

Package ‘RDelta’

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Type Package

Title Parse and Query DELTA-Format Taxonomic Descriptions

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Maintainer Mauro Cavalcanti <maurobio@gmail.com>

Description Provides an R interface to the 'tDelta' C++ library for parsing DELTA (DEscription Language for TAXonomy) format files <<https://freedelta.sourceforge.net>>.

Supports loading character lists, item descriptions, and specifications, with efficient searching and matching of items based on character values. It also supports the generation of identification keys, diagnoses, natural-language descriptions, and clustering and ordination analyses by means of the DELTA programs 'CONFOR', 'KEY', and 'DIST'.

License GPL (>= 3)

URL <https://github.com/maurobio/rdelta>

BugReports <https://github.com/maurobio/rdelta/issues>

Depends R (>= 3.5.0)

Imports Rcpp (>= 1.0.0), graphics, methods, stats, utils

LinkingTo Rcpp

Suggests knitr, rmarkdown

VignetteBuilder knitr

SystemRequirements C++17

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NeedsCompilation yes

Author Mauro Cavalcanti [aut, cre] (Original tDelta C++ library by Denis Ziegler),
Edinaldo Nelson dos Santos Silva [ctb]

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attribute_count	<i>Get number of attributes for an item</i>
-----------------	---

Description

Get number of attributes for an item

Usage

attribute_count(delta, itemnum)

Arguments

delta	A DeltaParser object
itemnum	Item number

Value

Integer number of attributes

attribute_string	<i>Get attribute string</i>
------------------	-----------------------------

Description

Get attribute string

Usage

attribute_string(delta, itemnum, attrnum)

Arguments

delta	A DeltaParser object
itemnum	Item number
attrnum	Attribute number

Value

Character string with the attribute

characters_df	<i>Get character information as a data frame</i>
---------------	--

Description

Extracts all character definitions from a DELTA dataset and returns them as a data frame.

Usage

```
characters_df(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

A data.frame with character information

chars_filename	<i>Get characters filename</i>
----------------	--------------------------------

Description

Get characters filename

Usage

```
chars_filename(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with the filename

char_count	<i>Get number of characters</i>
------------	---------------------------------

Description

Get number of characters

Usage

```
char_count(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Integer number of characters

Examples

```
delta <- tryCatch(  
  load_delta(  
    system.file("extdata", "chars_viola", package = "RDelta"),  
    system.file("extdata", "items_viola", package = "RDelta"),  
    system.file("extdata", "specs_viola", package = "RDelta")  
  ),  
  error = function(e) NULL  
)  
if (!is.null(delta)) char_count(delta)
```

char_feature	<i>Get character feature</i>
--------------	------------------------------

Description

Get character feature

Usage

```
char_feature(delta, charnum)
```

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Character string with the feature description

Examples

```
delta <- tryCatch(
  load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  ),
  error = function(e) NULL
)
if (!is.null(delta)) char_feature(delta, 1)
```

char_type	<i>Get character type</i>
-----------	---------------------------

Description

Get character type

Usage

```
char_type(delta, charnum)
```

Arguments

- delta A DeltaParser object
- charnum Character number

Value

Integer character type code

char_type_name	<i>Get character type name</i>
----------------	--------------------------------

Description

Get character type name

Usage

```
char_type_name(delta, charnum)
```

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Character string with type name

char_unit	<i>Get character unit</i>
-----------	---------------------------

Description

Get character unit

Usage

```
char_unit(delta, charnum)
```

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Character string with the unit

check	<i>Check the characters and items</i>
-------	---------------------------------------

Description

This function creates a directives file for the CONFOR program to check the characters and items in a DELTA dataset.

Usage

```
check(delta, remove_temp = TRUE)
```

Arguments

delta	A Delta dataset object (created by load_delta)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Integer: 0 if check is successful, 1 if check fails

Examples

Requires the CONFOR executable on the PATH.

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  check(delta)
})
```

checkc

Check the characters

Description

This function creates a directives file for the CONFOR program to check the characters in a DELTA dataset.

Usage

```
checkc(delta, remove_temp = TRUE)
```

Arguments

delta	A Delta dataset object (created by load_delta)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Integer: 0 if check is successful, 1 if check fails

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  checkc(delta)
})
```

checki

Check the items

Description

This function creates a directives file for the CONFOR program to check the items in a DELTA dataset.

Usage

```
checki(delta, remove_temp = TRUE)
```

Arguments

delta	A Delta dataset object (created by <code>load_delta</code>)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Integer: 0 if check is successful, 1 if check fails

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
})
```

```

    checki(delta)
  })

```

cluster

Hierarchical Cluster Analysis

Description

Performs hierarchical cluster analysis on a distance matrix generated by the `dist()` function. This function reads the distance matrix and item names from the DIST output files and creates a dendrogram.

Usage

```
cluster(notu, method = "average")
```

Arguments

<code>notu</code>	Number of operational taxonomic units (items) in the dataset.
<code>method</code>	The agglomeration method to be used. This should be one of "ward.D", "ward.D2", "single", "complete", "average" (= UPGMA), "mcquitty" (= WPGMA), "median" (= WPGMC) or "centroid" (= UPGMC). Default is "average".

Value

Invisibly returns a list with the following components:

hclust The `hclust` object produced by `hclust`, which can be further processed or plotted by the user.

cophenetic The cophenetic correlation coefficient (a single numeric value between -1 and 1) measuring how faithfully the dendrogram represents the original distance matrix. Values closer to 1 indicate a better fit.

dist The `dist` object representing the input distance matrix.

Examples

```
# Requires the CONFOR and DIST executables on the PATH.
```

```

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  dist(delta)
  res <- cluster(delta$get_items_nb())
  res$cophenetic

```

```
res <- cluster(delta$get_items_nb(), method = "complete")
})
```

debug_all	<i>Get all debug output</i>
-----------	-----------------------------

Description

Get all debug output

Usage

```
debug_all(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with all debug output

delta2sliks	<i>Convert DELTA dataset to SLIKS format</i>
-------------	--

Description

Converts a DELTA dataset to SLIKS (Simple List of Interactive Key States) format, which is used for interactive identification keys.

Usage

```
delta2sliks(
  delta,
  output_file = "data.js",
  exclude_numeric = TRUE,
  remove_temp = TRUE
)
```

Arguments

delta	A DeltaParser object (created by load_delta)
output_file	Output file name (default: "data.js")
exclude_numeric	Logical; if TRUE, exclude numeric and text characters
remove_temp	Logical; if TRUE, remove temporary files after conversion

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Invisibly returns the path to the output file

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  delta2sliks(delta, output_file = file.path(tempdir(), "data.js"))
})
```

delta_char_types	<i>Get character type constants</i>
------------------	-------------------------------------

Description

Get character type constants

Usage

```
delta_char_types()
```

Value

Named integer vector of DELTA character types

delta_version	<i>Get package version</i>
---------------	----------------------------

Description

Get package version

Usage

delta_version()

Value

Package version string

dependent_characters	<i>Get all dependent characters</i>
----------------------	-------------------------------------

Description

Get all dependent characters

Usage

dependent_characters(delta, ccnum, ccstate)

Arguments

- | | |
|---------|--------------------------|
| delta | A DeltaParser object |
| ccnum | Control character number |
| ccstate | Control character state |

Value

Integer vector of dependent character numbers

dependent_count	<i>Get number of dependent characters</i>
-----------------	---

Description

Get number of dependent characters

Usage

```
dependent_count(delta, ccnum, ccstate)
```

Arguments

delta	A DeltaParser object
ccnum	Control character number
ccstate	Control character state

Value

Integer count of dependent characters

dist	<i>Generate Distance Matrix using Gower's Coefficient</i>
------	---

Description

This function replicates the DIST command in the DELTA system for generating a distance matrix using Gower's coefficient. It creates the necessary directives files and runs the CONFOR and DIST programs.

Usage

```
dist(  
  delta,  
  heading = NULL,  
  match_overlap = FALSE,  
  minimum_comparisons,  
  phylip_format = FALSE,  
  exclude_items = NULL,  
  exclude_characters = NULL,  
  remove_temp = TRUE  
)
```

Arguments

<code>delta</code>	A Delta dataset object (created by <code>load_delta</code>)
<code>heading</code>	Heading for the output (default = NULL, uses heading from specs file)
<code>match_overlap</code>	For unordered multistate characters, the contribution of a character to the distance between two items is 0 if the items have any of the values of the character in common (default = FALSE)
<code>minimum_comparisons</code>	Minimum number of character comparisons required to calculate the distance between two items (default = ceiling(sqrt(number of included characters)))
<code>phylip_format</code>	Causes the taxon names to be interleaved with the rows of the distance matrix, as required by the program Phylip (default = FALSE)
<code>exclude_items</code>	A list of items to be excluded (default = NULL)
<code>exclude_characters</code>	A list of characters to be excluded (default = NULL)
<code>remove_temp</code>	Logical; if TRUE, remove temporary files after conversion

Details

The function assumes that the CONFOR and DIST program executables are available in the system PATH or in the current working directory.

Value

Invisibly returns 0 on success

Examples

```
# Requires the CONFOR and DIST executables on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  dist(delta)
  dist(delta, match_overlap = TRUE, phylip_format = TRUE,
        minimum_comparisons = 10)
})
```

find_matching	<i>Find all matching items</i>
---------------	--------------------------------

Description

Find all matching items

Usage

```
find_matching(delta, charnum, values, strict = TRUE, with_extrval = TRUE)
```

Arguments

delta	A DeltaParser object
charnum	Character number
values	Numeric vector of values
strict	Logical; strict comparison
with_extrval	Logical; include extreme values

Value

Integer vector of matching item numbers

first_matching	<i>Find first matching item</i>
----------------	---------------------------------

Description

Find first matching item

Usage

```
first_matching(delta, charnum, values, strict = TRUE, with_extrval = TRUE)
```

Arguments

delta	A DeltaParser object
charnum	Character number
values	Numeric vector of values
strict	Logical; strict comparison
with_extrval	Logical; include extreme values

Value

Integer item number or 0 if none

get_all_depchar	<i>Get all dependent characters</i>
-----------------	-------------------------------------

Description

Get all dependent characters

Usage

```
get_all_depchar(delta, ccnum, ccstate)
```

Arguments

delta	A DeltaParser object
ccnum	Control character number
ccstate	Control character state

Value

Integer vector of dependent character numbers

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  get_all_depchar(delta, 13, 2)
})
```

get_all_dependencies	<i>Get all dependency relationships</i>
----------------------	---

Description

Get all dependency relationships

Usage

```
get_all_dependencies(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

List of all dependency relationships

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  get_all_dependencies(delta)
})
```

```
get_all_implicit_values
```

Get all implicit values

Description

Get all implicit values

Usage

```
get_all_implicit_values(delta, iv_type = 1)
```

Arguments

delta	A DeltaParser object
iv_type	Implicit value type (1 or 2, default: 1)

Value

Integer vector of implicit values

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  get_all_implicit_values(delta)
})
```

get_attribute	<i>Get attribute string (C++ style)</i>
---------------	---

Description

Get attribute string (C++ style)

Usage

```
get_attribute(delta, itemnum, attrnum)
```

Arguments

delta	A DeltaParser object
itemnum	Item number
attrnum	Attribute number

Value

Character string with the attribute

get_attributes_nb	<i>Get number of attributes (C++ style)</i>
-------------------	---

Description

Get number of attributes (C++ style)

Usage

```
get_attributes_nb(delta, itemnum)
```

Arguments

delta	A DeltaParser object
itemnum	Item number

Value

Integer number of attributes

get_chars_debug	<i>Get character debug output</i>
-----------------	-----------------------------------

Description

Get character debug output

Usage

get_chars_debug(delta)

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with debug output

get_chars_nb	<i>Get number of characters (C++ style)</i>
--------------	---

Description

Get number of characters (C++ style)

Usage

get_chars_nb(delta)

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Integer number of characters

get_char_feature	<i>Get character feature (C++ style)</i>
------------------	--

Description

Get character feature (C++ style)

Usage

get_char_feature(delta, charnum)

Arguments

- | | |
|---------|----------------------|
| delta | A DeltaParser object |
| charnum | Character number |

Value

Character string with the feature description

get_char_type	<i>Get character type (C++ style)</i>
---------------	---------------------------------------

Description

Get character type (C++ style)

Usage

get_char_type(delta, charnum)

Arguments

- | | |
|---------|----------------------|
| delta | A DeltaParser object |
| charnum | Character number |

Value

Integer character type code

get_char_unit	<i>Get character unit (C++ style)</i>
---------------	---------------------------------------

Description

Get character unit (C++ style)

Usage

```
get_char_unit(delta, charnum)
```

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Character string with the unit

get_depchar	<i>Get dependent character by rank (C++ style)</i>
-------------	--

Description

Get dependent character by rank (C++ style)

Get dependent character at specific rank

Usage

```
get_depchar(delta, ccnum, ccstate, rank = 1)
```

```
get_depchar(delta, ccnum, ccstate, rank = 1)
```

Arguments

delta	A DeltaParser object
ccnum	Control character number
ccstate	Control character state
rank	Rank position (default: 1)

Value

Integer dependent character number

Dependent character number or 0 if none

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  get_depchar(delta, 13, 2, 1)
})
```

get_depchar_nb	<i>Get number of dependent characters (C++ style)</i>
----------------	---

Description

Get number of dependent characters (C++ style)

Get number of dependent characters

Usage

```
get_depchar_nb(delta, ccnum, ccstate)
```

```
get_depchar_nb(delta, ccnum, ccstate)
```

Arguments

delta	A DeltaParser object
ccnum	Control character number
ccstate	Control character state

Value

Integer count of dependent characters

Number of dependent characters

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  get_depchar_nb(delta, 13, 2)
})
```

get_example_files	<i>Get example file paths for testing</i>
-------------------	---

Description

Get example file paths for testing

Usage

```
get_example_files(dataset = "viola")
```

Arguments

dataset	Character string: "viola" or "grass"
---------	--------------------------------------

Value

List with file paths

get_filename	<i>Get filename (C++ style)</i>
--------------	---------------------------------

Description

Get filename (C++ style)

Usage

```
get_filename(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with the filename

get_implicit_value	<i>Get implicit value (C++ style)</i>
--------------------	---------------------------------------

Description

Get implicit value (C++ style)

Get implicit value for a character

Usage

```
get_implicit_value(delta, charnum, iv_type = 1)
```

```
get_implicit_value(delta, charnum, iv_type = 1)
```

Arguments

delta	A DeltaParser object
charnum	Character number
iv_type	Implicit value type (1 or 2, default: 1)

Value

Integer implicit value

Integer value or NA if not defined

Examples

```
try({  
  delta <- load_delta(  
    system.file("extdata", "chars_viola", package = "RDelta"),  
    system.file("extdata", "items_viola", package = "RDelta"),  
    system.file("extdata", "specs_viola", package = "RDelta")  
  )  
  get_implicit_value(delta, 1)  
})
```

get_item	<i>Get complete item data as a list</i>
----------	---

Description

Retrieves all data for a specific item.

Usage

```
get_item(delta, itemnum, include_comments = FALSE)
```

Arguments

delta	A DeltaParser object
itemnum	Integer item number
include_comments	Logical; if TRUE, include comments in item names

Value

A list with item name and attributes

get_items_debug	<i>Get items debug output</i>
-----------------	-------------------------------

Description

Get items debug output

Usage

```
get_items_debug(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with debug output

get_items_filename	<i>Get items filename (C++ style)</i>
--------------------	---------------------------------------

Description

Get items filename (C++ style)

Usage

```
get_items_filename(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with the filename

get_items_nb	<i>Get number of items (C++ style)</i>
--------------	--

Description

Get number of items (C++ style)

Usage

```
get_items_nb(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Integer number of items

get_item_name	<i>Get item name (C++ style)</i>
---------------	----------------------------------

Description

Get item name (C++ style)

Usage

```
get_item_name(delta, itemnum, include_comments = TRUE)
```

Arguments

delta	A DeltaParser object
itemnum	Item number
include_comments	Logical; if TRUE, include comments in item names

Value

Character string with item name

get_specs_debug	<i>Get specifications debug output</i>
-----------------	--

Description

Get specifications debug output

Usage

```
get_specs_debug(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with debug output

get_specs_filename	<i>Get specifications filename (C++ style)</i>
--------------------	--

Description

Get specifications filename (C++ style)

Usage

```
get_specs_filename(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Character string with the filename

get_state	<i>Get state name (C++ style)</i>
-----------	-----------------------------------

Description

Get state name (C++ style)

Usage

```
get_state(delta, charnum, statenum)
```

Arguments

delta	A DeltaParser object
charnum	Character number
statenum	State number

Value

Character string with state name

get_states_nb	<i>Get number of states (C++ style)</i>
---------------	---

Description

Get number of states (C++ style)

Usage

```
get_states_nb(delta, charnum)
```

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Integer number of states

get_version	<i>Get version of the underlying C++ library</i>
-------------	--

Description

Get version of the underlying C++ library

Usage

```
get_version(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Version string

has_specifications	<i>Check if specifications are available</i>
--------------------	--

Description

Check if specifications are available

Usage

has_specifications(delta)

Arguments

delta A DeltaParser object

Value

Logical

implicit_value	<i>Get implicit value</i>
----------------	---------------------------

Description

Get implicit value

Usage

implicit_value(delta, charnum, iv_type = 1)

Arguments

delta A DeltaParser object
charnum Character number
iv_type Implicit value type (1 or 2)

Value

Integer implicit value

implicit_values	<i>Get all implicit values</i>
-----------------	--------------------------------

Description

Get all implicit values

Usage

```
implicit_values(delta, iv_type = 1)
```

Arguments

delta	A DeltaParser object
iv_type	Implicit value type (1 or 2)

Value

Integer vector of implicit values

is_chars_parsed	<i>Check if characters are parsed</i>
-----------------	---------------------------------------

Description

Check if characters are parsed

Usage

```
is_chars_parsed(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Logical

is_dependent	<i>Check if character is dependent</i>
--------------	--

Description

Check if character is dependent

Check if a character is dependent

Usage

```
is_dependent(delta, dcnum, ccnum, ccstate)
```

```
is_dependent(delta, dcnum, ccnum, ccstate)
```

Arguments

delta	A DeltaParser object
dcnum	Dependent character number
ccnum	Control character number
ccstate	Control character state

Value

Logical indicating if dependent

Logical indicating if dcnum is dependent

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  is_dependent(delta, 14, 13, 2)
})
```

is_items_parsed	<i>Check if items are parsed</i>
-----------------	----------------------------------

Description

Check if items are parsed

Usage

is_items_parsed(delta)

Arguments

delta A DeltaParser object

Value

Logical

is_parsed	<i>Check if parsed (C++ style)</i>
-----------	------------------------------------

Description

Check if parsed (C++ style)

Usage

is_parsed(delta)

Arguments

delta A DeltaParser object

Value

Logical

is_specs_parsed	<i>Check if specifications are parsed</i>
-----------------	---

Description

Check if specifications are parsed

Usage

```
is_specs_parsed(delta)
```

Arguments

delta A DeltaParser object

Value

Logical

items_df	<i>Get item information as a data frame</i>
----------	---

Description

Extracts all item information from a DELTA dataset and returns it as a data frame.

Usage

```
items_df(delta, include_comments = FALSE)
```

Arguments

delta A DeltaParser object
include_comments Logical; if TRUE, include comments in item names

Value

A data.frame with item information

items_filename	<i>Get items filename</i>
----------------	---------------------------

Description

Get items filename

Usage

items_filename(delta)

Arguments

delta A DeltaParser object

Value

Character string with the filename

item_attributes	<i>Get item attributes as data frame</i>
-----------------	--

Description

Get item attributes as data frame

Usage

item_attributes(delta, itemnum)

Arguments

delta A DeltaParser object
itemnum Item number

Value

Data frame with attributes

item_count	<i>Get number of items</i>
------------	----------------------------

Description

Get number of items

Usage

```
item_count(delta)
```

Arguments

delta	A DeltaParser object
-------	----------------------

Value

Integer number of items

Examples

```
delta <- tryCatch(
  load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  ),
  error = function(e) NULL
)
if (!is.null(delta)) item_count(delta)
```

item_data	<i>Get item data as list</i>
-----------	------------------------------

Description

Get item data as list

Usage

```
item_data(delta, itemnum, include_comments = FALSE)
```

Arguments

delta	A DeltaParser object
itemnum	Item number
include_comments	Logical; if TRUE, include comments in item names

Value

List with item data

item_name	<i>Get item name</i>
-----------	----------------------

Description

Get item name

Usage

```
item_name(delta, itemnum, include_comments = TRUE)
```

Arguments

- delta A DeltaParser object
- itemnum Item number
- include_comments Logical; if TRUE, include comments in item names

Value

Character string with item name

Examples

```
delta <- tryCatch(
  load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  ),
  error = function(e) NULL
)
if (!is.null(delta)) item_name(delta, 1)
```

item_names	<i>Get all item names</i>
------------	---------------------------

Description

Get all item names

Usage

```
item_names(delta, include_comments = FALSE)
```

Arguments

delta	A DeltaParser object
include_comments	Logical; if TRUE, include comments in item names

Value

Character vector of item names

key	<i>Generate Dichotomous Key using CONFOR/KEY</i>
-----	--

Description

This function replicates the KEY command in the DELTA system for generating dichotomous keys. It creates the necessary directives files and runs the CONFOR and KEY programs.

Usage

```
key(
  delta,
  heading = NULL,
  add_character_numbers = FALSE,
  no_bracketted_key = FALSE,
  no_tabular_key = TRUE,
  number_of_confirmatory_characters = 0,
  treat_characters_as_variable = NULL,
  use_normal_values = NULL,
  character_reliabilities = NULL,
  key_states = NULL,
  abase = 2,
  rbase = 1.4,
  reuse = 1.01,
```

```

    varywt = 0.8,
    print_width = 80,
    exclude_items = NULL,
    exclude_characters = NULL,
    remove_temp = TRUE
)

```

Arguments

<code>delta</code>	A Delta dataset object (created by <code>load_delta</code>)
<code>heading</code>	Heading for the output (default = NULL, uses heading from specs file)
<code>add_character_numbers</code>	Character numbers are to be inserted in bracketed keys (default = FALSE)
<code>no_bracketted_key</code>	Suppresses the production of a key in the conventional, 'bracketed' format (default = FALSE)
<code>no_tabular_key</code>	Suppresses the production of a key in tabular format (default = TRUE)
<code>number_of_confirmatory_characters</code>	Number of confirmatory characters that will be sought for each main character in the key (default = 0, maximum = 4)
<code>treat_characters_as_variable</code>	A list of characters for which particular attributes are to be treated as 'variable' (default = NULL)
<code>use_normal_values</code>	A list of numeric characters for which extreme values are to be ignored and normal values used when translating into other formats (default = NULL)
<code>character_reliabilities</code>	A list of the 'reliabilities' of the characters (default = NULL)
<code>key_states</code>	A list of numeric character states to be divided into ranges for use as states in identification keys (default = NULL)
<code>abase</code>	Sets the base of the logarithmic item abundance scale (default = 2)
<code>rbase</code>	Sets the base of the logarithmic character-reliability scale (default = 1.4)
<code>reuse</code>	Attempt to minimize the number of different characters used in the key (default = 1.01)
<code>varywt</code>	Sets the value of a parameter that determines the treatment of intra-taxon variability in the process of character selection (default = 0.8)
<code>print_width</code>	Maximum line length for output of the keys (default = 80)
<code>exclude_items</code>	A list of items to be excluded (default = NULL)
<code>exclude_characters</code>	A list of characters to be excluded (default = NULL)
<code>remove_temp</code>	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR and KEY program executables are available in the system PATH or in the current working directory.

Value

Invisibly returns the key as a character vector on success

Examples

```
# Requires the CONFOR and KEY executables on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  key(delta)
  key(delta, abase = 2, rbase = 1.4,
    no_tabular_key = TRUE, number_of_confirmatory_characters = 2)
})
```

load_delta

Load a DELTA dataset

Description

Create a DeltaParser object from DELTA format files.

Usage

```
load_delta(chars_file, items_file, specs_file = NULL)
```

Arguments

chars_file	Path to the DELTA characters file
items_file	Path to the DELTA items file
specs_file	Optional path to the DELTA specifications file

Value

A DeltaParser Rcpp module object

Examples

```
# Load the packaged example dataset
delta <- tryCatch(
  load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
)
```

```
    ),
    error = function(e) NULL
  )

  if (!is.null(delta)) {
    char_count(delta)
    char_feature(delta, 1)
  }
}
```

matches	<i>Check if item matches values</i>
---------	-------------------------------------

Description

Check if item matches values

Usage

```
matches(delta, itemnum, charnum, values, strict = TRUE, with_extrval = TRUE)
```

Arguments

- | | |
|--------------|---------------------------------|
| delta | A DeltaParser object |
| itemnum | Item number |
| charnum | Character number |
| values | Numeric vector of values |
| strict | Logical; strict comparison |
| with_extrval | Logical; include extreme values |

Value

Logical indicating if item matches

natlan	<i>Translate DELTA-format data into natural language descriptions via CONFOR</i>
--------	--

Description

This function replicates the TRANSLATE INTO NATURAL LANGUAGE command in the DELTA system. It creates the necessary directives file and runs the CONFOR program to generate natural language descriptions.

Usage

```

natlan(
  delta,
  heading = NULL,
  replace_angle_brackets = TRUE,
  omit_character_numbers = TRUE,
  omit_inapplicables = TRUE,
  omit_comments = TRUE,
  omit_inner_comments = TRUE,
  omit_final_comma = TRUE,
  translate_implicit_values = FALSE,
  omit_lower_for_characters = NULL,
  omit_or_for_characters = NULL,
  omit_period_for_characters = NULL,
  new_paragraphs_at_characters = NULL,
  item_subheadings = NULL,
  link_characters = NULL,
  replace_semicolon_by_comma = NULL,
  print_width = 80,
  exclude_items = NULL,
  exclude_characters = NULL,
  vocabulary = NULL,
  remove_temp = TRUE
)

```

Arguments

<code>delta</code>	A Delta dataset object (created by load_delta)
<code>heading</code>	Heading for the descriptions (default = NULL, uses heading from specs file)
<code>replace_angle_brackets</code>	Replace angle brackets with parentheses (default = TRUE)
<code>omit_character_numbers</code>	Omit character numbers from descriptions (default = TRUE)
<code>omit_inapplicables</code>	Omit 'or not applicable' from descriptions (default = TRUE)
<code>omit_comments</code>	Omit comments in attributes (default = TRUE)
<code>omit_inner_comments</code>	Omit inner comments in character list and attributes (default = TRUE)
<code>omit_final_comma</code>	Omit final comma before 'and' (default = TRUE)
<code>translate_implicit_values</code>	Output implicit values in descriptions (default = FALSE)
<code>omit_lower_for_characters</code>	List of numeric characters to omit lower values
<code>omit_or_for_characters</code>	List of characters to omit 'or' between alternatives

omit_period_for_characters	List of characters where period would normally terminate a sentence
new_paragraphs_at_characters	List of characters where new paragraphs should start
item_subheadings	List of subheadings for items (delimiter/character/value)
link_characters	List of characters specifying how attributes are combined
replace_semicolon_by_comma	List of characters to use comma instead of semicolon
print_width	Maximum line length for output (default = 80)
exclude_items	List of items to exclude
exclude_characters	List of characters to exclude
vocabulary	List for custom vocabulary (default = NULL)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Invisibly returns the descriptions as a character vector

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  natlan(delta)
  natlan(delta,
    heading = "Flora of Region X - species descriptions",
    item_subheadings = list(
      "87" = "Transverse section of lamina",
      "96" = "Leaf epidermis"
    )
  )
})
```

next_matching	<i>Find next matching item</i>
---------------	--------------------------------

Description

Find next matching item

Usage

next_matching(delta, charnum, values, strict = TRUE, with_extrval = TRUE)

Arguments

- delta A DeltaParser object
- charnum Character number
- values Numeric vector of values
- strict Logical; strict comparison
- with_extrval Logical; include extreme values

Value

Integer item number or 0 if none

parse_attribute	<i>Parse a DELTA attribute string</i>
-----------------	---------------------------------------

Description

Parse a DELTA attribute string

Usage

parse_attribute(attr_string)

Arguments

- attr_string A DELTA attribute string

Value

A list with parsed components: charnum (integer), comment (character), and alternatives (list of parsed value lists).

parse_characters	<i>Parse characters file</i>
------------------	------------------------------

Description

Parse characters file

Usage

parse_characters(delta)

Arguments

delta A DeltaParser object

Value

Logical indicating success

parse_items	<i>Parse items file</i>
-------------	-------------------------

Description

Parse items file

Usage

parse_items(delta)

Arguments

delta A DeltaParser object

Value

Logical indicating success

parse_specs	<i>Parse specifications file</i>
-------------	----------------------------------

Description

Parse specifications file

Usage

```
parse_specs(delta)
```

Arguments

delta A DeltaParser object

Value

Logical indicating success

pcoa	<i>Principal Coordinates Analysis</i>
------	---------------------------------------

Description

Performs principal coordinates analysis (PCoA) on a distance matrix generated by the `dist()` function. This function reads the distance matrix and item names from the DIST output files and creates a PCoA scatterplot.

Usage

```
pcoa(notu)
```

Arguments

notu Number of operational taxonomic units (items) in the dataset.

Value

Invisibly returns a list with the following components:

points A two-column matrix of the coordinates of the items on the first two principal coordinate axes.

eig The eigenvalues of the PCoA solution, as returned by [cmdscale](#).

variance A numeric vector of length 2 giving the proportion of total variance explained by Axis 1 and Axis 2 (values between 0 and 1).

cumulative A single numeric value giving the cumulative proportion of variance explained by the first two axes combined.

cmdscale The full result object returned by [cmdscale](#), for users who need access to all components.

Examples

```
# Requires the CONFOR and DIST executables on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  dist(delta)
  res <- pcoa(delta$get_items_nb())
  res$variance
  res$cumulative
})
```

retrieve_all	<i>Retrieve ALL information for debugging</i>
--------------	---

Description

This matches the C++ retrieve_all() method from the original tDelta library, combining characters, items, and specifications output.

Usage

```
retrieve_all(delta)
```

Arguments

delta A DeltaParser object

Value

Character string with all debug information

retrieve_all_chars	<i>Retrieve all character information for debugging</i>
--------------------	---

Description

This matches the C++ retrieve_all() method from the original tDelta library.

Usage

```
retrieve_all_chars(delta)
```

Arguments

delta A DeltaParser object

Value

Character string with debug information

retrieve_all_items	<i>Retrieve all item information for debugging</i>
--------------------	--

Description

This matches the C++ retrieve_all() method from the original tDelta library.

Usage

retrieve_all_items(delta)

Arguments

delta A DeltaParser object

Value

Character string with debug information

retrieve_all_specs	<i>Retrieve all specifications information for debugging</i>
--------------------	--

Description

This matches the C++ retrieve_all() method from the original tDelta library.

Usage

retrieve_all_specs(delta)

Arguments

delta A DeltaParser object

Value

Character string with debug information

save_delta	<i>Save a Delta dataset to disk</i>
------------	-------------------------------------

Description

This function saves a Delta dataset object to disk as three plain text files: "chars", "items", and "specs" in the DELTA format.

Usage

```
save_delta(delta, dir, prefix = "", overwrite = FALSE, width = 79)
```

Arguments

delta	A Delta dataset object (Rcpp_DeltaParser from load_delta())
dir	Path to the directory where files should be saved. This argument is required: the function never writes to the current working directory by default. Use tempdir() if you only need a scratch location.
prefix	Optional prefix for filenames (default: "")
overwrite	Whether to overwrite existing files (default: FALSE)
width	Maximum line width for output files (default: 79, range: 40-132)

Value

Invisibly returns the input delta object

Examples

```
try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )

  # Write to a temporary directory
  save_delta(delta, dir = tempdir())

  # Write to a user-chosen directory with a prefix
  save_delta(delta, dir = tempdir(), prefix = "my_", overwrite = TRUE)

  # Use a wider output width
  save_delta(delta, dir = tempdir(), width = 120)
})
```

set_chars_filename	<i>Set characters filename</i>
--------------------	--------------------------------

Description

Set characters filename

Usage

```
set_chars_filename(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The characters filename stored in `delta` is updated.

set_char_type	<i>Set character type</i>
---------------	---------------------------

Description

Set character type

Usage

```
set_char_type(delta, charnum, chartype)
```

Arguments

delta	A DeltaParser object
charnum	Character number
chartype	Integer character type code

Value

No return value, called for side effects. The character type of `charnum` is modified in `delta` in place.

set_char_type_by_name *Set character type by name*

Description

Set character type by name

Usage

```
set_char_type_by_name(delta, charnum, type_name)
```

Arguments

delta	A DeltaParser object
charnum	Character number
type_name	Character type name

Value

No return value, called for side effects. The character type of charnum is modified in delta in place.

set_filename *Set filename (C++ style)*

Description

Set filename (C++ style)

Usage

```
set_filename(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The characters filename stored in delta is updated.

set_items_file	<i>Set items filename</i>
----------------	---------------------------

Description

Set items filename

Usage

```
set_items_file(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The items filename stored in `delta` is updated.

set_items_filename	<i>Set items filename (C++ style)</i>
--------------------	---------------------------------------

Description

Set items filename (C++ style)

Usage

```
set_items_filename(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The items filename stored in `delta` is updated.

set_specs_file	<i>Set specifications filename</i>
----------------	------------------------------------

Description

Set specifications filename

Usage

```
set_specs_file(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The specifications filename stored in `delta` is updated.

set_specs_filename	<i>Set specifications filename (C++ style)</i>
--------------------	--

Description

Set specifications filename (C++ style)

Usage

```
set_specs_filename(delta, fname, parse = TRUE)
```

Arguments

delta	A DeltaParser object
fname	New filename
parse	Logical, parse the file immediately

Value

No return value, called for side effects. The specifications filename stored in `delta` is updated.

specs_filename	<i>Get specifications filename</i>
----------------	------------------------------------

Description

Get specifications filename

Usage

specs_filename(delta)

Arguments

delta A DeltaParser object

Value

Character string with the filename

states	<i>Get all states for a character</i>
--------	---------------------------------------

Description

Get all states for a character

Usage

states(delta, charnum)

Arguments

delta A DeltaParser object
charnum Character number

Value

Character vector of state names

state_count	<i>Get number of states for a character</i>
-------------	---

Description

Get number of states for a character

Usage

state_count(delta, charnum)

Arguments

delta	A DeltaParser object
charnum	Character number

Value

Integer number of states

state_name	<i>Get state name</i>
------------	-----------------------

Description

Get state name

Usage

state_name(delta, charnum, statenum)

Arguments

delta	A DeltaParser object
charnum	Character number
statenum	State number

Value

Character string with state name

strip_comments	<i>Remove comments from a DELTA string</i>
----------------	--

Description

Remove comments from a DELTA string

Usage

```
strip_comments(src)
```

Arguments

src	A string with DELTA comments
-----	------------------------------

Value

A character string with all DELTA comments (delimited by < and >) removed.

summary	<i>Generate a statistical summary of taxonomic characters using CONFOR</i>
---------	--

Description

This function creates a directives file for the CONFOR program to generate a statistical summary of characters for a DELTA dataset. The summary includes character types, states, and frequency distributions.

Usage

```
summary(delta, heading = NULL, remove_temp = TRUE)
```

Arguments

delta	A Delta dataset object (created by load_delta)
heading	Heading for the summary (default = NULL, uses heading from specs file)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Invisibly returns the path to the generated summary file

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  summary(delta)
  summary(delta, heading = "Genre Viola")
})
```

uncoded

Generate a list of uncoded characters using CONFOR

Description

This function creates a directives file for the CONFOR program to generate a list of characters that are not coded (i.e., have no data) in a DELTA dataset. This is useful for identifying missing data and gaps in taxonomic descriptions.

Usage

```
uncoded(delta, heading = NULL, remove_temp = TRUE)
```

Arguments

delta	A Delta dataset object (created by <code>load_delta</code>)
heading	Heading for the output (default = NULL, uses heading from specs file)
remove_temp	Logical; if TRUE, remove temporary files after conversion (default = TRUE)

Details

The function assumes that the CONFOR program executable is available in the system PATH or in the current working directory.

Value

Invisibly returns the path to the generated uncoded characters file

Examples

```
# Requires the CONFOR executable on the PATH.

try({
  delta <- load_delta(
    system.file("extdata", "chars_viola", package = "RDelta"),
    system.file("extdata", "items_viola", package = "RDelta"),
    system.file("extdata", "specs_viola", package = "RDelta")
  )
  uncoded(delta)
  uncoded(delta, heading = "Genre Viola - Missing data report")
})
```

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