraphviz, data.table, dplyr, latticeExtra, Rcpp, RColorBrewer, stringr, scales, flowViz, matrixStats, digest, RcppParallel, flowCore(>= 1.51.4), ncdfFlow(>= 2.31.1)


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Page dimensions: 595.3x841.9
Import and replicate flowJo workspaces and gating schemes using flowCore.

Description

Import flowJo workspaces into R. Generate the flowJo gating hierarchy and gates using flowCore functionality. Transform and compensate data in accordance with flowJo settings. Plot gates, gating hierarchies, population statistics, and compare flowJo vs flowCore population summaries.

Details

Package: flowWorkspace
Type: Package
Version: 0.5.40
Date: 2011-03-04
License: Artistic 2.0
LazyLoad: yes
Depends: R (>= 2.16.0), Rcpp (>= 0.9.9)

Author(s)

Greg Finak, Mike Jiang

References

http://www.rglab.org/

Description

Create a GatingSet and add/remove the flowCore gate(or population) to/from a GatingHierarchy/GatingSet.

GatingSet method creates a gatingset from a flowSet with the ungated data as the root node. add method add the flowCore gate to a GatingHierarchy/GatingSet. gs_pop_set_gate method update the gate of one population node in GatingHierarchy/GatingSet. Rm method Remove the population node from a GatingHierarchy/GatingSet. They are equivalent to the workFlow.add and Rm methods in flowCore package. recompute method does the actual gating after the gate is added,i.e. calculating the event indices according to the gate definition.
Usage

```
add(gs, gate, ...)  
```

## Default S3 method:
```
add(gs, gate, ...)  
```

```
gs_pop_add(gs, gate, validityCheck = TRUE, ...)  
gs_pop_remove(gs, node, ...)  
Rm(node, gs, ...)  
```

Arguments

- **gs**: A GatingSet
- **gate**: A filter or a list of filters to be added to the GatingSet.
- **...**: some other arguments to specify how the gates are added to the gating tree.
  - names: a character vector of length four, which specifies the population names resulted by adding a quadGate. The order of the names is clock-wise starting from the top left quadrant population.
  - parent: a character scalar to specify the parent node name where the new gate to be added to, by default it is NULL, which indicates the root node.
  - name: a character scalar to specify the node name of population that is generated by the gate to be added.
  - recompute: a logical flag
  - negated: a logical scalar to specify whether the gate is negated, which means the the population outside of the gate will be kept as the result population. It is FALSE by default.
- **validityCheck**: logical whether to check the consistency of tree structure across samples. default is TRUE. Can be turned off when speed is preferred to the robustness.
- **node**: A character identifies the population node in a GatingHierarch or GatingSet to remove.

Value

GatingSet method returns a GatingSet object with just root node. add method returns a population node ID (or four population node IDs when adding a quadGate) that uniquely identify the population node within a GatingHierarchy.

See Also

- GatingSet-class

Examples

```
## Not run:  
data(GvHD)  
# select raw flow data  
fs<-GvHD[1:3]  

# transform the raw data
```
tf <- transformList(colnames(fs[[1]])[3:6], asinh, transformationId="asinh")
fs_trans <- transform(fs, tf)

# add transformed data to a gating set
gs <- GatingSet(fs_trans)
gs

# add one gate
rg <- rectangleGate("FSC-H"=c(200,400), "SSC-H"=c(250, 400),
filterId="rectangle")

nodeID <- gs_pop_add(gs, rg)# it is added to root node by default if parent is not specified
nodeID

gs_get_pop_paths(gs[[1]]) # the second population is named after filterId of the gate

# add a quadGate
qg <- quadGate("FL1-H"=2, "FL2-H"=4)
nodeIDs <- gs_pop_add(gs, qg, parent="rectangle")
nodeIDs # quadGate produces four population nodes

gs_get_pop_paths(gs[[1]]) # population names are named after dimensions of gate if not specified

# add a boolean Gate
bg <- booleanFilter(`CD15 FITC-CD45 PE+` | `CD15 FITC+CD45 PE-`)
bg

nodeID2 <- gs_pop_add(gs, bg, parent="rectangle")
nodeID2

gs_get_pop_paths(gs[[1]])

# do the actual gating
recompute(gs)

# plot one gate for one sample
plotGate(gs[[1]], "rectangle")
plotGate(gs[[1]], nodeIDs) # may be smoothed automatically if there are not enough events after gating

# plot gates across samples using lattice plot
plotGate(gs, nodeID)

# plot all gates for one sample
plotGate(gs[[1]]) # boolean gate is skipped by default
plotGate(gs[[1]], bool=TRUE)

# plot the gating hierarchy
plot(gs[[1]])

# remove one node causing the removal of all the descendants
gs_pop_remove('rectangle', gs = gs)

gs_get_pop_paths(gs[[1]])

## End(Not run)

### asinhGml2_trans

Inverse hyperbolic sine transformation.

**Description**

Used to construct inverse hyperbolic sine transform object.
Usage

asinhtGml2_trans(..., n = 6, equal.space = FALSE)

Arguments

... parameters passed to asinh_Gml2
n desired number of breaks (the actual number will be different depending on the
data range)
equal.space whether breaks at equal-spaced intervals

Value

asinhtGml2 transformation object

Examples

trans.obj <- asinhtGml2_trans(equal.space = TRUE)
data <- 1:1e3
brks.func <- trans.obj["breaks"]
brks <- brks.func(data)
brks # fasinh space displayed at raw data scale

#transform it to verify it is equal-spaced at transformed scale
trans.func <- trans.obj["transform"]
brks.trans <- trans.func(brks)
brks.trans

asinh_Gml2

inverse hyperbolic sine transform function generator (GatingML 2.0
version)

Description

hyperbolic sine/inverse hyperbolic sine transform function constructor. It is simply a special form
of flowjo_fasinh with length set to 1 and different default values for parameters t,m,a.

Usage

asinh_Gml2(T = 262144, M = 4.5, A = 0, inverse = FALSE)

Arguments

T numeric the maximum value of input data
M numeric the full width of the transformed display in asymptotic decades
A numeric Additional negative range to be included in the display in asymptotic
decades
inverse whether to return the inverse function

Value

fasinh/fsinh transform function
### booleanFilter-class

**booleanFilter-class**

*A class describing logical operation (& or |) of the reference populations*

### Description

booleanFilter class inherits class **expressionFilter** and exists for the purpose of methods dispatching.

### Usage

```r
booleanFilter(expr, ..., filterId = "defaultBooleanFilter")
char2booleanFilter(expr, ..., filterId = "defaultBooleanFilter")
```

### Arguments

- `expr` expression
- `...` further arguments to the expression
- `filterId` character identifier
- `object` booleanFilter

### See Also

- `add GatingHierarchy`

### Examples

```r
# "4+/TNFa+" and "4+/IL2+" are two existing gates
# note: no spaces between node names and & , ! operators
booleanFilter("4+/TNFa+&!4+/IL2+")
```

```
# programmatically
n1 <- "4+/TNFa+
"n2 <- "4+/IL2+
exprs <- paste0(n1, "&!", n2)
call <- substitute(booleanFilter(v), list(v = as.symbol(exprs)))
eval(call)
```
checkRedundantNodes

try to determine the redundant terminal (or leaf) nodes that can be removed

Description

These leaf nodes make the gating trees to be different from one another and can be removed by the subsequent convenient call gs_remove_redundant_nodes.

Usage

checkRedundantNodes(...)

gs_check_redundant_nodes(x, path = "auto", ...)

Arguments

... other arguments passed to gs_get_pop_paths.

x GatingSet or list of groups (each group is a list of 'GatingSet'). When it is a list, it is usually the outcome from gs_split_by_tree.

path argumented passed to gs_get_pop_paths. The default value is "auto".

Value

a list of the character vectors indicating the nodes that are considered to be redundant for each group of GatingSets.

Examples

## Not run:
gslist <- list(gs1, gs2, gs3, gs4, gs5)
gs_groups <- gs_split_by_tree(gslist)
toRm <- gs_check_redundant_nodes(gs_groups)
## End(Not run)

close a GatingSet

Description

clone a GatingSet

Usage

clone(x, ...)

gs_clone(x, ...)


Arguments

x A GatingSet

... ncdfFile = NULL: see clone.ncdfFlowSet

Details

Note that the regular R assignment operation on a GatingSet object does not return the copy as one would normally expect because the GatingSet contains environment slots (and external pointer for GatingSet), which require deep-copying. So make sure to use this clone method in order to make a copy of existing object.

Value

A copy of a given GatingSet.

Examples

## Not run:
#G is a GatingSet
G1<-gs_clone(G)

## End(Not run)

compensate,GatingSet,ANY-method

compensate the flow data associated with the GatingSet

Description

The compensation is saved in the GatingSet and can be retrieved by gh_get_compensations.

Usage

## S4 method for signature 'GatingSet,ANY'
compensate(x, spillover)

## S4 method for signature 'GatingSetList,ANY'
compensate(x, spillover)

Arguments

x GatingSet or GatingSetList

spillover compensation object or a list of compensation objects

Value

a GatingSet or GatingSetList object with the underlying flow data compensated.
**compute_timestep**

compute time step from fcs keyword

**Description**

compute time step from fcs keyword

**Usage**

```r
compute_timestep(kw, unit.range, timestep.source = c("TIMESTEP", "BTIM"))
```

**Arguments**

- `kw` list of keywords
- `unit.range` the actual measured time unit range
- `timestep.source` either "TIMESTEP" or "BTIM". prefer to STIMESTEP keyword when it is non NULL

**copyNode**

Copy a node along with all of its descendant nodes to the given ancestor

**Description**

Copy a node along with all of its descendant nodes to the given ancestor

**Usage**

```r
copyNode(gh, node, to)
gh_copy_gate(gh, node, to)
```

**Arguments**

- `gh` GatingHierarchy
- `node` the node to be copied
- `to` the new parent node under which the node will be copied
dropRedundantChannels

Examples

library(flowWorkspace)
dataDir <- system.file("extdata", package = "flowWorkspaceData")
suppressMessages(gs <- load_gs(list.files(dataDir, pattern = "gs_manual", full = TRUE)))
gh <- gs[[1]]
old.parent <- gs_pop_get_parent(gh, "CD4")
new.parent <- "singlets"
gh_copy_gate(gh, "CD4", new.parent)
gs_get_pop_paths(gh)

dropRedundantChannels  Remove the channels from flow data that are not used by gates

Description

Removing these redundant channels can help standardize the channels across different GatingSet objects and make them mergable.

Usage

dropRedundantChannels(...)

gs_remove_redundant_channels(gs, ...)

Arguments

...  other arguments passed to gs_get_pop_paths method

gs  a GatingSet

Value

a new GatingSet object that has redundant channels removed. Please note that this new object shares the same reference (or external pointers) with the original GatingSets.

Examples

## Not run:
 gs_new <- gs_remove_redundant_channels(gs)

## End(Not run)
dropRedundantNodes

Remove the terminal leaf nodes that make the gating trees to be different from one another.

Description
It is usually called after `gs_split_by_tree` and `gs_check_redundant_nodes`. The operation is done in place through external pointers which means all the original GatingSets are modified.

Usage

```r
dropRedundantNodes(x, toRemove)
gs_remove_redundant_nodes(x, toRemove)
```

Arguments

- `x`: GatingSet or list of groups (each group is a list of 'GatingSet'). When it is a list, it is usually the outcome from `gs_split_by_tree`.
- `toRemove`: list of the node sets to be removed. Its length must equal to the length of `x`. When `x` is a list, `toRemove` is usually the outcome from `gs_check_redundant_nodes`.

Examples

```r
## Not run:
gslist <- list(gs1, gs2, gs3, gs4, gs5)
gs_groups <- gs_split_by_tree(gslist)
toRm <- gs_check_redundant_nodes(gs_groups)
gs_remove_redundant_nodes(gs_groups, toRm)
# Now they can be merged into a single GatingSetList.
# Note that the original gs objects are all modified in place.
GatingSetList(gslist)
## End(Not run)
```

estimateLogicle.GatingHierarchy

Compute logicle transformation from the flowData associated with a GatingHierarchy

Description
See details in `flowCore::estimateLogicle`

Usage

```r
## S3 method for class 'GatingHierarchy'
estimateLogicle(x, channels, ...)
```
## extract_cluster_pop_name_from_node

**Extract the population name from the node path. It strips the parent path and cluster method name.**

### Description

Extract the population name from the node path. It strips the parent path and cluster method name.

### Usage

```r
extract_cluster_pop_name_from_node(node, cluster_method_name)
```

### Arguments

- `node`: population node path
- `cluster_method_name`: the name of the clustering method

### Examples

```r
equal_cluster_pop_name_from_node("cd3/flowClust_pop1", "flowClust")
# returns "pop1"
```
**Description**

convert flowCore filter to a list

It convert the flowCore gate to a list whose structure can be understood by underlying c++ data structure.

**Usage**

```r
filterObject(x)
```

## Default S3 method:

```r
filterObject(x)
```

```r
filter_to_list(x)
```

## S3 method for class 'rectangleGate'

```r
filter_to_list(x)
```

## S3 method for class 'polygonGate'

```r
filter_to_list(x)
```

## S3 method for class 'booleanFilter'

```r
filter_to_list(x)
```

## S3 method for class 'ellipsoidGate'

```r
filter_to_list(x)
```

## S3 method for class 'logical'

```r
filter_to_list(x)
```

**Arguments**

- **x**  
  filter a flowCore gate. Currently supported gates are: "rectangleGate", "polygonGate", "ellipsoidGate" and "booleanFilter"

**Value**

- **a list**
**fix_channel_slash**  
toggle the channel names between '/' and '_' character

**Description**
FlowJoX tends to replace '/' in the original channel names with '_' in gates and transformations. We need to do the same to the flow data but also need to change it back during the process since the channel names of the flowSet can’t be modified until the data is fully compensated.

**Usage**

```r
fix_channel_slash(chnls, slash_loc = NULL)
```

**Arguments**
- `chnls`: the channel names
- `slash_loc`: a list that records the locations of the original slash character within each channel name so that when restoring slash it won’t tamper the the original '_' character.

**Value**
the toggled channel names

---

**flowData**  
*Fetch or replace the flowData object associated with a GatingSet.*

**Description**
Accessor method that gets or replaces the flowset/ncdfFlowSet object in a GatingSet or GatingHierarchy

**Usage**

```r
gs_cyto_data(x)
gs_cyto_data(x) <- value
```

```r
## S4 method for signature 'GatingSet'
gs_cyto_data(x)
gs_cyto_data(x, ...)# S4 method for signature 'GatingSet'
gs_cyto_data(x, inverse.transform = FALSE)# S4 replacement method for signature 'GatingSet'
gs_cyto_data(x) <- value# S4 replacement method for signature 'GatingSet'
gs_cyto_data(x) <- value
```
flowjo_biexp

Arguments

- **x**
  A GatingSet

- **value**
  The replacement flowSet or ncdfFlowSet object

- **inverse.transform**
  logical flag indicating whether to inverse transform the data

Details

Accessor method that sets or replaces the ncdfFlowSet object in the GatingSet or GatingHierarchy.

Value

the object with the new flowSet in place.

flowjo_biexp

*construct the flowJo-type biexponential transformation function*

Description

Normally it was parsed from flowJo xml workspace. This function provides the alternate way to construct the flowJo version of logicle transformation function within R.

Usage

```r
flowjo_biexp(channelRange = 4096, maxValue = 262144, pos = 4.5,
             neg = 0, widthBasis = -10, inverse = FALSE)
```

```r
flowJoTrans(channelRange = 4096, maxValue = 262144, pos = 4.5,
             neg = 0, widthBasis = -10, inverse = FALSE)
```

Arguments

- **channelRange**
  numeric the maximum value of transformed data

- **maxValue**
  numeric the maximum value of input data

- **pos**
  numeric the full width of the transformed display in asymptotic decades

- **neg**
  numeric Additional negative range to be included in the display in asymptotic decades

- **widthBasis**
  numeric unknown.

- **inverse**
  logical whether to return the inverse transformation function.

Examples

```r
trans <- flowjo_biexp()
data.raw <- c(-1, 1e3, 1e5)
data.trans <- trans(data.raw)
round(data.trans)
inv <- flowjo_biexp(inverse = TRUE)
round(inv(data.trans))
```
flowjo_fasinh

Description

inverse hyperbolic sine transform function

Usage

flowjo_fasinh

Arguments

... parameters passed to flowjoTrans

n desired number of breaks (the actual number will be different depending on the data range)

equal.space whether breaks at equal-spaced intervals

Examples

library(flowCore)
data(GvHD)
fr <- GvHD[[1]]
data.raw <- exprs(fr)[, "FL1-H"]
trans.obj <- flowjo_fasinh(equal.space = TRUE)
brks.func <- trans.obj[["breaks"]]
brks <- brks.func(data.raw)
brks # biexp space displayed at raw data scale
#transform it to verify it is equal-spaced at transformed scale
trans.func <- trans.obj[["transform"]]
print(trans.func(brks))
Usage

flowjo_fasinh(m = 4, t = 12000, a = 0.7, length = 256)

flowJo.fasinh(m = 4, t = 12000, a = 0.7, length = 256)

flowjo_fsinh(m = 4, t = 12000, a = 0.7, length = 256)

flowJo.fsinh(m = 4, t = 12000, a = 0.7, length = 256)

Arguments

m
numeric the full width of the transformed display in asymptotic decades

t
numeric the maximum value of input data

a
numeric Additional negative range to be included in the display in asymptotic decades

length
numeric the maximum value of transformed data

Value

fasinh/fsinh transform function

Examples

trans <- flowjo_fasinh()
data.raw <- c(1,1e2,1e3)data.trans <- trans(data.raw)
data.trans

inverse.trans <- flowjo_fsinh()
inverse.trans(data.trans)

flowjo_fasinh_trans

flowJo inverse hyperbolic sine transformation.

Description

Used to construct the inverse hyperbolic sine transform object.

Usage

flowjo_fasinh_trans(..., n = 6, equal.space = FALSE)

flowJo_fasinh_trans(...)

Arguments

... parameters passed to flowjo_fasinh

n desired number of breaks (the actual number will be different depending on the data range)

equal.space whether breaks at equal-spaced intervals
flowjo_log_trans

Value

fasinh transformation object

Examples

trans.obj <- flowjo_fasinh_trans(equal.space = TRUE)
data <- 1:1e3
brks.func <- trans.obj["breaks"]
brks <- brks.func(data)
brks # fasinh space displayed at raw data scale

#transform it to verify it is equal-spaced at transformed scale
trans.func <- trans.obj["transform"]
round(trans.func(brks))

flowjo_log_trans  flog transform function

Description

flog transform function constructor. It is different from flowCore version of logtGml2 in the way
that it reset negative input so that no NAN will be returned.

Usage

flowjo_log_trans(decade = 4.5, offset = 1, scale = 1, n = 6,
equal.space = FALSE)

flowJo.flog(decade = 4.5, offset = 1, max_val = 262144,
min_val = 0, scale = 1, inverse = FALSE)

Arguments

decade  total number of decades (i.e. log(max)-log(min)
offset  offset to the orignal input(i.e. min value)
scale  the linear scale factor
inverse  whether return the inverse function

Value

flog(or its inverse) transform function

Examples

trans <- flowjo_log_trans()
data.raw <- c(1,1e2,1e3)
data.trans <- trans["transform"][data.raw]
data.trans

inverse.trans <- trans["inverse"][
inverse.trans(data.trans)
#negative input
data.raw <- c(-10, 1e2, 1e3)
data.trans <- trans["transform"](data.raw)
data.trans
inverse.trans(data.trans)# we lose the original value at lower end since flog can't restore negative value

# different
trans <- flowjo_log_trans(decade = 3, offset = 30)
data.trans <- trans["transform"](data.raw)
data.trans
inverse.trans <- trans["inverse"]
inverse.trans(data.trans)

flowWorkspace-deprecated

Deprecated functions in package flowWorkspace.

Description

getStats -> gs(/gh)_pop_get_stats
getProp -> gh_pop_get_proportion
getTotal -> gh_pop_get_count
getPopStats -> gs(/gh)_pop_get_stats
getNodes -> gs_get_pop_paths
getParent -> gs_pop_get_parent
getChildren -> gs_pop_get_children
getGate -> gs(/gh)_get_gate
getIndices -> gh_pop_get_indices
isGated -> gh_pop_is_gated
isNegated -> gh_pop_is_negated
isHidden -> gh_pop_is_hidden
getData -> gs(/gh)_get_data
getTransformations -> gh_get_transformations
getCompensationMatrices -> gh_get_compensations
plotGate -> autoplot
setNode -> gs(/gh)_set_node_name/gs(/gh)_set_node_visible
isNcdf -> gs_is_h5
clone -> gs_clone
recompute -> gs_recompute
flowData -> gs_cyto_data
flowData<- -> gs_cyto_data<-
getLoglevel -> get_log_level
setLoglevel -> set_log_level
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

flowWorkspace.par.init()
flowWorkspace.par.set

flowWorkspace.par.set sets a set of parameters in the flowWorkspace package namespace.

Description

flowWorkspace.par.set gets a set of parameters in the flowWorkspace package namespace.

Usage

flowWorkspace.par.set(name, value)

flowWorkspace.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 <- flowWorkspace.par.get("flowJo_versions")

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

flowWorkspace.par.get("flowJo_versions")

flow_breaks

Generate the breaks that makes sense for flow data visualization

Description

It is mainly used as helper function to construct breaks function used by 'trans_new'.

Usage

flow_breaks(x, n = 6, equal.space = FALSE, trans.fun, inverse.fun)
flow_trans

Arguments

- **x** the raw data values
- **n** desired number of breaks (the actual number will be different depending on the data range)
- **equal.space** whether breaks at equal-spaced intervals
- **trans.fun** the transform function (only needed when equal.space is TRUE)
- **inverse.fun** the inverse function (only needed when equal.space is TRUE)

Value

either $10^n$ intervals or equal-spaced(after transformed) intervals in raw scale.

Examples

```r
library(flowCore)
data(GvHD)
fr <- GvHD[[1]]
data.raw <- exprs(fr)[, "FL1-H"]
flow_breaks(data.raw)
trans <- logicleTransform()
inv <- inverseLogicleTransform(trans = trans)
myBrks <- flow_breaks(data.raw, equal.space = TRUE, trans = trans, inv = inv)
round(myBrks)
# to verify it is equally spaced at transformed scale
print(trans(myBrks))
```

flow_trans

*helper function to generate a trans objects Used by other specific trans constructor*

Description

helper function to generate a trans objects Used by other specific trans constructor

Usage

`flow_trans(name, trans.fun, inverse.fun, equal.space = FALSE, n = 6)`

Arguments

- **name** transformation name
- **trans.fun** the transform function (only needed when equal.space is TRUE)
- **inverse.fun** the inverse function (only needed when equal.space is TRUE)
- **equal.space** whether breaks at equal-spaced intervals
- **n** desired number of breaks (the actual number will be different depending on the data range)
**GatingHierarchy-class**  

**Class GatingHierarchy**

### Description

GatingHierarchy is a class for representing the gating hierarchy, which can be either imported from a flowJo workspace or constructed in R.

### Details

There is a one-to-one correspondence between GatingHierarchy objects and FCS files in the flowJo workspace. Each sample (FCS file) is associated with its own GatingHierarchy. It is also more space efficient by storing gating results as logical/bit vector instead of copying the raw data.

Given a GatingHierarchy, one can extract the data associated with any subpopulation, extract gates, plot gates, and extract population proportions. This facilitates the comparison of manual gating methods with automated gating algorithms.

### See Also

- GatingSet

### Examples

```r
## Not run:
require(flowWorkspaceData)
d<-system.file("extdata",package="flowWorkspaceData")
wsfile<-'list.files(d,pattern="A2004Analysis.xml",full=TRUE)
library(CytoML)
ws <- open_flowjo_xml(wsfile);
G<-'try(flowjo_to_gatingset(ws,path=d,name=1));
gh <- G[[1]]
gh_pop_compare_stats(gh);
gh_plot_pop_count_cv(gh)
    nodes <- gs_get_pop_paths(gh)
thisNode <- nodes[4]
plotGate(gh,thisNode);
gh_pop_get_gate(gh,thisNode);
gh_pop_get_data(gh,thisNode)
## End(Not run)
```

**GatingSet,flowSet,ANY-method**

*constructors for GatingSet*

### Description

construct a gatingset with empty trees (just root node)
Usage

```r
## S4 method for signature 'flowSet,ANY'
GatingSet(x)
```

```r
## S4 method for signature 'GatingSet'
identifier(object)
```

```r
## S4 method for signature 'GatingSetList'
identifier(object)
```

```r
## S4 replacement method for signature 'GatingSet,character'
identifier(object) <- value
```

```r
## S4 replacement method for signature 'GatingSetList,character'
identifier(object) <- value
```

**Arguments**

- `object`: GatingSet
- `value`: string

**Examples**

```r
## Not run:
#fdata could be a flowSet or ncdfFlowSet
gs <- GatingSet(fdata)
## End(Not run)
```

---

**Description**

construct object from existing gating hierarchy(gating template) and flow data

**Usage**

```r
## S4 method for signature 'GatingHierarchy,character'
GatingSet(x, y, path = ".", ...
```

```r
gh_apply_to_new_fcs(x, files, ...)
```

**Arguments**

- `x`: GatingHierarchy
- `y`: sample names
- `path`: character specifies the path to the flow data (FCS files)
- `...`: other arguments.
**GatingSet-class**

files  
  fcs file paths

swap_cols  
  for internal usage

---

**GatingSet-class**

*Class* "GatingSet"

---

**Description**

GatingSet holds a set of GatingHierarchy objects, representing a set of samples and the gating scheme associated with each.

- [ subsets a GatingSet or GatingSetList using the familiar bracket notation

- [[ extract a GatingHierarchy object from a GatingSet or GatingSetList

**Usage**

```r
## S4 method for signature 'GatingSet,ANY'
(x[i, j, ...], drop = TRUE)

## S4 method for signature 'GatingSet,numeric'
(x[[i, j, ...]])

## S4 replacement method for signature 'GatingSet,ANY,ANY,GatingHierarchy'
(x[[i, j = "missing", ...]] <- value)

## S4 method for signature 'GatingSetList,ANY'
(x[i, j, ...], drop = TRUE)
```

**Arguments**

- `x`  
  GatingSet or GatingSetList
- `i`  
  numeric or logical or character used as sample index
- `j`  
  not used
- `...`  
  not used
- `drop`  
  not used

**Details**

Objects stores a collection of GatingHierarchies and represent a group in a flowJo workspace. A GatingSet can have two “states”. After a call to `flowjo_to_gatingset(...,execute=FALSE)` the workspace is imported but the data is not. Setting `execute` to `TRUE` is needed in order to load, transform, compensate, and gate the associated data. Whether or not a GatingHierarchy has been applied to data is encoded in the `flag` slot. Some methods will warn the user, or may not function correctly if the GatingHierarchy has not been executed. This mechanism is in place, largely for the purpose of speed when working with larger workspaces. It allows the use to load a workspace and subset desired samples before proceeding to load the data.
GatingSetList-class

Slots

- `FCSPath`: deprecated
- `data`: Object of class "flowSet". flow data associated with this GatingSet
- `flag`: Object of class "logical". A flag indicating whether the gates, transformations, and compensation matrices have been applied to data, or simply imported.
- `axis`: Object of class "list". stores the axis information used for plotGate.
- `pointer`: Object of class "externalptr". points to the gating hierarchy stored in C data structure.
- `guid`: Object of class "character". the unique identifier for GatingSet object.
- `transformation`: Object of class "list". a list of transformation objects used by GatingSet.
- `compensation`: Object of class "ANY". compensation objects.

See Also

- GatingHierarchy

Examples

```r
## Not run:
require(flowWorkspaceData)
d <- system.file("extdata", package="flowWorkspaceData")
wsfile <- list.files(d, pattern="A2004Analysis.xml", full=TRUE)
library(CytoML)
ws <- open_flowjo_xml(wsfile);
G <- try(flowjo_to_gatingset(ws, execute=TRUE, path=d, name=1));
gs_plot_pop_count_cv(G);
## End(Not run)
```

GatingSetList-class  

Class "GatingSetList"

Description

A list of of GatingSet objects. This class exists for method dispatching. 
use GatingSetList constructor to create a GatingSetList from a list of GatingSet

Usage

GatingSetList(x, samples = NULL)

Arguments

- `x` a list of GatingSet
- `samples` character vector specifying the order of samples. if not specified, the samples are ordered as the underlying stored order.

Details

Objects store a collection of GatingSets,which usually has the same gating trees and markers. Most GatingSets methods can be applied to GatingSetList.
### Examples

```r
## Not run:
# load several GatingSets from disk
gs_list <- lapply(list.files("../gs_toMerge", full = T),
                 function(this_folder){
                   load_gs(this_folder)
                 })

# gs_list is a list
gs_groups <- merge(gs_list)
# returns a list of GatingSetList objects
gslist2 <- gs_groups[[2]]
# gslist2 is a GatingSetList that contains multiple GatingSets and they share the same gating and data structure

class(gslist2)
sampleNames(gslist2)

# reference a GatingSet by numeric index
gslist2[[1]]
# reference a GatingSet by character index
gslist2[['30104.fcs']]  

# loop through all GatingSets within GatingSetList
lapply(gslist2, sampleNames)

# subset a GatingSetList by [
sampleNames(gslist2[c(4,1)])  
sampleNames(gslist2[c(1,4)])  
gslist2[c('30104.fcs')]  

# get flow data from it
gs_pop_get_data(gslist2)
# get gated flow data from a particular population
gs_pop_get_data(gslist2, "3+")

# extract the gates associated with one population
gs_pop_get_gate(gslist2,"3+)
gs_pop_get_gate(gslist2,5)

# extract the pheno data
pData(gslist2[3:1])
# modify the pheno data
pd <- pData(gslist2)
pd$id <- 1:nrow(pd)
pData(gslist2) <- pd
pData(gslist2[3:2])

# plot the gate
plotGate(gslist2[1:2],5, smooth = T)
plotGate_labKey(gslist2[3:4],4, x = "<APC Cy7-A>", y = "<PE Tx RD-A>", smooth = T)

# remove certain gates by loop through GatingSets
gs_get_pop_paths(gslist2[[1]])
```
lapply(gslist2,function(gs)gs_pop_remove("Excl",gs = gs))

#extract the stats
gs_pop_get_count_fast(gslist2)
#extract statistics by using getQAStats defined in QUALIFIER package
res<-getQAStats(gslist2[c(4,2)],isMFI=F,isSpike=F,nslaves=1)

#archive the GatingSetList
save_gslist(gslist2, path ="~/rglab/workspace/flowIncubator/output/gslist",overwrite=T)
gslist2 <- load_gslist(path ="~/rglab/workspace/flowIncubator/output/gslist")

#convert GatingSetList into one GatingSet by gslist_to_gs
gs_merged2 <- gslist_to_gs(gslist2,ncdfFile=path.expand(tempfile(tmpdir="~/rglab/workspace/flowIncubator/output/")))
gs_merged2

## End(Not run)

## Not run:
sampleNames(gsA) # return A1, A2
sampleNames(gsB) # return B1, B2
gs.list <- list(gsA, gsB)
gslist<- GatingSetList(gs.list)
sampleNames(gslist) #return A1,A2,B1,B2

#set different order when create the GatingSetList
gslist<- GatingSetList(gs.list, samples = c("A1","B1", "A2", "B2"))
sampleNames(gslist) #return A1,B1,A2,B2

## End(Not run)

---

getCompensationMatrices

Retrieves the compensation matrices from a GatingHierarchy.

**Description**

Retrieve the compensation matrices from a GatingHierarchy.

**Usage**

getCompensationMatrices(x)

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

gh_get_compensations(x)

**Arguments**

x A GatingHierarchy object.

**Details**

Return all the compensation matrices in a GatingHierarchy.
Value
A list of matrix representing the spillover matrix in GatingHierarchy

Examples
## Not run:
# Assume gh is a GatingHierarchy
gh_get_compensations(gh);

## End(Not run)

### S4 method for signature 'GatingHierarchy'
getData(obj, y, ...)

gh_pop_get_data(obj, y = "root", inverse.transform = FALSE, ...)

### S4 method for signature 'GatingSet'
getData(obj, y, ...)

gs_pop_get_data(obj, y = "root", inverse.transform = FALSE, ...)

### S4 method for signature 'GatingSetList'
getData(obj, y, ...)

Arguments
obj A GatingHierarchy, GatingSet or GatingSetList object.
y character the node name or full/partial gating path. If not specified, will return the complete flowFrame/flowSet at the root node.
... arguments passed to ncdFlow::[[]
inverse.transform logical flag indicating whether to inverse transform the data

Details
Returns a flowFrame/flowSet containing the events in the gate defined at node y. Subset membership can be obtained using gh_pop_get_indices. Population statistics can be obtained using getPop and gh_pop_compare_stats. When calling gh_pop_get_data on a GatingSet, the trees representing the GatingHierarchy for each sample in the GatingSet are presumed to have the same structure. To update the data, use gs_cyto_data method.
**getGate,GatingHierarchy,character-method**

Return the flowCore gate definition associated with a node in a GatingHierarchy/GatingSet.

### Description

Return the flowCore gate definition object associated with a node in a GatingHierarchy or GatingSet object.

### Usage

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

gh_pop_get_gate(obj, y)

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

gs_pop_get_gate(obj, y)

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

### Arguments

- **obj**
  - A GatingHierarchy or GatingSet
- **y**
  - A character the name or full(/partial) gating path of the node of interest.

### Examples

```r
## Not run:
#G is a GatingSet
gpData(G,3) #get a flowSet constructed from the third node / population in the tree.
gpData(G,"cd4")

#gh is a GatingHierarchy
gh_pop_get_data(gh)

## End(Not run)
```

### See Also

`gs_cyto_data`, `gh_pop_get_indices`, `gh_pop_compare_stats`
Value

A gate object from flowCore. Usually a polygonGate, but may be a rectangleGate. Boolean gates are represented by a "BooleanGate" S3 class. This is a list boolean gate definition that references populations in the GatingHierarchy and how they are to be combined logically. If obj is a GatingSet, assuming the trees associated with each GatingHierarchy are identical, then this method will return a list of gates, one for each sample in the GatingSet corresponding to the same population indexed by y.

See Also

gh_pop_get_data gs_get_pop_paths

Examples

## Not run:  #gh is a GatingHierarchy
gh_pop_get_gate(gh, "CD3") #return the gate for the fifth node in the tree, but fetch it by name.
#G is a GatingSet
gs_pop_get_gate(G, "CD3") #return a list of gates for the fifth node in each tree

## End(Not run)

---

getIndices,GatingHierarchy,character-method

_get the membership indices for each event with respect to a particular gate in a GatingHierarchy_

Description

Returns a logical vector that describes whether each event in a sample is included or excluded by this gate.

Usage

## S4 method for signature 'GatingHierarchy,character'
getIndices(obj, y)

gh_pop_get_indices(obj, y)

Arguments

obj
  A GatingHierarchy representing a sample.

y
  A character giving the name or full/(partial) gating path of the population / node of interest.

Details

Returns a logical vector that describes whether each event in the data file is included in the given gate of this GatingHierarchy. The indices are for all events in the file, and do not reflect the population counts relative to the parent but relative to the root. To get population frequencies relative to the parent one cross-tabulate the indices of y with the indices of its parent.
Value

A logical vector of length equal to the number of events in the FCS file that determines whether each event is or is not included in the current gate.

Note

Generally you should not need to use gh_pop_get_indices but the more convenient methods gh_pop_get_proportion and gh_pop_compare_stats which return population frequencies relative to the parent node. The indices returned reference all events in the file and are not directly suitable for computing population statistics, unless subsets are taken with respect to the parent populations.

See Also

gh_pop_compare_stats

Examples

```r
## Not run:
# G is a gating hierarchy
# Return the indices for population 5 (topological sort)
gh_pop_get_indices(G, gs_get_pop_paths(G, tsort=TRUE)[5]);
## End(Not run)
```

getNodes, GatingSet-method

Get the names of all nodes from a gating hierarchy.

Description

gs_get_pop_paths returns a character vector of names of the nodes (populations) in the GatingSet.

Usage

```r
## S4 method for signature 'GatingSet'
getNodes(x, y = NULL, order = "regular", path = "full", showHidden = FALSE, ...)

gs_get_pop_paths(x, y = NULL, order = "regular", path = "full", showHidden = FALSE, ...)

gh_get_pop_paths(x, y = NULL, order = "regular", path = "full", showHidden = FALSE, ...)
```

Arguments

- `x`: A GatingSet. Assuming the gating hierarchy are identical within the GatingSet, the Gating tree of the first sample is used to query the node information.
- `y`: A character not used.
order

order=c("regular","tsort","bfs") returns the nodes in regular, topological or breadth-first sort order. "regular" is default.

path

A character or numeric scalar. When numeric, it specifies the fixed length of gating path (length 1 displays terminal name). When character, it can be either 'full' (full path, which is default) or 'auto' (display the shortest unique gating path from the bottom of gating tree).

showHidden

logical whether to include the hidden nodes

Additional arguments.

Details

integer indices of nodes are based on regular order, so whenever need to map from character node name to integer node ID, make sure to use default order which is regular.

Value

gs_get_pop_paths returns a character vector of node/population names, ordered appropriately.

Examples

## Not run:
# G is a gating hierarchy
gs_get_pop_paths(G, path = 1)# return node names (without prefix)
gs_get_pop_paths(G, path = "full")# return the full path
gs_get_pop_paths(G, path = 2)# return the path as length of two
gs_get_pop_paths(G, path = "auto")# automatically determine the length of path
gs_pop_set_name(G,"L","lymph")

## End(Not run)
getPopStats,GatingHierarchy-method

...)

gs_pop_get_children(obj, y, showHidden = TRUE, ...)

gh_pop_get_children(obj, y, showHidden = TRUE, ...)

Arguments

obj A GatingHierarchy
y a character/numeric the name or full/partial gating path or node indices of
the node / population.
... other arguments passed to gs_get_pop_paths methods
showHidden logical whether to include the hidden children nodes.

Value

gs_pop_get_parent returns a character vector, the name of the parent population. gs_pop_get_children returns a character or numeric vector of the node names or node indices of the child nodes of the current node. An empty vector if the node has no children.

See Also

gs_get_pop_paths

Examples

## Not run:
#G is a gatinghierarchy
#return the name of the parent of the fifth node in the hierarchy.
gs_pop_get_parent(G,gs_get_pop_paths(G[[1]][5])

m<-gs_get_pop_paths(G,tsort=T)[4];
gs_pop_get_children(G,m);#Get the names of the child nodes of the 4th node in this gating hierarchy.
gs_pop_get_children(G,4);#Get the ids of the child nodes

## End(Not run)

getPopStats,GatingHierarchy-method

Compare the stats(count/freq) between the version parsed from xml
and the one recalculated/gated from R

Description

Compare the stats(count/freq) between the version parsed from xml and the one recalculated/gated from R

Usage

## S4 method for signature 'GatingHierarchy'
getPopStats(x, path = "auto", ...)

gh_pop_compare_stats(x, path = "auto", ...)

gh_plot_pop_count_cv(x, path = "auto", ...)
Arguments

x  GatingHierarchy
path  see gs_get_pop_paths
...  not used

getPopStats,GatingSet-method

Return a table of population statistics for all populations in a GatingHierarchy/GatingSet or the population proportions or the total number of events of a node (population) in a GatingHierarchy

Description

gs_pop_get_count_fast is more useful than getPop. Returns a table of population statistics for all populations in a GatingHierarchy/GatingSet. Includes the xml counts, openCyto counts and frequencies.

Usage

## S4 method for signature 'GatingSet'
getPopStats(x, statistic = c("freq", "count"),
xml = FALSE, subpopulations = NULL, format = c("long", "wide"),
path = "full", ...)

gs_pop_get_count_fast(x, statistic = c("freq", "count"), xml = FALSE,
subpopulations = NULL, format = c("long", "wide"), path = "full",
...)

gs_pop_get_count_with_meta(x, ...)

Arguments

x  A GatingHierarchy or GatingSet
statistic  character specifies the type of population statistics to extract.(only valid when format is "wide"). Either "freq" or "count" is currently supported.
xml  logical indicating whether the statistics come from xml (if parsed from xml workspace) or from openCyto.
subpopulations  character vector to specify a subset of populations to return. (only valid when format is "long")
format  character value of c("wide", "long") specifying whether to origanize the output in long or wide format
path  character see gs_get_pop_paths
...  Additional arguments passed to gs_get_pop_paths
x  a GatingSet or GatingSetList
...  additional arguments passed to gs_pop_get_count_fast
getProp

Details

gs_pop_get_count_fast returns a table population statistics for all populations in the gating hierarchy. The output is useful for verifying that the import was successful, if the xml and openCyto derived counts don’t differ much (i.e. if they have a small coefficient of variation.) for a GatingSet, returns a matrix of proportions for all populations and all samples

Value

gs_pop_get_count_fast returns a data.frame with columns for the population name, xml derived counts, openCyto derived counts, and the population proportions (relative to their parent population).

a data.table of merged population statistics with sample metadata.

See Also

gs_get_pop_paths

Examples

## Not run:
#gh is a GatingHierarchy
gh = gs_pop_get_count_fast(gh);
gh_pop_get_stats(gh, gs_get_pop_paths(gh, tsort=T)[5])

#gs is a GatingSet
gs_pop_get_count_fast(gs)
#optionally output in long format as a data.table
gs_pop_get_count_fast(gs, format = "long", path = "auto")
#only get stats for a subset of populations
gs_pop_get_count_fast(gs, format = "long", subpopulations = gs_get_pop_paths(gs)[4:6])

## End(Not run)
## Not run:
#G is a GatingSetList
stats = gs_pop_get_count_with_meta(G)

## End(Not run)

getProp

Get count or proportion from populations

Description

Get count or proportion from populations

Usage

getProp(x, y, xml = FALSE)

gh_pop_get_proportion(x, y, xml = FALSE)

getTotal(x, y, xml = FALSE)

gh_pop_get_count(x, y, xml = FALSE)
**getSingleCellExpression**

### Arguments

- **x**: GatingHierarchy
- **y**: character, node name or path
- **xml**: whether to extract XML stats or openCyto stats

### Description

Returns a list of matrix containing the events that expressed in any one of the populations defined in `y`.

### Usage

```r
getSingleCellExpression(...)
```

```r
gs_get_singlecell_expression(x, nodes, other.markers = NULL, swap = FALSE, threshold = TRUE, marginal = TRUE, mc.cores = getOption("mc.cores", 1L), ...)
```

### Arguments

- **...**: other arguments map a named list providing the mapping between node names (as specified in the gating hierarchy of the gating set) and channel names (as specified in either the `desc` or `name` columns of the parameters of the associated `flowFrames` in the `GatingSet`). see examples.
- **ignore.case**: whether to ignore case when match the marker names. Default is `FALSE`.
- **x**: A `GatingSet` or `GatingSetList` object.
- **nodes**: character vector specifying different cell populations
- **other.markers**: character vector specifying the extra markers/channels to be returned besides the ones derived from `nodes` and `map` argument. It is only valid when `threshold` is set to `FALSE`.
- **swap**: logical, indicates whether channels and markers of flow data are swapped.
- **threshold**: logical, indicates whether to threshold the flow data by setting intensity value to zero when it is below the gate threshold.
- **marginal**: logical, indicates whether the gate is treaded as 1d marginal gate. Default is `TRUE`, which means markers are determined either by node name or by `map` argument explained below. When `FALSE`, the markers are determined by the gate dimensions. and node name and `map` argument are ignored.
- **mc.cores**: passed to `mclapply`. Default is 1, which means the process runs in serial mode. When it is larger than 1, parallel mode is enabled.
getStats

Extract stats from populations (or nodes)

Description

Extract stats from populations (or nodes)

Usage

getStats(x, ...)

## S3 method for class 'GatingSet'
getStats(x, ...)

## S3 method for class 'GatingSetList'
getStats(x, ...)

gs_pop_get_stats(x, ...)

## S3 method for class 'GatingHierarchy'

Examples

## Not run:
#G is a GatingSet
nodes <- c("4+/TNFa+", "4+/IL2+")
res <- gs_get_singlecell_expression(gs, nodes)
res[[1]]

# if it fails to match the given nodes to the markers, then try to provide the mapping between node and marker explicitly
res <- gs_get_singlecell_expression(gs, nodes, map = list("4+/TNFa+" = "TNFa", "4+/IL2+" = "IL2"))

# It can also operate on the 2d gates by setting marginal to FALSE
# The markers are no longer deduced from node names or supplied by map
# Instead, it retrieves the markers that are associated with the gates
nodes <- c("4+/TNFa+IFNg+", "4+/IL2+IL3+")
res <- gs_get_singlecell_expression(gs, nodes, marginal = FALSE)

# or simply call convenient wrapper
gs_get_singlecell_expression_by_gate(gs, nodes)

## End(Not run)
getStats

getStats(...)  

gh_pop_get_stats(x, nodes = NULL, type = "count", xml = FALSE,  
                inverse.transform = FALSE, stats.fun.arg = list(), ...)

Arguments

x  a GatingSet or GatingHierarchy

...  arguments passed to gs_get_pop_paths method.

nodes  the character vector specifies the populations of interest. default is all available nodes

type  the character vector specifies the type of pop stats or a function used to compute population stats. when character, it is expected to be either "count" or "percent". Default is "count" (total number of events in the populations). when a function, it takes a flowFrame object through 'fr' argument and return the stats as a named vector.

xml  whether to extract xml stats or openCyto stats

inverse.transform  logical flag . Whether inverse transform the data before computing the stats.

stats.fun.arg  a list of arguments passed to 'type' when 'type' is a function.

Value

a data.table that contains stats values (if MFI, for each marker per column) along with 'pop' column and 'sample' column (when used on a 'GatingSet')

Examples

## Not run:
dataDir <- system.file("extdata",package="flowWorkspaceData")
suppressMessages(gs <- load_gs(list.files(dataDir, pattern = "gs_manual",full = TRUE)))

# get stats all nodes
dt <- gs_pop_get_stats(gs) #default is "count"

nodes <- c("CD4", "CD8")
gs_pop_get_stats(gs, nodes, "percent")

# pass a build-in function
gs_pop_get_stats(gs, nodes, type = pop.MFI)

# compute the stats based on the raw data scale
gs_pop_get_stats(gs, nodes, type = pop.MFI, inverse.transform = TRUE)

# supply user-defined stats fun
pop.quantiles <- function(fr){
  chnls <- colnames(fr)
  res <- matrixStats::colQuantiles(exprs(fr), probs = 0.75)
  names(res) <- chnls
  res
}
gs_pop_get_stats(gs, nodes, type = pop.quantiles)

## End(Not run)
getTransformations

Return a list of transformations or a transformation in a GatingHierarchy

Description

Return a list of all the transformations or a transformation in a GatingHierarchy

Usage

getTransformations(x, ...)

## S3 method for class 'GatingHierarchy'
getTransformations(...)

gh_get_transformations(x, channel = NULL, inverse = FALSE,
only.function = TRUE, ...)

Arguments

x A GatingHierarchy object
...
other arguments equal.spaced logical passed to the breaks function to determine
whether to break at 10^n or equally spaced intervals
channel character channel name
inverse logical whether to return the inverse transformation function. Valid when
only.function is TRUE
only.function logical whether to return the function or the entire transformer object(see
scales package) that contains transform and inverse and breaks function.

Details

Returns a list of the transformations or a transformation in the flowJo workspace. The list is of
length L, where L is the number of distinct transformations applied to samples in the flowjo_workspace.
Each element of L is itself a list of length M, where M is the number of parameters that were trans-
formed for a sample or group of samples in a flowjo_workspace. For example, if a sample has
10 parameters, and 5 are transformed during analysis, using two different sets of transformations,
then L will be of length 2, and each element of L will be of length 5. The elements of L repre-
sent channel- or parameter-specific transformation functions that map from raw intensity values to
channel-space used by flowJo.

Value

lists of functions(or transform objects when only.function is FALSE), with each element of the list
representing a transformation applied to a specific channel/parameter of a sample.

Examples

## Not run:
#Assume gh is a GatingHierarchy
gh_get_transformations(gh); # return a list transformation functions
gh_get_transformations(gh, inverse = TRUE); # return a list inverse transformation functions


**get_log_level**  
*get/set the log level*

**Description**  
It is helpful sometime to get more detailed print out for the purpose of trouble shooting

**Usage**  
```
get_log_level()

set_log_level(level = "none")
```

**Arguments**  
- **level** a character that represents the log level, can be value of c("none", "GatingSet", "GatingHierarchy", "Population", "gate") default is "none", which does not print any information from C parser.

**Value**  
a character that represents the internal log level

**Examples**  
```
get_log_level()
set_log_level("Population")
get_log_level()
```

---

**gh_get_cluster_labels**  
*Retrieve the cluster labels from the cluster nodes*

**Description**  
Clustering results are stored as individual gated nodes. This helper function collect all the gating indices from the same clustering run (identified by 'parent' node and 'cluster_method_name' and merge them as a single factor.

**Usage**  
```
gh_get_cluster_labels(gh, parent, cluster_method_name)
```
**gh_pop_get_descendants**

**Arguments**

- **gh** : GatingHierarchy
- **parent** : the parent population/node name or path
- **cluster_method_name** : the name of the clustering method

**Description**

get all the descendant nodes for the given ancestor

**Usage**

gh_pop_get_descendants(gh, node, ...)

getDescendants(...)

**Arguments**

- **gh** : GatingHierarchy
- **node** : the node path
- **...** : passed to getNode call

---

**gh_pop_get_cluster_name**

*check if a node is clustering node*

**Description**

check if a node is clustering node

**Usage**

gh_pop_get_cluster_name(gh, node)

**Arguments**

- **gh** : GatingHierarchy
- **node** : the population/node name or path

**Value**

the name of the clustering method. If it is not cluster node, returns NULL
**gh_pop_get_full_path**

**Examples**

```r
library(flowWorkspace)
dataDir <- system.file("extdata", package = "flowWorkspaceData")
suppressMessages(gs <- load_gs(list.files(dataDir, pattern = "gs_manual", full = TRUE)))
gh_pop_get_descendants(gs[[1]], "CD4")
gh_pop_get_descendants(gs[[1]], "CD8", path = "auto")
```

**gh_pop_get_full_path**  
*convert the partial gating path to the full path*

**Description**

*convert the partial gating path to the full path*

**Usage**

```r
gh_pop_get_full_path(gh, path)
```

**Arguments**

- `gh`: GatingHierarchy object
- `path`: the partial gating path

**Value**

the full gating path

---

**gh_pop_get_indices_mat**  
*Return the single-cell matrix of 1/0 dichotomized expression*

**Description**

*Return the single-cell matrix of 1/0 dichotomized expression*

**Usage**

```r
gh_pop_get_indices_mat(gh, y)
```

**Arguments**

- `gh`: GatingHierarchy object
- `y`: character string containing the boolean or of node names e.g. `"cd4|cd8"`
gh_pop_set_xml_count   save the event counts parsed from xml into c++ tree structure

Description

It is for internal use by the diva parser

Usage

gh_pop_set_xml_count(gh, node, count)

Arguments

gh  GatingHierarchy
node the unique gating path that uniquely identifies a population node
count integer number that is events count for the respective gating node directly parsed from xml file

Examples

## Not run:
gh_pop_set_xml_count(gh, "CD3", 10000)
## End(Not run)

groupByChannels   split GatingSets into groups based on their flow channels

Description

Sometimes it is gates are defined on the different dimensions across different GatingSets. (e.g. ‘FSC-W’ or ‘SSC-H’ may be used for Y axis for cytokines) These difference in dimensions may not be critical since they are usually just used for visualization(instead of thresholding events) But this prevents the gs from merging because they may not be collected across batches Thus we have to separate them if we want to visualize the gates.

Usage

groupByChannels(x)

gs_split_by_channels(x)

Arguments

x   a list of GatingSets
**Examples**

```r
## Not run:
gslist <- list(gs1, gs2, gs3, gs4, gs5)
gs_groups <- gs_split_by_channels(gslist)
## End(Not run)
```

**Description**

It allows isomorphism in Gating tree and ignore difference in hidden nodes i.e. tree is considered to be the same as long as `gs_get_pop_paths(gh, path = "auto", showHidden = F) returns the same set.`

**Usage**

```r
groupByTree(x)
gs_split_by_tree(x)
```

**Arguments**

- `x`: a list of GatingSets or one GatingSet

**Value**

When `x` is a GatingSet, this function returns a list of sub-GatingSets When `x` is a list of GatingSets, it returns a list of list, each list itself is a list of GatingSets, which share the same gating tree.

**Examples**

```r
## Not run:
gslist <- list(gs1, gs2, gs3, gs4, gs5)
gs_groups <- gs_split_by_tree(gslist)
## End(Not run)
```

**gs_get_compensation_internal**

extract compensation object from GatingSet

**Description**

extract compensation object from GatingSet

**Usage**

```r
gs_get_compensation_internal(gs, sampleName)
```
Arguments

gs GatingSet
sampleName sample name

---

gs_get_leaf_nodes get all the leaf nodes

Description

get all the leaf nodes

Usage

gs_get_leaf_nodes(x, ...)
get_leaf_nodes(...) gh_get_leaf_nodes(x, ...)

Arguments

x GatingHierarchy/GatingSet object
...
arguments passed to 'gs_get_pop_paths" method

Value

the leaf nodes

---

gs_is_h5 determine the flow data associated with a Gating Hierarchy is based on 'ncdfFlowSet' or 'flowSet'

Description

determine the flow data associated with a Gating Hierarchy is based on 'ncdfFlowSet' or 'flowSet'

Usage

gs_is_h5(x)
isNcdf(x)

Arguments

x GatingHierarchy object

Value

logical
gs_plot_diff_tree  
visualize the tree structure difference among the GatingSets

Description

visualize the tree structure difference among the GatingSets

Usage

gs_plot_diff_tree(x, path = "auto", ...)

Arguments

x list of groups(each group is a list of 'GatingSet'). it is usually the outcome from gs_split_by_tree.
path passed to getNodes
...

Examples

## Not run:
gslist <- list(gs1, gs2, gs3, gs4, gs5)
gs_groups <- gs_split_by_tree(gslist)
gs_plot_diff_tree(gs_groups)
## End(Not run)

gs_plot_pop_count_cv  
Plot the coefficient of variation between xml and openCyto population statistics for each population in a gating hierarchy.

Description

This function plots the coefficient of variation calculated between the xml population statistics and the openCyto population statistics for each population in a gating hierarchy extracted from a xml Workspace.

Usage

gs_plot_pop_count_cv(x, scales = list(x = list(rot = 90)), path = "auto", ...)

Arguments

x A GatingHierarchy from or a GatingSet.
scales list see barchart
path character see gs_get_pop_paths
...

Additional arguments to the barchart methods.
Details

The CVs are plotted as barplots across panels on a grid of size \( m \) by \( n \).

Value

Nothing is returned.

See Also

gs_pop_get_count_fast

Examples

## Not run:
#G is a GatingHierarchy
gs_plot_pop_count_cv(G, 4, 4);
## End(Not run)

gs_pop_get_stats_tfilter

Extract stats from populations(or nodes) within a restricted time window

Description

Extract stats from populations(or nodes) within a restricted time window

Usage

gs_pop_get_stats_tfilter(x, ...)

g_h_pop_get_stats_tfilter(x, nodes = NULL, type = "count",
                        inverse.transform = FALSE, stats.fun.arg = list(), tfilter = NULL, ...)

Arguments

- **nodes**: the character vector specifies the populations of interest. default is all available nodes
- **type**: the character vector specifies the type of pop stats or a function used to compute population stats. when character, it is expected to be either "count" or "percent". Default is "count" (total number of events in the populations). when a function, it takes a flowFrame object through ‘fr’ argument and return the stats as a named vector.
- **inverse.transform**: logical flag . Whether inverse transform the data before computing the stats.
- **stats.fun.arg**: a list of arguments passed to 'type' when 'type' is a function.
Either a list \((t_{\text{min}}, t_{\text{max}})\) specifying the minimum and maximum of a time window filter or a GatingHierarchy, whose minimum and maximum time will be used to determine the window. For both \(x\) and the reference GatingHierarchy in \(t\)filter, the only channels that will match this filter are "Time" or "time" and the filter will be applied to each event such that only events with time value \(t\) where \(t_{\text{min}} \leq t \leq t_{\text{max}}\) will be evaluated.

**isGated**

The flags of gate nodes gh_pop_is_gated checks if a node is already gated gh_pop_is_negated checks if a node is negated. gh_pop_is_hidden checks if a node is hidden.

**Description**

The flags of gate nodes gh_pop_is_gated checks if a node is already gated gh_pop_is_negated checks if a node is negated. gh_pop_is_hidden checks if a node is hidden.

**Usage**

isGated(obj, y)

gh_pop_is_gated(obj, y)

isNegated(obj, y)

gh_pop_is_negated(obj, y)

isHidden(obj, y)

gh_pop_is_hidden(obj, y)

gh_pop_is_bool_gate(obj, y)

**Arguments**

<table>
<thead>
<tr>
<th>obj</th>
<th>GatingHierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>node/gating path</td>
</tr>
<tr>
<td>...</td>
<td>not used</td>
</tr>
</tbody>
</table>

**keyword,GatingHierarchy,character-method**

Retrieve a specific keyword for a specific sample in a GatingHierarchy or or set of samples in a GatingSet or GatingSetList

**Description**

Retrieve a specific keyword for a specific sample in a GatingHierarchy or or set of samples in a GatingSet or GatingSetList.
## S4 method for signature 'GatingHierarchy,character'
keyword(object, keyword)

## S4 method for signature 'GatingHierarchy,missing'
keyword(object, keyword = "missing", ...)

## S4 method for signature 'GatingSet,missing'
keyword(object, keyword = "missing", ...)

## S4 method for signature 'GatingSet,character'
keyword(object, keyword)

## S4 method for signature 'GatingSetList,missing'
keyword(object, keyword = "missing", ...)

## S4 method for signature 'GatingSetList,character'
keyword(object, keyword)

### Arguments

- **object**: GatingHierarchy or GatingSet or GatingSetList
- **keyword**: character specifying keyword name. When missing, extract all keywords.
- **...**: other arguments passed to keyword-methods

### Details

See keyword in Package `flowCore`

### See Also

keyword-methods

### Examples

```r
## Not run:
# get all the keywords from all samples
keyword(G)
# get all the keywords from one sample
keyword(G[[1]])
# filter the instrument setting
keyword(G[[1]], compact = TRUE)
# get single keyword from all samples
keyword(G, "FILENAME")
# get single keyword from one sample
keyword(G[[1]], "FILENAME")
```

## End(Not run)
**Description**

Sample names are used for names of the returned list.

**Usage**

```r
## S4 method for signature 'GatingSet'
lapply(X, FUN, ...)
```

**Arguments**

- `X` (GatingSet)
- `FUN` (function to be applied to each sample in 'GatingSet')
- `...` (other arguments to be passed to 'FUN')

---

**length,GatingSet-method**

*Methods to get the length of a GatingSet*

**Description**

Return the length of a GatingSet or GatingSetList object (number of samples).

**Usage**

```r
## S4 method for signature 'GatingSet'
length(x)
## S4 method for signature 'GatingSet'
show(object)
```

**Arguments**

- `x` (GatingSet)
- `object` (object)
logicleGml2_trans

**Description**

The only difference from logicle_trans is it is scaled to c(0,1) range.

**Usage**

```r
logicleGml2_trans(T = 262144, M = 4.5, W = 0.5, A = 0, n = 6,
                  equal.space = FALSE)
```

**Arguments**

- `T, M, W, A` see logicletGml2
- `n` desired number of breaks (the actual number will be different depending on the data range)
- `equal.space` whether breaks at equal-spaced intervals

**Value**

- a logicleGml2 transformation object

**Examples**

```r
trans.obj <- logicleGml2_trans(equal.space = TRUE)
data <- 1:1e3
brks.func <- trans.obj[["breaks"]]
brks <- brks.func(data)
brks # logicle space displayed at raw data scale
#transform it to verify the equal-spaced breaks at transformed scale
print(trans.obj[["transform"]](brks))
```

logicle_trans

**Description**

Used for construct logicle transform object.

**Usage**

```r
logicle_trans(..., n = 6, equal.space = FALSE)
```

**Arguments**

- `...` arguments passed to logicleTransform.
- `n` desired number of breaks (the actual number will be different depending on the data range)
- `equal.space` whether breaks at equal-spaced intervals
logtGml2_trans

Value

a logicle transformation object

Examples

trans.obj <- logicle_trans(equal.space = TRUE)
data <- 1:1e3
brks.func <- trans.obj[["breaks"]]
brks <- brks.func(data)
brks # logicle space displayed at raw data scale
#transform it to verify the equal-spaced breaks at transformed scale
print(trans.obj[["transform"]])(brks)

logtGml2_trans  Gating-ML 2.0 Log transformation.

Description

Used to construct flog transformer object.

Usage

logtGml2_trans(M = 4.5, T = 262144, n = 6, equal.space = FALSE)

Arguments

M  number of decades
T  top scale value
n  desired number of breaks (the actual number will be different depending on the
data range)
   equal.space  whether breaks at equal-spaced intervals

Value

logtGml2 transformation object

Examples

trans.obj <- logtGml2_trans(M = 1, T = 1e3, equal.space = TRUE)
data <- 1:1e3
brks.func <- trans.obj[["breaks"]]
brks <- brks.func(data)
brks # fasinh space displayed at raw data scale
#transform it to verify it is equal-spaced at transformed scale
trans.func <- trans.obj[["transform"]]
brks.trans <- trans.func(brks)
brks.trans
Description

It simply calls the methods for the underlying flow data (flowSet/ncdfFlowSet/ncdfFlowList).

Usage

```r
## S4 method for signature 'GatingHierarchy'
markernames(object)

## S4 replacement method for signature 'GatingHierarchy'
markernames(object) <- value

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

## S4 replacement method for signature 'GatingHierarchy'
colnames(x) <- value

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

## S4 replacement method for signature 'GatingSet'
markernames(object) <- value

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

## S4 replacement method for signature 'GatingSet'
colnames(x) <- value
```

Arguments

- `value` named character vector for `markernames<-`, regular character vector for `colnames<-`
- `x, object` GatingHierarchy/GatingSet/GatingSetList
- `do.NULL, prefix` not used.

Examples

```r
## Not run:

markers.new <- c("CD4", "CD8")
chnls <- c("<B710-A>", "<R780-A>")
names(markers.new) <- chnls
```
markernames(gs) <- markers.new
chnls <- colnames(gs)
chnls.new <- chnls
chnls.new[c(1,4)] <- c("fsc", "ssc")
colnames(gs) <- chnls.new

## End(Not run)

---

**mkformula**

*make a formula from a character vector*

**Description**

construct a valid formula to be used by flowViz::xyplot

**Usage**

mkformula(dims, isChar = FALSE)

**Arguments**

dims a character vector that contains y, x axis, if it is unnamed, then treated as the order of c(y,x)
isChar logical flag indicating whether to return a formula or a pasted string

**Value**

when isChar is TRUE, return a character, otherwise coerce it as a formula

**Examples**

all.equal(mkformula(c("SSC-A", "FSC-A")), "SSC-A ~ FSC-A") # unnamed vector
all.equal(mkformula(c(x = "SSC-A", y = "FSC-A")), "FSC-A ~ SSC-A") # named vector

---

**moveNode**

*move a node along with all of its descendant nodes to the given ancestor*

**Description**

move a node along with all of its descendant nodes to the given ancestor

**Usage**

moveNode(gh, node, to)

gh_pop_move(gh, node, to)
Arguments

gh  GatingHierarchy
node the node to be moved
to the new parent node under which the node will be moved to

Examples

library(flowWorkspace)
dataDir <- system.file("extdata", package="flowWorkspaceData")
suppressMessages(gs <- load_gs(list.files(dataDir, pattern = "gs_manual", full = TRUE)))
gh <- gs[[1]]
old.parent <- gs_pop_get_parent(gh, "CD4")
new.parent <- "singlets"
gh_pop_move(gh, "CD4", new.parent)
gs_pop_get_parent(gh, "CD4")

cFlowSet Fetch the flowData object associated with a GatingSet.

Description

Deprecated by flowData method
Deprecated by flowData method

openWorkspace It is now moved along with entire flowJo parser to CytoML package

Description

It is now moved along with entire flowJo parser to CytoML package

Usage

openWorkspace(file, ...)

Arguments

file xml file
... other arguments
**pData,GatingHierarchy-method**

**Description**

Accessor method that gets or replaces the pData of the flowset/ncdfFlowSet object in a GatingSet or GatingSetList.

**Usage**

```r
## S4 method for signature 'GatingHierarchy'
pData(object)
## S4 method for signature 'GatingSet'
pData(object)
## S4 replacement method for signature 'GatingSet,data.frame'
pData(object) <- value
## S4 replacement method for signature 'GatingSetList,data.frame'
pData(object) <- value
```

**Arguments**

- `object`  GatingSet or GatingSetList
- `value`   data.frame The replacement of pData for flowSet or ncdfFlowSet object

**Value**

a data.frame

**plot,GatingSet,missing-method**

*plot a gating tree*

**Description**

Plot a tree/graph representing the GatingHierarchy.

**Usage**

```r
## S4 method for signature 'GatingSet,missing'
plot(x, y, ...)
## S4 method for signature 'GatingSet,character'
plot(x, y, ...)
```
Arguments

- `x`: GatingHierarchy or GatingSet. If GatingSet, the first sample will be used to extract gating tree.
- `y`: missing or character specifies.
- `...`: other arguments:
  - `boolean`: TRUE|FALSE logical specifying whether to plot boolean gate nodes. Defaults to FALSE.
  - `showHidden`: TRUE|FALSE logical whether to show hidden nodes
  - `layout`: See `layoutGraph` in package Rgraphviz
  - `width`: See `layoutGraph` in package Rgraphviz
  - `height`: See `layoutGraph` in package Rgraphviz
  - `fontsize`: See `layoutGraph` in package Rgraphviz
  - `labelfontsize`: See `layoutGraph` in package Rgraphviz
  - `fixedsize`: See `layoutGraph` in package Rgraphviz

Examples

```r
## Not run:
#gs is a GatingSet
plot(gs)  # the same as plot(gs[[1]])
#plot a substree rooted from 'CD4'
plot(gs, "CD4")

## End(Not run)
```

plotGate

Plot gates and associated cell population contained in a GatingHierarchy or GatingSet

Description

When applied to a GatingHierarchy, `arrange` is set as TRUE, then all the gates associated with it are plotted as different panel on the same page. If `arrange` is FALSE, then it plots one gate at a time. By default, `merge` is set as TRUE, plot multiple gates on the same plot when they share common parent population and axis. When applied to a GatingSet, if `lattice` is TRUE, it plots one gate (multiple samples) per page, otherwise, one sample (with multiple gates) per page.

Usage

```r
plotGate(x, y, ...)
```

## S4 method for signature 'GatingHierarchy,numeric'
plotGate(x, y, ...)

## S4 method for signature 'GatingSet,missing'
plotGate(x, y, ...)

## S4 method for signature 'GatingSetList,character'
plotGate(x, y, ...)

```
plotGate

Arguments

- **x** GatingSet or GatingHierarchy object
- **y** character the node name or full/(partial) gating path or numeric representing the node index in the GatingHierarchy, or missing which will plot all gates and one gate per page. It is useful for generating plots in a multi-page pdf. Nodes can be accessed with `gs_get_pop_paths`.

... • bool logical specifying whether to plot boolean gates.
• arrange.main character The title of the main page of the plot. Default is the sample name. Only valid when x is GatingHierarchy
• arrange logical indicating whether to arrange different populations/nodes on the same page via `arrangeGrob` call.
• merge logical indicating whether to draw multiple gates on the same plot if these gates share the same parent population and same x,y dimensions/parameters;
• projections list of character vectors used to customize x,y axis. By default, the x,y axis are determined by the respective gate parameters. The elements of the list are named by the population name or path (see y). Each element is a pair of named character specifying the channel name(or marker name) for x, y axis. Short form of channel or marker names (e.g. "APC" or "CD3") can be used as long as they can be uniquely matched to the dimensions of flow data. For example, `projections = list("lymph" = c(x = "SSC-A", y = "FSC-A"), "CD3" = c(x = "CD3", y = "SSC-A"))`
• par.settings list of graphical parameters passed to lattice;
• gpar list of grid parameters passed to `grid.layout`;
• lattice logical deprecated;
• formula formula a formula passed to `xyplot` function of `flowViz`, by default it is NULL, which means the formula is generated according to the x,y parameters associated with gate.
• cond character the conditioning variable to be passed to lattice plot.
• overlayNode names. These populations are plotted on top of the existing gates(defined by y argument) as the overlaid dots.
• overlay.symbolA named (lattice graphic parameter) list that defines the symbol color and size for each overlaid population. If not given, we automatically assign the colors.
• keyLattice legend parameter for overlay symbols.
• default.y character specifying y channel for `xyplot` when plotting a 1d gate. Default is "SSC-A" and session-wise setting can be stored by `flowWorkspace.par.set("plotGate", list(default.y = "FSC-A"))`.
• type character either "xyplot" or "densityplot". Default is "xyplot" and session-wise setting can be stored by `flowWorkspace.par.set("plotGate", list(type = "xyplot"))`.
• fitGate used to disable behavior of plotting the gate region in 1d density-plot. Default is FALSE and session-wise setting can be stored by `flowWorkspace.par.set("plotGate", list(fitGate = FALSE))`.
• strip logical specifies whether to show pop name in strip box,only valid when x is GatingHierarchy.
• strip.text either "parent" (the parent population name) or "gate "(the gate name).
pop.MFI

- raw.scale logical whether to show the axis in raw(untransformed) scale. Default is TRUE and can be stored as session-wise setting by 'flowWorkspace.par.set("plotGate", list(raw.scale = TRUE))'
- xlim, ylim character can be either "instrument" or "data" which determines the x, y axis scale either by instrument measurement range or the actual data range. or numeric which specifies customized range. They can be stored as session-wise setting by 'flowWorkspace.par.set("plotGate", list(xlim = "instrument"))'
- ... path A character or numeric scalar passed to gs_get_pop_paths method (used to control how the gating/node path is displayed)
- ... The other additional arguments to be passed to xyplot.

Value

a trellis object if arrange is FALSE.

References

http://www.rglab.org/

Examples

```r
## Not run:
projections <- list("cd3" = c(x = "cd3", y = "AViD"),
                   "cd4" = c(x = "cd8", y = "cd4"),
                   "cd4/IL2" = c(x = "IL2", y = "IFNg"),
                   "cd4/IFNg" = c(x = "IL2", y = "IFNg"))
plotGate(gh, c("cd3", "cd4", "cd4/IL2", "cd4/IFNg"), path = "auto", projections = projections, gpar = c(nrow = 2))
## End(Not run)
## Not run:
#G is a GatingHierarchy
plotGate(G, gs_get_pop_paths(G)[5]);#plot the gate for the fifth node
## End(Not run)
```

---

**Description**

pop.MFI computes and returns the median fluorescence intensity for each marker. They are typically used as the arguments passed to gh_pop_get_stats method to perform the sample-wise population stats calculations.

**Usage**

pop.MFI(fr)
**pop_add**

**Arguments**

- `fr` a flowFrame represents a gated population

**Value**

- a named numeric vector

---

**Description**

Add populations to a GatingHierarchy

**Usage**

```r
pop_add(gate, gh, ...)  
## S3 method for class 'filter'
pop_add(gate, gh, ...)  
## S3 method for class 'filters'
pop_add(gate, gh, names = NULL, ...)  
## S3 method for class 'quadGate'
pop_add(gate, gh, names = NULL, ...)  
## S3 method for class 'logical'
pop_add(gate, gh, parent, name, recompute,  
          cluster_method_name = NULL, ...)  
## S3 method for class 'factor'
pop_add(gate, gh, name = NULL, ...)  
## S3 method for class 'logicalFilterResult'
pop_add(gate, gh, ...)  
## S3 method for class 'multipleFilterResult'
pop_add(gate, gh, name = NULL, ...)  
gh_pop_remove(gh, node, ...)
```

**Arguments**

- `gate` a gate object that extends `flowCore::filter` or `flowCore::filters`
- `gh` GatingHierarchy
- `...` other arguments
- `names` a character vector of length four, which specifies the population names resulted by adding a quadGate. The order of the names is clock-wise starting from the top left quadrant population.
prettyAxis

Determine tick mark locations and labels for a given channel axis

Description

Determine tick mark locations and labels for a given channel axis

Usage

prettyAxis(gh, channel)

Arguments

gh GatingHierarchy
channel character channel name

Value

when there is transformation function associated with the given channel, it returns a list of that contains positions and labels to draw on the axis otherwise returns NULL

Examples

## Not run:
prettyAxis(gh, "<B710-A>")

## End(Not run)
rbind2,GatingSetList,missing-method

Merge a GatingSetList into a single GatingSet

Description

Merge a GatingSetList into a single GatingSet

Usage

## S4 method for signature 'GatingSetList,missing'
rbind2(x, y = "missing", ...)
gslist_to_gs(x, ...)

Arguments

x GatingSetList
y missing not used.
... other arguments passed to gslist_to_gs method for ncdfFlowList

recompute,GatingSet-method

Compute the cell events by the gates stored within the gating tree.

Description

Compute each cell event to see if it falls into the gate stored within the gating tree and store the result as cell count.

Usage

## S4 method for signature 'GatingSet'
recompute(x, y = "root", alwaysLoadData = FALSE, ...)

## S4 method for signature 'GatingSetList'
recompute(x, ...)

Arguments

x GatingSet
y character node name or node path. Default "root". Optional.
alwaysLoadData logical. Specifies whether to load the flow raw data for gating boolean gates. Default 'FALSE'. Optional. Sometime it is more efficient to skip loading the raw data if all the reference nodes and parent are already gated. 'FALSE' will check the parent node and reference to determine whether to load the data. This check may not be sufficient since the further upstream ancestor nodes may not be
gated yet. In that case, we allow the gating to fail and prompt user to recompute
those nodes explicitly. When TRUE, then it forces data to be loaded to guarantee
the gating process to be uninterrupted at the cost of unnecessary data IO.

... other arguments leaf.bool whether to compute the leaf boolean gate, default is
TRUE

Details

It is usually used immediately after add or gs_pop_set_gate calls.

rotate_gate

Simplified geometric rotation of gates associated with nodes

Description

Rotate a gate associated with a node of a GatingHierarchy or GatingSet. This method is a wrapper for rotate_gate that enables updating of the gate associated with a node of a GatingHierarchy or GatingSet.

rotate_gate calls gs_pop_set_gate to modify the provided GatingHierarchy or GatingSet directly so there is no need to re-assign its output. The arguments will be essentially identical to the flowCore method, except for the specification of the target gate. Rather than being called on an object of type flowCore:filter, here it is called on a GatingHierarchy or GatingSet object with an additional character argument for specifying the node whose gate should be transformed. The rest of the details below are taken from the flowCore documentation.

Usage

## S3 method for class 'GatingHierarchy'
rotate_gate(obj, y, deg = NULL,
  rot_center = NULL, ...)

## S3 method for class 'GatingSet'
rotate_gate(obj, y, deg = NULL, rot_center = NULL,
  ...)

Arguments

obj A GatingHierarchy or GatingSet object
y A character specifying the node whose gate should be modified
deg An angle in degrees by which the gate should be rotated in the counter-clockwise direction
rot_center A separate 2-dimensional center of rotation for the gate, if desired. By default, this will be the center for ellipsoidGate objects or the centroid for polygonGate objects. The rot_center argument is currently only supported for polygonGate objects.
... not used
sampleNames, GatingHierarchy-method

Details

This method allows for geometric rotation of filter types defined by simple geometric gates (ellipsoidGate, and polygonGate). The method is not defined for rectangleGate or quadGate objects, due to their definition as having 1-dimensional boundaries.

The angle provided in the deg argument should be in degrees rather than radians. By default, the rotation will be performed around the center of an ellipsoidGate or the centroid of the area encompassed by a polygonGate. The rot_center argument allows for specification of a different center of rotation for polygonGate objects (it is not yet implemented for ellipsoidGate objects) but it is usually simpler to perform a rotation and a translation individually than to manually specify the composition as a rotation around a shifted center.

See Also

transform_gate flowCore::rotate_gate

Examples

```r
## Not run:
# Rotates the original gate 15 degrees counter-clockwise
scale_gate(gs, node, deg = 15)
# Rotates the original gate 270 degrees counter-clockwise
scale_gate(gs, node, 270)
```

---

sampleNames, GatingHierarchy-method

Get/update sample names in a GatingSet

Description

Return a sample names contained in a GatingSet

Usage

```r
## S4 method for signature 'GatingHierarchy'
sampleNames(object)

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

## S4 replacement method for signature 'GatingSet'
sampleNames(object) <- value
```

Arguments

```r
tabular

- **object**
  - or a GatingSet

- **value**
  - character new sample names

```
Details

The sample names comes from pdata of fs.

Value

A character vector of sample names

Examples

### Not run:

```r
#G is a GatingSet
sampleNames(G)
```

### End(Not run)

---

**save_gs**

save/load a GatingSet/GatingSetList to/from disk.

Description

Save/load a GatingSet/GatingSetList which is the gated flow data including gates and populations to/from the disk. The GatingSet object The internal C data structure (gating tree), ncdfFlowSet object (if applicable)

Usage

```r
save_gs(G, path, overwrite = FALSE, cdf = c("copy", "move", "skip", "symlink", "link"), ...)
```

```r
load_gs(path)
```

```r
save_gslst(gslist, path, ...)
```

```r
load_gslst(path)
```

Arguments

- **G**
  - A GatingSet
- **path**
  - A character scalar giving the path to save/load the GatingSet to/from.
- **overwrite**
  - A logical scalar specifying whether to overwrite the existing folder.
- **cdf**
  - a character scalar. The valid options are: "copy", "move", "skip", "symlink", "link" specifying what to do with the cdf data file. Sometime it is more efficient to move or create a link of the existing cdf file to the archived folder. It is useful to "skip" archiving cdf file if raw data has not been changed.
- **...**
  - other arguments: not used.
- **gslist**
  - A GatingSetList

Value

`load_gs` returns a GatingSet object `load_gslst` returns a GatingSetList object
See Also

GatingSet-class, GatingSetList-class

Examples

```r
## Not run:
#G is a GatingSet
save_gs(G,path="tempFolder")
G1<-load_gs(path="tempFolder")

#G is a GatingSet
save_gsls(gslist1,path="tempFolder")
gsls2<-load_gsls(path="tempFolder")

## End(Not run)
```

scale_gate

*Simulated geometric scaling of gates associated with nodes*

Description

Simplified geometric scaling of gates associated with nodes

Usage

```r
## S3 method for class 'GatingHierarchy'
scale_gate(obj, y, scale = NULL, ...)

## S3 method for class 'GatingSet'
scale_gate(obj, y, scale = NULL, ...)
```

Arguments

- `obj` A GatingHierarchy or GatingSet object
- `y` A character specifying the node whose gate should be modified
- `scale` Either a numeric scalar (for uniform scaling in all dimensions) or numeric vector specifying the factor by which each dimension of the gate should be expanded (absolute value > 1) or contracted (absolute value < 1). Negative values will result in a reflection in that dimension.
- `...` not used

Details

This method allows uniform or non-uniform geometric scaling of filter types defined by simple geometric gates (*quadGate*, *rectangleGate*, *ellipsoidGate*, and *polygonGate*) Note that these methods are for manually altering the geometric definition of a gate. To easily transform the definition of a gate with an accompanying scale transformation applied to its underlying data, see `ggcyto::rescale_gate`.

The `scale` argument passed to `scale_gate` should be either a scalar or a vector of the same length as the number of dimensions of the gate. If it is scalar, all dimensions will be multiplicatively
setGate

scaled uniformly by the scalar factor provided. If it is a vector, each dimension will be scaled by its corresponding entry in the vector.

The scaling behavior of `scale_gate` depends on the type of gate passed to it. For `rectangleGate` and `quadGate` objects, this amounts to simply scaling the values of the 1-dimensional boundaries. For `polygonGate` objects, the values of `scale` will be used to determine scale factors in the direction of each of the 2 dimensions of the gate (`scale_gate` is not yet defined for higher-dimensional `polytopeGate` objects). **Important:** For `ellipsoidGate` objects, `scale` determines scale factors for the major and minor axes of the ellipse, *in that order*. Scaling by a negative factor will result in a reflection in the corresponding dimension.

See Also

`transform_gate` `flowCore::scale_gate`

Examples

```r
## Not run:
# Scales both dimensions by a factor of 5
scale_gate(gs, node, 5)

# Shrinks the gate in the first dimension by factor of 1/2
# and expands it in the other dimension by factor of 3
scale_gate(gs, node, c(0.5,3))

## End(Not run)
```

---

**setGate**

**update the gate**

**Description**

update the population node with a flowCore-compatible gate object

**Usage**

```r
setGate(obj, y, value, ...)
```

## S4 method for signature 'GatingHierarchy,character,filter'

```r
setGate(obj, y, value, ...)
```

`gh_pop_set_gate(obj, y, value, negated = FALSE, ...)`

## S4 method for signature 'GatingSet,character,ANY'

```r
setGate(obj, y, value, ...)
```

`gs_pop_set_gate(obj, y, value, ...)`
Arguments

obj  GatingHierarchy or GatingSet
y    character node name or path
value filter or filterList or list of filter objects
...  other arguments
negated logical see add

Details

Usually `recompute` is followed by this call since updating a gate doesn’t re-calculating the cell events within the gate automatically. see `filterObject` for the gate types that are currently supported.

Examples

```r
## Not run:
rg1 <- rectangleGate("FSC-H"=c(200,400), "SSC-H"=c(250, 400), filterId="rectangle")
rg2 <- rectangleGate("FSC-H"=c(200,400), "SSC-H"=c(250, 400), filterId="rectangle")
flist <- list(rg1,rg2)
names(flist) <- sampleNames(gs[1:2])
gs_pop_set_gate(gs[1:2], "lymph", flist)
recompute(gs[1:2], "lymph")
## End(Not run)
```

Description

`gs_pop_set_name` update the name of one node in a gating hierarchy/GatingSet.

Usage

```
## S4 method for signature 'GatingHierarchy,character,character'
setNode(x, y, value)
gh_pop_set_name(x, y, value)

## S4 method for signature 'GatingSet,character,ANY'
setNode(x, y, value)

gs_pop_set_name(x, y, value)
```

Arguments

x  GatingHierarchy
y  pop name/path
value A character the name of the node. or logical to indicate whether to hide a node
Examples

```r
## Not run:
#G is a gating hierarchy
gs_get_pop_paths(G[[1]]) # return node names
gh_pop_set_name(G,"L","lymph")

## End(Not run)
```

## Not run:
gh_pop_set_visibility(gh, 4, FALSE) # hide a node
gh_pop_set_visibility(gh, 4, TRUE) # unhide a node

## End(Not run)

---

shift_gate

### Simplified geometric translation of gates associated with nodes

---

setNode, GatingHierarchy, character, logical-method

hide/unhide a node

#### Description

hide/unhide a node

#### Usage

```r
## S4 method for signature 'GatingHierarchy,character,logical'
setNode(x, y, value)
gh_pop_set_visibility(x, y, value)
gs_pop_set_visibility(x, y, value)
```

#### Arguments

- `x`: GatingHierarchy object
- `y`: character node name or path
- `value`: TRUE/FALSE

#### Examples

```r
## Not run:
gh_pop_set_visibility(gh, 4, FALSE) # hide a node
gh_pop_set_visibility(gh, 4, TRUE) # unhide a node

## End(Not run)
```

---

shift_gate

### Simplified geometric translation of gates associated with nodes
**shift_gate**

**Description**
Shift the location of a gate associated with a node of a GatingHierarchy or GatingSet. This method is a wrapper for `shift_gate` that enables updating of the gate associated with a node of a GatingHierarchy or GatingSet.

`shift_gate` calls `gs_pop_set_gate` to modify the provided GatingHierarchy or GatingSet directly so there is no need to re-assign its output. The arguments will be essentially identical to the flowCore method, except for the specification of the target gate. Rather than being called on an object of type `flowCore::filter`, here it is called on a GatingHierarchy or GatingSet object with an additional character argument for specifying the node whose gate should be transformed. The rest of the details below are taken from the flowCore documentation.

**Usage**

```r
## S3 method for class 'GatingHierarchy'
shift_gate(obj, y, dx = NULL, dy = NULL, 
            center = NULL, ...)

## S3 method for class 'GatingSet'
shift_gate(obj, y, dx = NULL, dy = NULL, 
            center = NULL, ...)
```

**Arguments**

- `obj`: A GatingHierarchy or GatingSet object
- `y`: A character specifying the node whose gate should be modified
- `dx`: Either a numeric scalar or numeric vector. If it is scalar, this is just the desired shift of the gate in its first dimension. If it is a vector, it specifies both dx and dy as (dx, dy). This provides an alternate syntax for shifting gates, as well as allowing shifts of `ellipsoidGate` objects in more than 2 dimensions.
- `dy`: A numeric scalar specifying the desired shift of the gate in its second dimension.
- `center`: A numeric vector specifying where the center or centroid should be moved (rather than specifying dx and/or dy)
- `...`: not used

**Details**

This method allows for geometric translation of filter types defined by simple geometric gates (`rectangleGate`, `quadGate`, `ellipsoidGate`, or `polygonGate`). The method provides two approaches to specify a translation. For `rectangleGate` objects, this will shift the min and max bounds by the same amount in each specified dimension. For `quadGate` objects, this will simply shift the dividing boundary in each dimension. For `ellipsoidGate` objects, this will shift the center (and therefore all points of the ellipse). For `polygonGate` objects, this will simply shift all of the points defining the polygon.

The method allows two different approaches to shifting a gate. Through the dx and/or dy arguments, a direct shift in each dimension can be provided. Alternatively, through the center argument, the gate can be directly moved to a new location in relation to the old center of the gate. For `quadGate` objects, this center is the intersection of the two dividing boundaries (so the value of the boundary slot). For `rectangleGate` objects, this is the center of the rectangle defined by the intersections of the centers of each interval. For `ellipsoidGate` objects, it is the center of the ellipsoid, given by the mean slot. For `polygonGate` objects, the centroid of the old polygon will be calculated and
shifted to the new location provided by center and all other points on the polygon will be shifted by relation to the centroid.

See Also
transform_gate flowCore::shift_gate

Examples
## Not run:
# Moves the entire gate +500 in its first dimension and 0 in its second dimension
shift_gate(gs, node, dx = 500)

# Moves the entire gate +250 in its first dimension and +700 in its second dimension
shift_gate(gs, node, dx = 500, dy = 700)

# Same as previous
shift_gate(gs, node, c(500, 700))

# Move the gate based on shifting its center to (700, 1000)
shift_gate(gs, node, center = c(700, 1000))

## End(Not run)

standardize-GatingSet

The tools to standardize the tree structures and channel names.

Description

gs_split_by_tree(x)
gs_split_by_channels(x)
gs_check_redundant_nodes(x)
gs_remove_redundant_nodes(x, toRemove)
gs_remove_redundant_channels(gs)
gs_update_channels(gs, map, all = TRUE)
gh_pop_move(gh, node, to)
gs_pop_set_visibility(x, y, FALSE)

Details

In order to merge multiple GatingSets into single GatingSetList, the gating trees and channel names must be consistent. These functions help removing the discrepancies and standardize the GatingSets so that they are mergable.

gs_split_by_tree splits the GatingSets into groups based on the gating tree structures.
gs_split_by_channels split GatingSets into groups based on their flow channels.
gs_check_redundant_nodes returns the terminal(or leaf) nodes that makes the gating trees to be different among GatingSets and thus can be considered to remove as redundant nodes.
gs_remove_redundant_nodes removes the terminal (or leaf) nodes that are detected as redundant by
 gs_check_redundant_nodes.

gs_remove_redundant_channels remove the redundant channels that are not used by any gate de-
defined in the GatingSet.

gs_update_channels modifies the channel names in place. (Usually used to standardize the channels
among GatingSets due to the letter case discrepancies or typo).

gh_pop_move inserts a dummy gate to the GatingSet. Is is useful trick to deal with the extra non-
leaf node in some GatingSets that can not be simply removed by gs_remove_redundant_nodes.

gs_pop_set_visibility hide a node/gate in a GatingSet. It is useful to deal with the non-leaf node
that causes the tree structure discrepancy.

---

subset.GatingSet  
subset the GatingSet/GatingSetList based on 'pData'

Description
subset the GatingSet/GatingSetList based on 'pData'

Usage
## S3 method for class 'GatingSet'
subset(x, subset, ...)

Arguments
x          GatingSet or GatingSetList
subset      logical expression(within the context of pData) indicating samples to keep. see
            subset
...        other arguments. (not used)

Value
a codeGatingSet or GatingSetList object

---

swap_data_cols  
Swap the colnames Perform some validity checks before returning the
updated colnames

Description
Swap the colnames Perform some validity checks before returning the updated colnames

Usage
swap_data_cols(cols, swap_cols)
### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cols</td>
<td>the original colname vector</td>
</tr>
<tr>
<td>swap_cols</td>
<td>a named list specifying the pairs to be swapped</td>
</tr>
</tbody>
</table>

### Value

the new colname vector that has some colnames swapped

### Examples

```r
library(flowCore)
data(GvHD)
fr <- GvHD[[1]]
colnames(fr)
new <- swap_data_cols(colnames(fr), list("FSC-H" = "SSC-H", "FL2-H" = "FL2-A"))
colnames(fr) <- new
```

---

**transform, GatingSet-method**

Transform the flow data associated with the GatingSet

---

**Description**

The transformation functions are saved in the GatingSet and can be retrieved by `gh_get_transformations`. Currently only flowJo-type biexponential transformation (either returned by `gh_get_transformations` or constructed by `flowJoTrans`) is supported.

**Usage**

```r
## S4 method for signature 'GatingSet'
transform(.data, translist, ...)

## S4 method for signature 'GatingSetList'
transform(.data, ...)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.data</td>
<td>GatingSet or GatingSetList</td>
</tr>
<tr>
<td>translist</td>
<td>expect a <code>transformList</code> object or a list of <code>transformList</code> objects (with names matched to sample names)</td>
</tr>
<tr>
<td>...</td>
<td>other arguments passed to <code>transform</code> method for <code>ncdfFlowSet</code> (e.g. <code>ncdf-File</code>)</td>
</tr>
</tbody>
</table>

**Value**

a GatingSet or GatingSetList object with the underlying flow data transformed.
Examples

```r
## Not run:
data(GvHD)
fs <- GvHD[1:2]
gs <- GatingSet(fs)

# construct biexponential transformation function
biexpTrans <- flowjo.biexp_trans(channelRange=4096, maxValue=262144, pos=4.5, neg=0, widthBasis=-10)

# make a transformerList object
chnls <- c("FL1-H", "FL2-H")
transList <- transformerList(chnls, biexpTrans)

# add it to GatingSet
gs_trans <- transform(gs, transList)

## End(Not run)
```

transformerList

*Constructor for transformerList object*

Description

Similar to transformList function, it constructs a list of transformer objects generated by trans_new method from scales so that the inverse and breaks functions are also included.

Usage

```r
transformerList(from, trans)
```

Arguments

- `from` channel names
- `trans` a trans object or a list of trans objects constructed by trans_new method.

Examples

```r
library(flowCore)
library(scales)
# create transformer object from scratch
trans <- logicleTransform(w = 0.5, t = 262144, m = 4.5, a = 0)
inv <- inverseLogicleTransform(trans = trans)
trans.obj <- flow_trans("logicle", trans, inv, n = 5, equal.space = FALSE)

# or simply use convenient constructor
#trans.obj <- logicle_trans(n = 5, equal.space = FALSE, w = 0.5, t = 262144, m = 4.5, a = 0)

transformerList(c("FL1-H", "FL2-H"), trans.obj)

# use different transformer for each channel
trans.obj2 <- asinhGml2_trans()
transformerList(c("FL1-H", "FL2-H"), list(trans.obj, trans.obj2))
```
transform_gate

Simplified geometric transformations of gates associated with nodes

Description

Perform geometric transformations of a gate associated with a node of a GatingHierarchy or GatingSet. This method is a wrapper for transform_gate that enables updating of the gate associated with a node of a GatingHierarchy or GatingSet.

transform_gate calls gs_pop_set_gate to modify the provided GatingHierarchy or GatingSet directly so there is no need to re-assign its output. The arguments will be essentially identical to the flowCore method, except for the specification of the target gate. Rather than being called on an object of type flowCore::filter, here it is called on a GatingHierarchy or GatingSet object with an additional character argument for specifying the node whose gate should be transformed. The rest of the details below are taken from the flowCore documentation.

Usage

```r
## S3 method for class 'GatingHierarchy'
transform_gate(obj, y, scale = NULL,
               deg = NULL, rot_center = NULL, dx = NULL, dy = NULL,
               center = NULL, ...)
```

Arguments

- `obj` A GatingHierarchy or GatingSet object
- `y` A character specifying the node whose gate should be modified
- `scale` Either a numeric scalar (for uniform scaling in all dimensions) or numeric vector specifying the factor by which each dimension of the gate should be expanded (absolute value > 1) or contracted (absolute value < 1). Negative values will result in a reflection in that dimension.
  
  For rectangleGate and quadGate objects, this amounts to simply scaling the values of the 1-dimensional boundaries. For polygonGate objects, the values of scale will be used to determine scale factors in the direction of each of the 2 dimensions of the gate (scale_gate is not yet defined for higher-dimensional polytopeGate objects). **Important:** For ellipsoidGate objects, scale determines scale factors for the major and minor axes of the ellipse, in that order.
- `deg` An angle in degrees by which the gate should be rotated in the counter-clockwise direction.
- `rot_center` A separate 2-dimensional center of rotation for the gate, if desired. By default, this will be the center for ellipsoidGate objects or the centroid for polygonGate objects. The rot_center argument is currently only supported for polygonGate objects. It is also usually simpler to perform a rotation and a translation individually than to manually specify the composition as a rotation around a shifted center.
- `dx` Either a numeric scalar or numeric vector. If it is scalar, this is just the desired shift of the gate in its first dimension. If it is a vector, it specifies both dx and dy as (dx, dy). This provides an alternate syntax for shifting gates, as well as allowing shifts of ellipsoidGate objects in more than 2 dimensions.
- `dy` A numeric scalar specifying the desired shift of the gate in its second dimension.
center

A numeric vector specifying where the center or centroid should be moved (rather than specifying dx and/or dy)

... Assignments made to the slots of the particular Gate-type filter object in the form "<slot_name> = <value>"

Details

This method allows changes to the four filter types defined by simple geometric gates (quadGate, rectangleGate, ellipsoidGate, and polygonGate) using equally simple geometric transformations (shifting/translation, scaling/dilation, and rotation). The method also allows for directly resetting the slots of each Gate-type object. Note that these methods are for manually altering the geometric definition of a gate. To easily transform the definition of a gate with an accompanying scale transformation applied to its underlying data, see ?ggcyto::rescale_gate.

First, transform_gate will apply any direct alterations to the slots of the supplied Gate-type filter object. For example, if "mean = c(1,3)" is present in the argument list when transform_gate is called on a ellipsoidGate object, the first change applied will be to shift the mean slot to (1,3). The method will carry over the dimension names from the gate, so there is no need to provide column or row names with arguments such as mean or cov for ellipsoidGate or boundaries for polygonGate.

transform_gate then passes the geometric arguments (dx, dy, deg, rot_center, scale, and center) to the methods which perform each respective type of transformation: shift_gate, scale_gate, or rotate_gate. The order of operations is to first scale, then rotate, then shift. The default behavior of each operation follows that of its corresponding method but for the most part these are what the user would expect. A few quick notes:

- rotate_gate is not defined for rectangleGate or quadGate objects, due to their definition as having 1-dimensional boundaries.
- The default center for both rotation and scaling of a polygonGate is the centroid of the polygon. This results in the sort of scaling most users expect, with a uniform scale factor not distorting the shape of the original polygon.

See Also

flowCore::transform_gate

Examples

## Not run:
# Scale the original gate non-uniformly, rotate it 15 degrees, and shift it
transform_gate(gs, node, scale = c(2,3), deg = 15, dx = 500, dy = -700)

# Scale the original gate (in this case an ellipsoidGate) after moving its center to (1500, 2000)
transform_gate(gs, node, scale = c(2,3), mean = c(1500, 2000))

## End(Not run)
updateChannels

Update the channel information of a GatingSet (c++ part)

Description

It updates the channels stored in gates, compensations and transformations based on given mapping between the old and new channel names.

Usage

updateChannels(gs, map, all = TRUE)

Arguments

gs a GatingSet object

map data.frame contains the mapping from old (case insensitive) to new channel names Note: Make sure to remove the '<' or '>' characters from 'old' name because the API tries to only look at the raw channel name so that the gates with both prefixed and non-prefixed names could be updated.

all logical whether to update the flow data as well

Value

when 'all' is set to TRUE, it returns a new GatingSet but it still shares the same underlying c++ tree structure with the original GatingSet otherwise it returns nothing (less overhead.)

Examples

## Not run:
##this will update both "Qdot 655-A" and "<Qdot 655-A>"

gs <- gs_update_channels(gs, map = data.frame(old = c("Qdot 655-A"),
                                 , new = c("QDot 655-A")
                                 )

## End(Not run)

updateIndices,GatingHierarchy,character,logical-method

directly update event indices without changing gates

Description

It is useful when we want to alter the popluation at events level yet without removing or adding the existing gates.
Usage

```r
## S4 method for signature 'GatingHierarchy,character,logical'
updateIndices(obj, y, z)

gh_pop_set_indices(obj, y, z)
```

Arguments

- `obj` GatingHierarchy object
- `y` character node name or path
- `z` logical vector as local event indices relative to node `y`

Examples

```r
library(flowWorkspace)
dataDir <- system.file("extdata", package="flowWorkspaceData")
suppressMessages(gs <- load_gs(list.files(dataDir, pattern = "gs_manual", full = TRUE)))
gh <- gs[[1]]
# get pop counts
pop.stats <- gh_pop_get_stats(gh, nodes = c("CD3+", "CD4", "CD8"))

# subsample 30% cell events at CD3+ node
total.cd3 <- pop.stats[pop == "CD3+", count]
gInd <- seq_len(total.cd3) # create integer index for cd3
random <- sample.int(total.cd3, size = total.cd3 * 0.3, replace = TRUE) # randomly select 30%
gInd.logical <- rep(FALSE, total.cd3)
gInd.logical[random] <- TRUE
# replace the original index stored at GatingHierarchy
gh_pop_set_indices(gh, "CD3+", gInd.logical)

# check the updated pop counts
gh_pop_get_stats(gs[[1]], nodes = c("CD3+", "CD4", "CD8")) # note that CD4, CD8 are not updated
# update all the descendants of CD3+
for (node in gh_pop_get_descendants(gh, "CD3+"))
  suppressMessages(recompute(gh, node))

gh_pop_get_stats(gs[[1]], nodes = c("CD3+", "CD4", "CD8")) # now all are update to date
```
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