

Package: R.filesets (via r-universe)

August 21, 2024

Version 2.15.1

Depends R (>= 3.2.0), R.oo (>= 1.24.0)

Imports digest, R.methodsS3, R.utils, R.cache, stats

Suggests gtools (>= 3.5.0)

SuggestsNote Recommended: gtools

Title Easy Handling of and Access to Files Organized in Structured Directories

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Description A file set refers to a set of files located in one or more directories on the file system. This package provides classes and methods to locate, setup, subset, navigate and iterate such sets. The API is designed such that these classes can be extended via inheritance to provide a richer API for special file formats. Moreover, a specific name format is defined such that filenames and directories can be considered to have full names which consists of a name followed by comma-separated tags. This adds additional flexibility to identify file sets and individual files. NOTE: This package's API should be considered to be in an beta stage. Its main purpose is currently to support the aroma.* packages, where it is one of the main core components; if you decide to build on top of this package, please contact the author first.

License LGPL (>= 2.1)

URL <https://github.com/HenrikBengtsson/R.filesets>,
<https://www.aroma-project.org/>

BugReports <https://github.com/HenrikBengtsson/R.filesets/issues>

LazyLoad TRUE

Repository <https://henrikbengtsson.r-universe.dev>

RemoteUrl <https://github.com/HenrikBengtsson/R.filesets>

RemoteRef master

RemoteSha 0a2d371874dc16606dbcc5f45a9f88b6d14d6b98

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R.filesets-package *Package R.filesets*

Description

A file set refers to a set of files located in one or more directories on the file system. This package provides classes and methods to locate, setup, subset, navigate and iterate such sets. The API is designed such that these classes can be extended via inheritance to provide a richer API for special file formats. Moreover, a specific name format is defined such that filenames and directories can be considered to have full names which consists of a name followed by comma-separated tags. This adds additional flexibility to identify file sets and individual files. NOTE: This package's API should be considered to be in an beta stage. Its main purpose is currently to support the aroma.* packages, where it is one of the main core components; if you decide to build on top of this package, please contact the author first.

This package should be considered to be in an alpha or beta phase. You should expect the API to be changing over time.

Installation

To install this package, call `install.packages("R.filesets")`.

To get started

To get started, see:

1. [GenericDataSet](#)
2. [TabularTextFile](#)

How to cite this package

Please cite references [1] when using this package.

License

The releases of this package is licensed under LGPL version 2.1 or newer.

The development code of the packages is under a private licence (where applicable) and patches sent to the author fall under the latter license, but will be, if incorporated, released under the "release" license above.

Author(s)

Henrik Bengtsson

References

[1] H. Bengtsson, *The R.oo package - Object-Oriented Programming with References Using Standard R Code*, In Kurt Hornik, Friedrich Leisch and Achim Zeileis, editors, Proceedings of the 3rd International Workshop on Distributed Statistical Computing (DSC 2003), March 20-22, Vienna, Austria. <https://www.r-project.org/conferences/DSC-2003/Proceedings/>

ChecksumFile

The ChecksumFile class

Description

Package: R.filesets

Class ChecksumFile

Object

```

~~|
~~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFile
~~~~~|
~~~~~+--ChecksumFile

```

Directly known subclasses:

public abstract static class **ChecksumFile**
 extends *GenericDataFile*

A ChecksumFile is an object referring to a file that contains a checksum for a corresponding "main" file.

Usage

```
ChecksumFile(...)
```

Arguments

... Arguments passed to *GenericDataFile*.

Fields and Methods**Methods:**

create	-
getChecksum	-
isOld	-
readChecksum	Reads the checksum value.
validate	Asserts that the checksum matches the checksum of file.

Methods inherited from GenericDataFile:

as.character, clone, compareChecksum, copyTo, equals, fromFile, getAttribute, getAttributes, getChecksum, getChecksumFile, getCreatedOn, getDefaultFullName, getExtension, getExtensionPattern, getFileSize, getFileType, getFilename, getFilenameExtension, getLastAccessedOn, getLastModifiedOn, getOutputExtension, getPath, getPathname, gunzip, gzip, hasBeenModified, is.na, isFile, isGzipped, linkTo, readChecksum, renameTo, renameToUpperCaseExt, setAttribute, setAttributes, setAttributesBy, setAttributesByTags, setExtensionPattern, testAttributes, validate, validateChecksum, writeChecksum

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

ChecksumFileSet *The ChecksumFileSet class*

Description

Package: R.filesets

Class ChecksumFileSet**Object**

```

~~|
~~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFileSet
~~~~~|
~~~~~+--ChecksumFileSet

```

Directly known subclasses:

```

public static class ChecksumFileSet
extends GenericDataFileSet

```

An ChecksumFileSet object represents a set of [ChecksumFiles](#).

Usage

```
ChecksumFileSet(...)
```

Arguments

```
...                   Arguments passed to GenericDataFileSet.
```

Fields and Methods**Methods:**

```

readChecksums -
validate      -

```

Methods inherited from GenericDataFileSet:

[, [[, anyDuplicated, anyNA, append, appendFiles, appendFullNamesTranslator, appendFullNamesTranslatorByNULL, appendFullNamesTranslatorByTabularTextFile, appendFullNamesTranslatorByTabularTextFileSet, appendFullNamesTranslatorBydata.frame, appendFullNamesTranslatorByfunction, appendFullNamesTranslatorBylist, as.character, as.list, byName, byPath, c, clearCache, clearFullNamesTranslator, clone, copyTo, dsApplyInPairs, duplicated, equals, extract, findByName, findDuplicated, getChecksum, getChecksumFileSet, getChecksumObjects, getDefaultFullName, getFile, getFileClass, getFileSize, getFiles, getFullNames, getNames, getOneFile, getPath, getPathnames, getSubdirs, gunzip, gzip, hasFile, indexOf, is.na, names, nbrOfFiles, rep, resetFullNames, setFullNamesTranslator, sortBy, unique, update2, updateFullName, updateFullNames, validate

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

ColumnNamesInterface *The ColumnNamesInterface class interface*

Description

Package: R.filesets

Class ColumnNamesInterface**Interface**

```
~~|
~~+--ColumnNamesInterface
```

Directly known subclasses:

[GenericTabularFile](#), [TabularTextFile](#)

```
public abstract class ColumnNamesInterface
  extends Interface
```

Usage

```
ColumnNamesInterface(...)
```

Arguments

```
...          Not used.
```

Fields and Methods**Methods:**

<code>clearColumnNamesTranslator</code>	-
<code>getColumnNames</code>	Gets the column names.
<code>nbrOfColumns</code>	Gets the number of columns.
<code>setColumnNames</code>	Sets the column names.
<code>setColumnNamesTranslator</code>	-

Methods inherited from Interface:

extend, print, uses

Author(s)

Henrik Bengtsson

FullNameInterface *The FullNameInterface class interface*

Description

Package: R.filesets

Class FullNameInterface**Interface**

```
~~|
~~+--FullNameInterface
```

Directly known subclasses:

[ChecksumFile](#), [ChecksumFileSet](#), [GenericDataFile](#), [GenericDataFileSet](#), [GenericDataFileSetList](#), [GenericTabularFile](#), [GenericTabularFileSet](#), [RDataFile](#), [RDataFileSet](#), [RdsFile](#), [RdsFileSet](#), [TabularTextFile](#), [TabularTextFileSet](#)

```
public abstract class FullNameInterface
  extends Interface
```

Usage

```
FullNameInterface(...)
```

Arguments

```
...          Not used.
```

Details

The full name consists of a name followed by optional comma-separated tags. For instance, the full name of foo, a.2, b has name foo with tags a.2 and b.

Fields and Methods**Methods:**

<code>appendFullNameTranslator</code>	-
<code>clearFullNameTranslator</code>	-
<code>getFullName</code>	Gets the full name.
<code>getName</code>	Gets the name.
<code>getTags</code>	Gets the tags.
<code>hasTag</code>	-
<code>hasTags</code>	Checks whether the fullname contains a given set of tag(s).
<code>setFullName</code>	Sets the full name.
<code>setFullNameTranslator</code>	-
<code>setName</code>	Sets the name part of the fullname.
<code>setTags</code>	Sets the tags.

Methods inherited from Interface:

```
extend, print, uses
```

Author(s)

```
Henrik Bengtsson
```

Examples

```
# Setup a file set
path <- system.file("R", package="R.filesets")
ds <- GenericDataFileSet$byPath(path)

# -----
# Data set
# -----
cat("Path of data set:\n")
print(getPath(ds))

cat("Fullname of data set:\n")
```



```
print(getFullName(ds))

# -----
# Data files
# -----
cat("Pathnames:\n")
print(getPathnames(ds))

cat("Filenames:\n")
print(sapply(ds, getFilename))

cat("Default fullnames:\n")
print(getFullNames(ds))

cat("Extensions:\n")
print(sapply(ds, getExtension))

# -----
# Translation of data file names
# -----
# Translate fullnames to lower case
setFullNamesTranslator(ds, function(names, ...) tolower(names))
cat("Lower-case fullnames:\n")
print(getFullNames(ds))

# Append a translator that reverse the order of the letters
revStr <- function(names, ...) {
  names <- strsplit(names, split="", fixed=TRUE)
  names <- lapply(names, FUN=rev)
  names <- sapply(names, FUN=paste, collapse="")
  names
}
appendFullNamesTranslator(ds, revStr)
cat("Reversed lower-case fullnames:\n")
fn3 <- getFullNames(ds)
print(fn3)

# Alternative for setting up a sequence of translators
setFullNamesTranslator(ds, list(function(names, ...) tolower(names), revStr))
cat("Reversed lower-case fullnames:\n")
fn3b <- getFullNames(ds)
print(fn3b)
stopifnot(identical(fn3b, fn3))

# Reset
clearFullNamesTranslator(ds)
cat("Default fullnames (after resetting):\n")
print(getFullNames(ds))
```

GenericDataFile

*The abstract GenericDataFile class***Description**

Package: R.filesets

Class GenericDataFile

Object

~~|

~~+---FullNameInterface

~~~~~|

~~~~~+---GenericDataFile

Directly known subclasses:*ChecksumFile, GenericTabularFile, RDataFile, RdsFile, TabularTextFile*public abstract static class **GenericDataFile**extends *FullNameInterface*

A GenericDataFile is an object referring to a data file on a file system. Note that this class is abstract and can not be instantiated, but instead you have to use one of the subclasses or the generic `*fromFile()` method.

Usage

```
GenericDataFile(filename=NULL, path=NULL, mustExist=!is.na(filename), ...,
  .onUnknownArgs=c("error", "warning", "ignore"))
```

Arguments

| | |
|----------------|--|
| filename | The filename of the file. |
| path | An optional path to the file. |
| mustExist | If TRUE , an exception is thrown if the file does not exist, otherwise not. |
| ... | Not used. |
| .onUnknownArgs | A character string specifying what should occur if there are unknown arguments in ... |

Fields and Methods**Methods:**

| | |
|------------------------------|---|
| <code>compareChecksum</code> | Compares the file checksum with the value of the checksum file. |
| <code>equals</code> | Checks if a file equals another. |

| | |
|-------------------------------|--|
| <code>getChecksum</code> | Gets the checksum of a file. |
| <code>getChecksumFile</code> | - |
| <code>getExtension</code> | Gets the filename extension. |
| <code>getFileSize</code> | Gets the size of a file. |
| <code>getFileType</code> | Gets the file type of a file. |
| <code>getFilename</code> | Gets the filename of the file. |
| <code>getPath</code> | Gets the path (directory) of the file. |
| <code>getPathname</code> | Gets the pathname of the file. |
| <code>is.na</code> | - |
| <code>isFile</code> | Checks if this is an existing file. |
| <code>validateChecksum</code> | Asserts that the file checksum matches the one of the checksum file. |
| <code>writeChecksum</code> | Write the file checksum to a checksum file. |

Methods inherited from FullNameInterface:

`appendFullNameTranslator`, `appendFullNameTranslatorByNULL`, `appendFullNameTranslatorByTabularTextFile`, `appendFullNameTranslatorByTabularTextFileSet`, `appendFullNameTranslatorBycharacter`, `appendFullNameTranslatorBydata.frame`, `appendFullNameTranslatorByfunction`, `appendFullNameTranslatorBylist`, `clearFullNameTranslator`, `clearListOfFullNameTranslators`, `getDefaultFullName`, `getFullName`, `getFullNameTranslator`, `getListOfFullNameTranslators`, `getName`, `getTags`, `hasTag`, `hasTags`, `resetFullName`, `setFullName`, `setFullNameTranslator`, `setListOfFullNameTranslators`, `setName`, `setTags`, `updateFullName`

Methods inherited from Object:

`$`, `$<-`, `[[`, `[[<-`, `as.character`, `attach`, `attachLocally`, `clearCache`, `clearLookupCache`, `clone`, `detach`, `equals`, `extend`, `finalize`, `getEnvironment`, `getFieldModifier`, `getFieldModifiers`, `getFields`, `getInstantiationTime`, `getStaticInstance`, `hasField`, `hashCode`, `ll`, `load`, `names`, `objectSize`, `print`, `save`

Filename convention

The filename of an `GenericDataFile` is structured as follows:

filename : "sample001,a,b,c.CEL" (this follows the R convention, but not the Unix convention)

fullname : "sample001,a,b,c"

name : "sample001"

tags : c("a", "b", "c")

extension : "CEL"

Author(s)

Henrik Bengtsson

See Also

An object of this class is typically part of an [GenericDataFileSet](#).

GenericDataFileSet *The GenericDataFileSet class*

Description

Package: R.filesets

Class GenericDataFileSet

Object

~~|

~~+---FullNameInterface

~~~~~|

~~~~~+---GenericDataFileSet

Directly known subclasses:

[ChecksumFileSet](#), [GenericTabularFileSet](#), [RDataFileSet](#), [RdsFileSet](#), [TabularTextFileSet](#)

public static class **GenericDataFileSet**

extends *FullNameInterface*

A GenericDataFileSet object represents a set of [GenericDataFiles](#).

Usage

```
GenericDataFileSet(files=NULL, tags="*", depth=NULL, ...,
  .onUnknownArgs=c("error", "warning", "ignore"))
```

Arguments

| | |
|----------------|---|
| files | A list of GenericDataFile :s or a GenericDataFileSet . |
| tags | A character vector of tags to be used for this file set. The string "*" indicates that it should be replaced by the tags part of the file set pathname. |
| depth | An non-negative integer . |
| ... | Not used. |
| .onUnknownArgs | A character string specifying what should occur if there are unknown arguments in ... |

Fields and Methods

Methods:

| | |
|---------------|---|
| anyDuplicated | - |
| anyNA | - |
| append | - |

```

appendFiles      -
as.list          -
byName          -
byPath          -
duplicated       -
equals          -
extract         -
getChecksum     -
getChecksumFileSet -
getDefaultFullName -
getFile         -
getFileClass    -
getFileSize     -
getFullNames    -
getNames        -
getOneFile      -
getPath         -
getPathnames    -
gunzip          -
gzip           -
hasFile         -
indexOf         -
is.na           -
sortBy         -
unique         -
validate       -

```

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [], [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

Examples

```
# Setup a file set
```

```

path <- system.file(package="R.filesets")
ds <- GenericDataFileSet$byPath(path)

# -----
# Data set
# -----
cat("Path of data set:\n")
print(getPath(ds))

cat("Fullname of data set:\n")
print(getFullName(ds))

# -----
# Data files
# -----
cat("Pathnames:\n")
print(getPathnames(ds))

cat("Filenames:\n")
print(sapply(ds, getFilename))

cat("Extensions:\n")
print(sapply(ds, getExtension))

# -----
# Subsetting
# -----
n <- length(ds)
ds2 <- extract(ds, 1:n)
print(ds2)

ds3 <- extract(ds, n:1)
print(ds3)

stopifnot(identical(rev(getPathnames(ds3)), getPathnames(ds2)))

idxs <- c(1,2,NA,n,NA)
ds4 <- extract(ds, idxs, onMissing="NA")
print(ds4)
print(getFullNames(ds4))
print(getFiles(ds4))

stopifnot(identical(is.na(idxs), unname(is.na(getPathnames(ds4))))))

```

GenericDataFileSetList

The GenericDataFileSetList class

Description

Package: R.filesets

Class GenericDataFileSetList**Object**

```

~~|
~~+---FullNameInterface
~~~~~|
~~~~~+---GenericDataFileSetList

```

Directly known subclasses:

```

public static class GenericDataFileSetList
extends FullNameInterface

```

A GenericDataFileSetList object represents a list of [GenericDataFileSets](#).

Usage

```

GenericDataFileSetList(dsList=list(), tags="*", ..., allowDuplicates=TRUE,
  .setClass="GenericDataFileSet")

```

Arguments

| | |
|-----------------|---|
| dsList | A single or a list of GenericDataFileSet :s. |
| tags | A character vector of tags. |
| ... | Not used. |
| allowDuplicates | If FALSE , files with duplicated names are not allowed and an exception is thrown, otherwise not. |
| .setClass | A character string specifying a name of the class that each data set must be an instance of. |

Fields and Methods**Methods:**

```

as -
as.GenericDataFileSetList -
as.list -
getFileList -
getFullNames -
getNames -
getSet -

```

| | |
|-----------|---|
| getSets | - |
| indexOf | - |
| length | - |
| nbrOfSets | - |

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

Examples

```
# Setup a file set
path1 <- system.file(package="R.filesets")
ds1 <- GenericDataFileSet$byPath(path1)

path2 <- system.file(package="R.utils")
ds2 <- GenericDataFileSet$byPath(path2)

dsl <- GenericDataFileSetList(list(ds1, ds2), tags=c("*", "CustomTag"))
print(dsl)

df <- as.data.frame(dsl)
print(df)

print(df["DESCRIPTION", "R.filesets"])
```


Description

Package: R.filesets

Class GenericTabularFile

Object

```

~~|
~~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFile
~~~~~|
~~~~~+--ColumnNamesInterface
~~~~~|
~~~~~+--GenericTabularFile

```

Directly known subclasses:

[TabularTextFile](#)

```

public abstract static class GenericTabularFile
extends ColumnNamesInterface

```

A TabularTextFile is an object referring to a tabular text file on a file system containing data in a tabular format. Methods for reading all or a subset of the tabular data exist.

Usage

```
GenericTabularFile(..., .verify=TRUE, verbose=FALSE)
```

Arguments

```

...           Arguments passed to GenericDataFile.
.verify, verbose
              (Internal only) If TRUE, the file is verified while the object is instantiated by the
              constructor. The verbose argument is passed to the verifier function.

```

Fields and Methods**Methods:**

```

dim           -
extractMatrix -
head          -
nbrOfColumns  -
nbrOfRows     -
readColumns   -
readDataFrame -
tail          -

```

writeColumnsToFiles -

Methods inherited from ColumnNamesInterface:

appendColumnNamesTranslator, appendColumnNamesTranslatorByNULL, appendColumnNamesTranslatorBycharacter, appendColumnNamesTranslatorByfunction, appendColumnNamesTranslatorBylist, clearColumnNamesTranslator, clearListOfColumnNamesTranslators, getColumnNames, getColumnNamesTranslator, getDefaultColumnNames, getListOfColumnNamesTranslators, nbrOfColumns, setColumnNames, setColumnNamesTranslator, setListOfColumnNamesTranslators, updateColumnNames

Methods inherited from GenericDataFile:

as.character, clone, compareChecksum, copyTo, equals, fromFile, getAttribute, getAttributes, getChecksum, getChecksumFile, getCreatedOn, getDefaultFullName, getExtension, getExtensionPattern, getFileSize, getFileType, getFilename, getFilenameExtension, getLastAccessedOn, getLastModifiedOn, getOutputExtension, getPath, getPathname, gunzip, gzip, hasBeenModified, is.na, isFile, isGzipped, linkTo, readChecksum, renameTo, renameToUpperCaseExt, setAttribute, setAttributes, setAttributesBy, setAttributesByTags, setExtensionPattern, testAttributes, validate, validateChecksum, writeChecksum

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

See Also

An object of this class is typically part of an [GenericTabularFileSet](#).

Description

Package: R.filesets

Class GenericTabularFileSet**Object**

```

~~|
~~+---FullNameInterface
~~~~~|
~~~~~+---GenericDataFileSet
~~~~~|
~~~~~+---GenericTabularFileSet

```

Directly known subclasses:

[TabularTextFileSet](#)

```

public static class GenericTabularFileSet
extends GenericDataFileSet

```

An `GenericTabularFileSet` object represents a set of [GenericTabularFiles](#).

Usage

```
GenericTabularFileSet(...)
```

Arguments

... Arguments passed to [GenericDataFileSet](#).

Fields and Methods**Methods:**

extractMatrix -

Methods inherited from GenericDataFileSet:

[, [[, anyDuplicated, anyNA, append, appendFiles, appendFullNamesTranslator, appendFullNamesTranslatorByNULL, appendFullNamesTranslatorByTabularTextFile, appendFullNamesTranslatorByTabularTextFileSet, appendFullNamesTranslatorBydata.frame, appendFullNamesTranslatorByfunction, appendFullNamesTranslatorBylist, as.character, as.list, byName, byPath, c, clearCache, clearFullNamesTranslator, clone, copyTo, dsApplyInPairs, duplicated, equals, extract, findByName, findDuplicated, getChecksum, getChecksumFileSet, getChecksumObjects, getDefaultFullName, getFile, getFileClass, getFileSize, getFiles, getFullNames, getNames, getOneFile, getPath, getPathnames, getSubdirs, gunzip, gzip, hasFile, indexOf, is.na, names, nbrOfFiles, rep, resetFullNames, setFullNamesTranslator, sortBy, unique, update2, updateFullName, updateFullNames, validate

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

loadRDS

Reads data from a RDS file

Description

Reads data from a RDS file.

Usage

```
## Default S3 method:
loadRDS(file, ...)
## S3 method for class 'RdsFile'
loadRDS(file, ...)
```

Arguments

`file` A [character](#) string, a [connection](#), or an [RdsFile](#) specifying a RDS file/connection to be read.

`...` Additional arguments passed to [readRDS\(\)](#).

Value

Returns an R object.

Author(s)

Henrik Bengtsson

See Also

[readRDS\(\)](#).

| | |
|-----------|-----------------------------------|
| loadToEnv | <i>Reads data from a RDS file</i> |
|-----------|-----------------------------------|

Description

Reads data from a RDS file.

Usage

```
## S3 method for class 'RDataFile'
loadToEnv(file, ...)
```

Arguments

| | |
|------|---|
| file | A character string, a connection , or an RDataFile specifying an RData file to be read. |
| ... | Additional arguments passed to loadToEnv . |

Value

Returns an [environment](#).

Author(s)

Henrik Bengtsson

See Also

[loadToEnv](#).

| | |
|-----------|----------------------------|
| RDataFile | <i>The RDataFile class</i> |
|-----------|----------------------------|

Description

Package: R.filesets

Class RDataFile

Object

```
~|
~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFile
~~~~~|
~~~~~+--RDataFile
```

Directly known subclasses:

public abstract static class **RDataFile**
 extends *GenericDataFile*

An RDataFile represents a binary file containing R objects saved using the `save()` function.

Usage

```
RDataFile(...)
```

Arguments

... Arguments passed to *GenericDataFile*.

Fields and Methods**Methods:**

```
loadObject -  
loadToEnv -
```

Methods inherited from GenericDataFile:

as.character, clone, compareChecksum, copyTo, equals, fromFile, getAttribute, getAttributes, getChecksum, getChecksumFile, getCreatedOn, getDefaultFullName, getExtension, getExtensionPattern, getFileSize, getFileType, getFilename, getFilenameExtension, getLastAccessedOn, getLastModifiedOn, getOutputExtension, getPath, getPathname, gunzip, gzip, hasBeenModified, is.na, isFile, isGzipped, linkTo, readChecksum, renameTo, renameToUpperCaseExt, setAttribute, setAttributes, setAttributesBy, setAttributesByTags, setExtensionPattern, testAttributes, validate, validateChecksum, writeChecksum

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

See Also

An object of this class is typically part of an [RDataFileSet](#).

RDataFileSet

The RDataFileSet class

Description

Package: R.filesets

Class RDataFileSet

Object

```

~|
~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFileSet
~~~~~|
~~~~~+--RDataFileSet

```

Directly known subclasses:

```

public static class RDataFileSet
extends GenericDataFileSet

```

An RDataFileSet object represents a set of [RDataFile](#)s.

Usage

```
RDataFileSet(...)
```

Arguments

... Arguments passed to [GenericDataFileSet](#).

Fields and Methods**Methods:**

byPath -

Methods inherited from GenericDataFileSet:

[, [[, anyDuplicated, anyNA, append, appendFiles, appendFullNamesTranslator, appendFullNamesTranslatorByNULL, appendFullNamesTranslatorByTabularTextFile, appendFullNamesTranslatorByTabularTextFileSet, appendFullNamesTranslatorBydata.frame, appendFullNamesTranslatorByfunction, appendFullNamesTranslatorBylist, as.character, as.list, byName, byPath, c, clearCache, clearFullNamesTranslator, clone, copyTo, dsApplyInPairs, duplicated, equals, extract, findByName, findDuplicated, getChecksum, getChecksumFileSet, getChecksumObjects, getDefaultFullName, getFile, getFileClass, getFileSize, getFiles, getFullNames, getNames, getOneFile, getPath, getPathnames, getSubdirs, gunzip, gzip, hasFile, indexOf, is.na, names, nbrOfFiles, rep, resetFullNames, setFullNamesTranslator, sortBy, unique, update2, updateFullName, updateFullNames, validate

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

RdsFile

The RdsFile class

Description

Package: R.filesets

Class RdsFile**Object**

```

~~|
~~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFile
~~~~~|
~~~~~+--RdsFile

```

Directly known subclasses:


```
public abstract static class RdsFile
  extends GenericDataFile
```

An RdsFile represents a binary file containing an R object saved using the `saveRDS()` function.

Usage

```
RdsFile(...)
```

Arguments

... Arguments passed to `GenericDataFile`.

Fields and Methods

Methods:

```
loadObject -
loadRDS -
```

Methods inherited from `GenericDataFile`:

as.character, clone, compareChecksum, copyTo, equals, fromFile, getAttribute, getAttributes, getChecksum, getChecksumFile, getCreatedOn, getDefaultFullName, getExtension, getExtensionPattern, getFileSize, getFileType, getFilename, getFilenameExtension, getLastAccessedOn, getLastModifiedOn, getOutputExtension, getPath, getPathname, gunzip, gzip, hasBeenModified, is.na, isFile, isGzipped, linkTo, readChecksum, renameTo, renameToUpperCaseExt, setAttribute, setAttributes, setAttributesBy, setAttributesByTags, setExtensionPattern, testAttributes, validate, validateChecksum, writeChecksum

Methods inherited from `FullNameInterface`:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from `Object`:

\$, \$<-, [, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

See Also

An object of this class is typically part of an [RdsFileSet](#).

RdsFileSet

The RdsFileSet class

Description

Package: R.filesets

Class RdsFileSet

Object

```

~~|
~~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFileSet
~~~~~|
~~~~~+--RdsFileSet

```

Directly known subclasses:

```

public static class RdsFileSet
extends GenericDataFileSet

```

An RdsFileSet object represents a set of [RdsFile](#):s.

Usage

```
RdsFileSet(...)
```

Arguments

... Arguments passed to [GenericDataFileSet](#).

Fields and Methods**Methods:**

byPath -

Methods inherited from GenericDataFileSet:

[, [[, anyDuplicated, anyNA, append, appendFiles, appendFullNamesTranslator, appendFullNamesTranslatorByNULL, appendFullNamesTranslatorByTabularTextFile, appendFullNamesTranslatorByTabularTextFileSet, appendFullNamesTranslatorBydata.frame, appendFullNamesTranslatorByfunction, appendFullNamesTranslatorBylist, as.character, as.list, byName, byPath, c, clearCache, clearFullNamesTranslator, clone, copyTo, dsApplyInPairs, duplicated, equals, extract, findByName, findDuplicated, getChecksum, getChecksumFileSet, getChecksumObjects, getDefaultFullName, getFile, getFileClass, getFileSize, getFiles, getFullNames, getNames, getOneFile, getPath, getPathnames, getSubdirs, gunzip, gzip, hasFile, indexOf, is.na, names, nbrOfFiles, rep, resetFullNames, setFullNamesTranslator, sortBy, unique, update2, updateFullName, updateFullNames, validate

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

| | |
|---------------|---------------------------------------|
| readDataFrame | <i>Reads data from a tabular file</i> |
|---------------|---------------------------------------|

Description

Reads data from a tabular file or a set of such files.

Usage

```
## Default S3 method:
readDataFrame(filename, path=NULL, ...)
```

Arguments

filename, path **character vector** specifying one or more files to be read.
 ... Additional arguments passed to either (i) `readDataFrame` for class `TabularTextFile`, or (ii) `readDataFrame` for class `TabularTextFileSet`, depending on whether one or multiple files are read.

Details

When reading multiple files at once, first each file is read into a `data.frame`, and then these `data.frames` are (by default) merged into one `data.frame` using `rbind()`. This requires that the same set of columns are read for each file. Which columns to read can be controlled by specifying their names in argument `colClasses`. To change how the `data.frames` are merged, use argument `combineBy`. For more information, follow the help on the above to `readDataFrame()` help links.

Value

Returns a `data.frame`.

Author(s)

Henrik Bengtsson

See Also

`read.table`. For further details, see classes `TabularTextFile` and `TabularTextFileSet`.

Examples

```
path <- system.file("exData/dataSetA,original", package="R.filesets")

# - - - - -
# Example: Standard tab-delimited file with header comments
# - - - - -
pathname <- file.path(path, "fileA,20100112.dat")

# Read all data
df <- readDataFrame(pathname)
print(df)

# Read columns 'x', 'y', and 'char'
df <- readDataFrame(pathname, colClasses=c("(x|y)"="integer", "char"="character"))
print(df)

# - - - - -
# Example: Tab-delimited file with header comments but
#           also two garbage at the very beginning
# - - - - -
pathname <- file.path(path, "fileA,20130116.datx")

# Explicitly skip the two rows
df <- readDataFrame(pathname, skip=2)
print(df)

# Skip until the first data row
df <- readDataFrame(pathname, skip="^x")
print(df)
```

```

# -----
# Example: Tab-delimited file without column header
# -----
path <- system.file("exData/dataSetB", package="R.filesets")
pathname <- file.path(path, "fileF,noHeader.dat")

# Incorrectly assuming column header
df <- readDataFrame(pathname)
print(df)

# No column header
df <- readDataFrame(pathname, header=FALSE)
print(df)

```

TabularTextFile

The TabularTextFile class

Description

Package: R.filesets

Class TabularTextFile

Object

```

~~|
~~+---FullNameInterface
~~~~~|
~~~~~+---GenericDataFile
~~~~~|
~~~~~+---ColumnNamesInterface
~~~~~|
~~~~~+---GenericTabularFile
~~~~~|
~~~~~+---TabularTextFile

```

Directly known subclasses:

public abstract static class **TabularTextFile**

extends *GenericTabularFile*

A TabularTextFile is an object referring to a tabular text file on a file system containing data in a tabular format. Methods for reading all or a subset of the tabular data exist.

Usage

```
TabularTextFile(..., sep=c("\t", ","), quote="\\"", fill=FALSE, skip=0L, columnNames=NA,
  commentChar="#", .verify=TRUE, verbose=FALSE)
```

Arguments

... Arguments passed to [GenericTabularFile](#).

sep A [character](#) specifying the symbol used to separate the cell entries. If more than one symbol is specified, it will try to select the correct one by peeking into the file.

quote A [character](#) specifying the quote symbol used, if any.

fill As in [read.table](#).

skip As in [read.table](#).

columnNames A [logical](#) or a [character vector](#). If `TRUE`, then column names are inferred from the file. If a [character vector](#), then the column names are given by this argument.

commentChar A single [character](#) specifying which symbol should be used for comments, cf. [read.table](#).

.verify, verbose (Internal only) If `TRUE`, the file is verified while the object is instantiated by the constructor. The verbose argument is passed to the verifier function.

Fields and Methods**Methods:**

| | |
|---------------|---|
| getHeader | - |
| nrOfLines | - |
| nrOfRows | - |
| readDataFrame | - |
| readLines | - |

Methods inherited from GenericTabularFile:

[, as.character, dim, extractMatrix, head, nrOfColumns, nrOfRows, readColumns, readDataFrame, tail, writeColumnsToFiles

Methods inherited from ColumnNamesInterface:

appendColumnNamesTranslator, appendColumnNamesTranslatorByNULL, appendColumnNamesTranslatorBycharacter, appendColumnNamesTranslatorByfunction, appendColumnNamesTranslatorBylist, clearColumnNamesTranslator, clearListOfColumnNamesTranslators, getColumnNames, getColumnNamesTranslator, getDefaultColumnNames, getListOfColumnNamesTranslators, nrOfColumns, setColumnNames, setColumnNamesTranslator, setListOfColumnNamesTranslators, updateColumnNames

Methods inherited from GenericDataFile:

as.character, clone, compareChecksum, copyTo, equals, fromFile, getAttribute, getAttributes, getChecksum, getChecksumFile, getCreatedOn, getDefaultFullName, getExtension, getExtensionPattern, getFileSize, getFileType, getFilename, getFilenameExtension, getLastAccessedOn, getLastModifiedOn, getOutputExtension, getPath, getPathname, gunzip, gzip, hasBeenModified, is.na, isFile, isGzipped, linkTo, readChecksum, renameTo, renameToUpperCaseExt, setAttribute, setAttributes, setAttributesBy, setAttributesByTags, setExtensionPattern, testAttributes, validate, validateChecksum, writeChecksum

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$. \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

See Also

An object of this class is typically part of an [TabularTextFileSet](#).

Examples

```
path <- system.file("exData/dataSetA,original", package="R.filesets")

db <- TabularTextFile("fileA,20100112.dat", path=path)
print(db)

# Read all data
data <- readDataframe(db)
print(data)

# Read columns 'x', 'y', and 'char'
data <- readDataframe(db, colClasses=c("(x|y)"="integer", "char"="character"))
print(data)

# Translate column names on the fly
db <- setColumnNamesTranslator(db, function(names, ...) toupper(names))
data <- readDataframe(db, colClasses=c("(X|Y)"="integer", "CHAR"="character"))
print(data)
```

TabularTextFileSet *The TabularTextFileSet class*

Description

Package: R.filesets

Class TabularTextFileSet

Object

```

~|
~+--FullNameInterface
~~~~~|
~~~~~+--GenericDataFileSet
~~~~~|
~~~~~+--GenericTabularFileSet
~~~~~|
~~~~~+--TabularTextFileSet

```

Directly known subclasses:

```

public static class TabularTextFileSet
extends GenericTabularFileSet

```

An TabularTextFileSet object represents a set of [TabularTextFiles](#).

Usage

```
TabularTextFileSet(...)
```

Arguments

... Arguments passed to [GenericTabularFileSet](#).

Fields and Methods

Methods:

readDataFrame -

Methods inherited from [GenericTabularFileSet](#):

extractMatrix

Methods inherited from GenericDataFileSet:

[, [[, anyDuplicated, anyNA, append, appendFiles, appendFullNamesTranslator, appendFullNamesTranslatorByNULL, appendFullNamesTranslatorByTabularTextFile, appendFullNamesTranslatorByTabularTextFileSet, appendFullNamesTranslatorBydata.frame, appendFullNamesTranslatorByfunction, appendFullNamesTranslatorBylist, as.character, as.list, byName, byPath, c, clearCache, clearFullNamesTranslator, clone, copyTo, dsApplyInPairs, duplicated, equals, extract, findByName, findDuplicated, getChecksum, getChecksumFileSet, getChecksumObjects, getDefaultFullName, getFile, getFileClass, getFileSize, getFiles, getFullNames, getNames, getOneFile, getPath, getPathnames, getSubdirs, gunzip, gzip, hasFile, indexOf, is.na, names, nbrOfFiles, rep, resetFullNames, setFullNamesTranslator, sortBy, unique, update2, updateFullName, updateFullNames, validate

Methods inherited from FullNameInterface:

appendFullNameTranslator, appendFullNameTranslatorByNULL, appendFullNameTranslatorByTabularTextFile, appendFullNameTranslatorByTabularTextFileSet, appendFullNameTranslatorBycharacter, appendFullNameTranslatorBydata.frame, appendFullNameTranslatorByfunction, appendFullNameTranslatorBylist, clearFullNameTranslator, clearListOfFullNameTranslators, getDefaultFullName, getFullName, getFullNameTranslator, getListOfFullNameTranslators, getName, getTags, hasTag, hasTags, resetFullName, setFullName, setFullNameTranslator, setListOfFullNameTranslators, setName, setTags, updateFullName

Methods inherited from Object:

\$, \$<-, [[, [[<-, as.character, attach, attachLocally, clearCache, clearLookupCache, clone, detach, equals, extend, finalize, getEnvironment, getFieldModifier, getFieldModifiers, getFields, getInstantiationTime, getStaticInstance, hasField, hashCode, ll, load, names, objectSize, print, save

Author(s)

Henrik Bengtsson

Examples

```
# Setup a file set consisting of all *.dat tab-delimited files
# in a particular directory
path <- system.file("exData/dataSetA,original", package="R.filesets")
ds <- TabularTextFileSet$byPath(path, pattern=".dat$")
print(ds)

# Read column 'y' and a subset of the rows from each of the
# tab-delimited files and combine into a matrix
rows <- c(3:5, 8, 2)
data <- extractMatrix(ds, column="y", colClass="integer", rows=rows)
print(data)

# -----
# See also help("readDataFrame.TabularTextFileSet")
# -----

# -----
# ADVANCED: Translation of fullnames
```

```
# - - - - -
fnts <- TabularTextFileSet$byPath(getPath(ds), pattern=",fullnames[.]txt$")
appendFullNamesTranslator(ds, as.list(fnts))

cat("Default fullnames:\n")
print(head(getFullNames(ds, translate=FALSE)))
cat("Translated fullnames:\n")
print(head(getFullNames(ds)))

cat("Default fullnames:\n")
print(getFullNames(ds, translate=FALSE))
cat("Translated fullnames:\n")
print(getFullNames(ds))
```

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