Package 'SDAR'

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Title Stratigraphic Data Analysis

Version 0.9-3

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Depends R (>= 3.0)

Description A fast, consistent tool for plotting and facilitating the analysis of stratigraphic and sedimentological data. Taking advantage of the flexible plotting tools available in R, 'SDAR' uses stratigraphic and sedimentological data to produce detailed graphic logs for outcrop sections and borehole logs. These logs can include multiple features (e.g., bed thickness, lithology, samples, sedimentary structures, colors, fossil content, bioturbation index, electrical logs) (Johnson, 1992, <ISSN 0037-0738>).

License GPL (>= 2)

URL https://repository.si.edu/10088/35917

Imports methods, grid, linbin, grImport2, readxl

Repository CRAN

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Note The development of this package was supported by Carlos Jaramillo, Center for Tropical Paleoecology and Archaeology at Smithsonian Tropical Research Institute.

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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R topics documented:

`log_demo` *Simulated log demo borehole Saltarin 1A dataset (gamma-ray)*

Description

this gamma-ray log is a simulated dataset generated for SDAR examples, this electrical log does not have a geological meaning".

Usage

```
data(log_demo)
```

Format

The *log_demo* dataset provided by this package is a provisional dataset comprising the gamma-ray values along of 671 meters of the Saltarin 1A borehole; it is a data.frame object with 2 (columns), Depth and GR values.

Depth numeric; stratigraphic position where the Gamma-ray was measured, in meters.

GR numeric; measured gamma ray intensity, API units.

Examples

```
data(log_demo)
names(log_demo)
```

`plot` *Plot method for stratigraphic and sedimentological data (strata class object)*

Description

Plot method for stratigraphic and sedimentological data. This function will produce a graphic log of outcrop section or borehole log in a PDF format (check the working directory for the PDF output file).

Usage

```
## S3 method for class 'strata'
plot(x,
  datum = "top",
  data.units = "feet",
  d.scale = 100,
  d.barscale = 2,
  lithology = TRUE,
  bed.number = TRUE,
  file.name = "SDAR_graphical_output",
  GR.log = NULL,
  ncore = NULL,
  samples = NULL,
  oil.stain = NULL,
  sed.structures = NULL,
  fossils = NULL,
  tracefossils = NULL,
  other.sym = NULL,
  bioturbation = NULL,
  lithostrat = NULL,
  d.legend = TRUE,
  metadata = NULL,
  main = NULL,
  sub = NULL,
  subset.base = NULL,
  subset.top = NULL,
  plot.order = NULL,
  d.color = 0,
  bar.type = 0,
  symbols.size = 1,
  xlim.GR=c(0, 300),
  family = "serif",
  fontsize = 10,
  cex.main = 1,
  ...)
```

Arguments

x	an object of strata class to be plotted, which holds the minimum required data to draw a lithological profile in SDAR. See strata class for more details about the requirements of this 'x' object.
datum	string; either 'base' or 'top', case sensitive. 'base' is the case when thickness is measured up from the bottom of, e.g., an outcrop section; 'top' is the case when depths are measured down from the surface, e.g., boreholes and cores.
data.units	string; either 'meters' or 'feet', case sensitive. This argument specifies the unit of measure of the stratigraphic thickness used for input data (thickness measured in field). Default unit 'feet'.

`d.scale` default 100, a numerical value giving the graphic vertical scaling. It defines the vertical scale on which the graphic log is drawn; recommended scales are 1:25, 1:50, 1:100, 1:250, 1:500, and 1:1000.

`d.barscale` default 2, a numerical value indicating how often the horizontal tick marks will be displayed on the vertical scale (thickness). The bar scale is displayed using the same units as 'data.units' parameter, and it will be plotted at the left side of the graphic log.

`lithology` default `TRUE`; a logical value indicating whether lithology should be displayed.

`bed.number` default `TRUE`; a logical value indicating whether bed number should be displayed.

`file.name` string; a file name without extension. Graphic logs generated by SDAR are exported as PDF files (editable with vector graphics software). The paper size is automatically updated when the vertical scale changes, or when different sets of attributes are displayed adjacent to the lithology column. Default name "SDAR_graphical_output".

`GR.log` a two-column data frame containing the depth, and the total natural radioactivity measured in API units; the columns must be named ('Depth' and 'GR'). See read.LAS function for details of how to parse geophysical "Log Ascii Standard" files (.las files) into R.

`ncore` a data frame containing the depth interval and the core number. It is useful information about how the core is stored. This information should be stored into three columns named ('base', 'top', and 'core_number'), with the information of each core in a separate row containing the depth interval (base and top) and the core number.

`samples` a data frame containing the sample dataset. This information should be stored in three columns named ('base', 'top', and 'type'); the columns 'base' and 'top' should be numeric. Each sample should be in a separate row containing the stratigraphic position (base and top) and the analysis type (e.g., palynology, petrography, rock sample). It is possible to add drawing parameters such as 'pch', and 'color', each one in a separate column in the input data.

`oil.stain` a data frame containing the oil.stain dataset. This information should be stored in three columns named ('base', 'top', and 'intensity'); the columns 'base' and 'top' should be numeric. Each staining interval should be in a separate row containing the stratigraphic position (base and top) and the staining intensity (weak, moderate, moderate strong, strong).

`sed.structures` a data frame containing the sedimentary structure dataset. This information should be stored in three columns named ('base', 'top', and 'sed_structure'); the columns 'base' and 'top' should be numeric. Each sedimentary structure occurrence should be in a separate row containing the stratigraphic position and the sedimentary structure type; overlapping between sedimentary structures intervals is allowed.

`fossils` a data frame containing the fossil dataset. This information should be stored in three columns named ('base', 'top', and 'fossil'); the columns 'base' and 'top' should be numeric. Each fossil occurrence should be in a separate row containing the stratigraphic position and the fossil type. If the fossil occurrence

covers a stratigraphic interval, define it using 'base' and 'top' (overlapping between fossil intervals is allowed); in a case where fossil occurrence corresponds to a specific stratigraphic position, fill variables 'base' and 'top' with the same stratigraphic position value.

`tracefossils` same dataset structure as fossil dataset. Three columns named ('base', 'top', and 'tracefossil'), "this option is not available at current version".

`other.sym` same dataset structure as fossil dataset. Three columns named ('base', 'top', and 'other_symbols'). This is the place to symbolize features as accessory minerals, organic matter, intraclast, etc.

`bioturbation` a data frame containing the bioturbation dataset. This information should be stored in three columns named ('base', 'top', and 'index'); the columns 'base' and 'top' should be numeric. Each bioturbated interval should be in a separate row containing the stratigraphic interval (base and top) and the bioturbation index value. The index classifies on a scale of zero to six (Reineck, 1967; modified by Taylor and Goldring, 1993).

`lithostrat` a data frame containing the lithostratigraphic data. This information should be stored in four columns named ('base', 'top', 'litho_unit_type' and 'name'); the columns 'base' and 'top' should be numeric. Each lithostratigraphic interval should be in a separate row containing the stratigraphic interval (base and top), the lithostratigraphic unit rank (e.g., Group, Formation, Member, Informal Member), and the name of the lithostratigraphic unit.

`d.legend` default `TRUE`; a logical value indicating whether automatic legend should be drawn. The legend function creates a legend based on the lithological, sedimentological, and paleontological data provided for the current stratigraphic section or well. SDAR uses the standard symbols suggested by the Federal Geographic Data Committee. The legend will be displayed at the bottom of the PDF file.

`metadata` an object of class list, including any or all of the following named values: locality_name, locality_id, locality_type, thickness_unit, reference_datum, latitude, longitude, elevation, country, author and/or references. The objects in the list should be named using the previous names 'case sensitive', e.g., list(locality_name = "Saltarin", locality_type = "borehole core", thickness_unit = "meters", country = "Colombia", author ="Ortiz J. & Jaramillo C.").

`main` an overall title for the graphic log, the main title (on top).

`sub` an overall sub-title for the graphic log, the sub-title (on top).

`subset.base` option to draw and analyse a specific interval for a given outcrop section or borehole log. This argument defines the lower limit of the stratigraphic interval of interest.

`subset.top` This argument defines the upper limit of the stratigraphic interval of interest.

`plot.order` a string vector. This parameter provides a user interaction to arrange (order) the layout scheme. If the user wants to change the default order, this string vector provides the desired order, e.g., c("d.samples", "d.ncore", "d.bed.number", "d.graphic_bar", "d.lithostrat", "d.lithology", "d.fossils", "d.tracefossils", "d.sed.structures", "d.other.sym", "d.oil.stain", d.bioturbation", "d.GR.log").

`d.color` numeric 0 or 3; '0 to draw SDAR default colors', or '3 for black & white option', (munsell and RGB options will be available at next version)

bar.type	numeric 0 or 1; '0 to draw classical black & white bar', or '1 to draw a simple "line" with tick marks'
symbols.size	numeric; a number indicating the amount by which plotting symbols (fossils, tracefossils, sedimentary structures, and other symbols) should be re-scaled relative to the default. 0.5 = default, 1 is 50% larger, 0.4 is 10% smaller, etc.
xlim.GR	a range to specify axis limits *c(xmin, xmax)*, its define the minimum and maximun value of the x-axis to display Gamma Ray data.
family	the font family to be used. The default font family is serif, in windows, serif is mapped to "TT Times New Roman".
fontsize	numeric; number indicating the amount by which plotting text should be scaled relative to default. 1=default, 1.5 is 50% larger, 0.5 is 50% smaller, etc.
cex.main	number indicating the amount by which main text should be scaled relative to the default. 1=default, 1.5 is 50% larger, 0.5 is 50% smaller, etc.
...	other arguments

Note

We have presented a summary of the specific types of data required by the SDAR package, along with the formats that should be followed when inputting data to be integrated using SDAR. The SDAR project includes the development of a graphic user interface to connect this R package with a database management system; for this reason the structure of the data and headers (column names) should be followed in order to match the database structure.
On the SDAR repository there are two excel spreadsheet with the suggested format by SDAR, one to store thickness, and texture description of rock layers (beds), and other to store "intervals information" (e.g., metadata, samples, oil stain, bioturbation, sedimentary structures, fossil and trace fossil content).
If you see problems with the PDF output, remember that the problem is much more likely to be in your viewer than in R. Try another viewer if possible.

Author(s)

John Ortiz, <jrortizt@unal.edu.co>

References

Reineck, H.-E., 1967. *Parameter von Schichtung und bioturbation. Geologischen Rundschau* **56**, 420-438.

Taylor, A.M., Goldring, R., 1993. *Description and analysis of bioturbation and ichnofabric. Journal of the Geological Society of London* **150**, 141-148.

Examples

```
# --------  OUTPUT  --------
#  The output of this function is a graphic log of outcrop section or borehole log
#     in a PDF format (check the working directory for the PDF output file, deafult
#     name "SDAR_graphic_log.pdf").
# --------------------------
```

```
# ----------
# example 1: Graphic log of Saltarin 1A core using SDAR default options.
# ----------

data(saltarin)
saltarin_val <- strata(saltarin, datum="top")
plot(saltarin_val, subset.base=200, subset.top=0,
  main="Graphic log of Saltarin-1A well", sub="Scale 1:100",
  file.name=tempfile("saltarin_well_SDAR_demo"))

# ----------
# example 2:
# ----------

data(log_demo)
plot(saltarin_val, d.scale=200, d.barscale=5,
  subset.base=400, subset.top=0,
  main="Graphic log of Saltarin-1A well", sub="Scale 1:200",
  GR.log=log_demo, file.name=tempfile("log_demo_SDAR"))

# ----------
# example 3:  Read beds information from "SDAR excel spreadsheet format"
# ----------

library(readxl)
fpath <- system.file("demo_data_entry",
  "SDAR_beds_data_entry_saltarin.xlsx", package = "SDAR")
beds_saltarin <- read_excel(fpath, trim_ws=FALSE)
beds_val <- strata(beds_saltarin, datum="top")
plot(beds_val, d.scale=50,
  subset.base=120, subset.top=10,
  main="Graphic log of Saltarin-1A well", sub="Scale 1:200",
  file.name=tempfile("saltarin_well"))
```

`read.LAS` *read.LAS files*

Description

Log ASCII Standard (LAS) is a standard file-format common in the oil-and-gas and water-well industries to store well log information. This function is designed to read Log ASCII Standard (LAS) files; the objective of this function is to omit the information in the header of the LAS file, and extract only the data (curve information ~*A "ASCII Log Data"*) to keep it into R data structure `data.frame`. Also, it includes the option of write the data table (curve information) as CSV file. *WARNING: This method is very much in an alpha stage. Expect it to change.*

Usage

```
read.LAS(filePath, repl.null = FALSE, writecsv=FALSE)
```

Arguments

`filePath`	the name of the .LAS file which the data are to be read. If `filePath` does not contain an *absolute* path, the file name is *relative* to the current working directory. `filePath` can also be a complete URL.
`repl.null`	logical, default `FALSE`. It refers to null values; commonly used null values in .LAS files are -9999, -999.25 and -9999.25. If this argument is set to `TRUE`, the null values will be replaced by missing values (**NA**).
`writecsv`	logical, default `FALSE`. If `TRUE` the data *~A (ASCII Log Data)* will be saved in a CSV format. Note that the file is written to your working directory; row and column names are included. See default options of `write.csv` function.

Note

read.LAS function included in SDAR packages is not very mature yet; it is an experimental version. We are working on making it compatible with versions 1.2, 2.0 and 3.0 of the LAS file specification published by the Canadian Well Logging Society(CWLS).
This is NOT a function to read LAS file formats used for Remote Sensing Data (also called LAS files); there is a package on CRAN called **rlas** to read and write this format.
The source of the file '1044907529.las' Well 13-T (API: 15-003-25233) is the Kansas Geological Survey website. All Rights Reserved.

Author(s)

John Ortiz

Examples

```
fpath <- system.file("demo_data_entry", "1044907529.las", package = "SDAR")
data_logs <- read.LAS(fpath, repl.null=TRUE)
names(data_logs)
GR_SDAR_format <- data_logs[,c(1, 4)]
```

`saltarin` *Lithological description of borehole Saltarin 1A dataset (beds/layers)*

Description

This dataset gives a lithologic description for borehole Saltarin 1A, located in the Llanos Basin in eastern Colombia (4.612 N, 70.495 W). The stratigraphic well Saltarin 1A drilled 671 meters of the Miocene succession of the eastern Llanos basin, corresponding to the Carbonera (124.1 m; 407.1 ft), Leon (105.1 m; 344.8 ft), and Guayabo Formations (441.8 m; 1449.5 ft) (Bayona, et al. 2008). The Saltarin core was described at a scale of 1:50 for identification of grain-size trends, sedimentary structures, clast composition, thickness of lamination, bioturbation patterns, and macrofossil identification, all of which are used for identify individual lithofacies and for sedimentological and stratigraphic analyses.

Usage

```
data(saltarin)
```

Format

The *Saltarin* dataset provided by this package is a dataset comprising the lithological description of 686 rock layers described along of 671 meters of the Saltarin 1A borehole; it is a data.frame object with 686 layers (rows), including thickness, composition and texture description of each layer, stored following the suggested format by SDAR (27 columns).

locality_id numeric; it is an ID number that uniquely identifies a locality in a database.

bed_number numeric; it is useful to give each bed/layer a number to facilitate later reference; numbering begins at the stratigraphically lowest bed (Tucker 2011)

base numeric; stratigraphic position measured at the bottom of each layer, in meters.

top numeric; stratigraphic position measured at the top of each layer, in meters.

rock_type string; rock type class following this clasification: *sedimentary, igneous, or covered*.

prim_litho string; description of the primary (i.e. major) lithology class, (e.g., *claystone, mudstone, siltstone, shale, sandstone, conglomerate, breccia, limestone, coal*).

grain_size string; description of the grain size dominant in layer. For siliciclastic rocks, it is based on the Wentworth (1922) classification system, for carbonate rocks it is based on Dunham (1962), and for classification of pyroclastic rocks it is based on Wentworth and Williams (1932). (e.g., *mud, silt; very fine sand, fine sand, medium sand, coarse sand, and very coarse sand*); see a grain-size table in vignettes.

prim_pct numeric; percent of primary lithology.

sec_litho string; using same category table described for *prim_litho*.

sec_pct numeric; percent of secondary lithology.

ter_litho string; using same category table described for *prim_litho*.

ter_pct numeric; percent of tertiary lithology.

contact_type string; description of the boundary at the base of the layer (geological contact): *sharp planar, sharp irregular, erosional, gradational, faulted, covered*.

grading string; description of the vertical variations in grain size; *ungraded, normal* (beds that show gradation from coarser particles at the base to finer particles at the top), *inverse* (reverse or inverse grading, gradation from finer at the base to coarser at the top), (Boggs, 2011).

grain_size_base string; grain size at the base of the layer using same category table described for *grain_size*.

grain_size_top string; grain size at the top of the layer using same category table described for *grain_size*.

grain_size_int_A string; grain size at intermediate **point A** using same category table described for *grain_size*. *Points A and B* provides flexibility to draw grain size variations inside of a bed; see viggnetes for more details.

strat_pos_int_A numeric; stratigraphic position of point A.

grain_size_int_B grain size at intermediate **point B** using same category table described for *grain_size*.

strat_pos_int_B numeric; stratigraphic position of point B.

sorting string; description of the degree of uniformity of grain size: *very well sorted, well sorted, moderately sorted, poorly sorted, very poorly sorted*.

roundness string; measurement of roundness of sedimentary particles (Krumbein 1941): *very angular, angular, sub angular, sub rounded, rounded, well rounded*.

matrix string; composition of material wherein larger grains, crystals or clasts are embedded: *muddy, sandy, ashy, micrite, not recognizable*.

cement string; composition of the crystalline material precipitated around the edges of grains: *siliceous, ferruginous, calcite, dolomite, kaolinitic, sparite, not recognizable*.

fabric string; grain fabric (packing). For sedimentary rocks: *clast supported, matrix supported; and for igneous rocks: phaneritic, aphanitic, fragmental*.

munsell_code string; color description based on the Munsell chart codes from the Geological Society of America Rock Color Chart (Committee 1991)

notes string; additional description in a free text format ('Comments/Remarks').

Author(s)

Lithological description: Bayona, et al. 2008
Sedimentological and Stratigraphic Interpretation: Bayona, G. and Duarte, E.

Source

Access to the well core was provided by Alejandro Mora and Andres Fajardo of HOCOL S.A. (core description: 2007)

References

Bayona, G., Valencia, A., Mora, A., Rueda, M., Ortiz, J., Montenegro, O. 2008. *Estratigrafia y procedencia de las rocas del Mioceno en la parte distal de la cuenca antepais de los Llanos de Colombia.* Geologia Colombiana, **33**, 23-46.

Bogs, S. 2011. *Principles of Sedimentology and Stratigraphy.* Prentice Hall, fifth edition.

Dunham, R. 1962. *American Association of Petroleum Geologists Memoir. Classification of carbonate rocks according to depositional texture.* In Ham, W.E. Classification of carbonate rocks, **1**, 108-121

Krumbein, W. C. 1941. *The effects of abrasion on the size, shape and roundness of rock fragments.* The Journal of Geology **49(5)**, 482-520.

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Tucker, M. E. 2011. *Sedimentary Rocks in the Field: A Practical Guide*. Geological Field Guide. Wiley

Wentworth, C. K. 1922. *A scale of grade and class terms for clastic sediments*. Journal of Geology, **30**, 377-392.

Wentworth, C. K. and Williams, H. 1932. *Classification and terminology of pyroclastic rocks*. National Research Council Bulletin, **89**, 19-53.

Examples

```
data(saltarin)
names(saltarin)
```

SDAR *SDAR: A Toolkit for Stratigraphic Data Analysis in R*

Description

SDAR is an analytical package designed for both plotting and facilitating the analysis of stratigraphic and sedimentological data. Taking advantage of the flexible plotting tools available in R, SDAR uses stratigraphic and sedimentological data to produce detailed graphic logs for outcrop sections and borehole logs. These logs can include multiple features (e.g., bed thickness, lithology, samples, sedimentary structures, colors, fossil content, bioturbation index, electrical logs).

This package includes a dataset giving a lithologic description for borehole Saltarin 1A. The Saltarin core was described at a scale of 1:50 for identification of grain-size trends, sedimentary structures, clast composition, thickness of lamination, bioturbation patterns, and macrofossil identification (Bayona, et al. 2008).

Installation and updates

To install this package do:

```
install.packages("SDAR")
```

License

The releases of this package is licensed under GPL version 2 or newer.

Acknowledgments

I would like to thank geologists from STRI, Corporacion Geologica ARES, and Instituto Colombiano del Petroleo (ICP-ECOPETROL) for supporting the SDAR project and for giving me many exciting ideas and much geological knowledge. Moreover, I would like to express my gratitude to my supervisor, Prof. Dr. Edzer Pebesma (Institute for Geoinformatics), and to my co-supervisors, Prof. Dr. Sebastien Castelltort (Department of Earth Sciences, University of Geneva) and Prof. Dr. Jorge Mateu (Department of Mathematics, University Jaume I). They contributed to this project with their valuable ideas and helpful advice. Furthermore, I am much indebted to G. Bayona, M. Baquero, F. Moreno, C. D Apolito, A. Cardenas, and C. Montes for their valuable critical reviews. Finally, I also acknowledge the R Core Team and its large group of R contributors for their hard work.

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Author(s)

Author: John R. Ortiz [aut, cre],
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Maintainer: <John R. Ortiz <jrortizt@unal.edu.co>

References

Bayona, G., Valencia, A., Mora, A., Rueda, M., Ortiz, Johan., Montenegro, O. 2008. *Estratigrafia y procedencia de las rocas del Mioceno en la parte distal de la cuenca antepais de los Llanos de Colombia. Geologia Colombiana,* ***33****, 23-46.*

`strata-class` *Class "strata"*

Description

The SDAR package introduces a new S4 object class called strata to define the representation of stratigraphy and sedimentological data. This S4 class gives a rigorous definition of a stratigraphy object; a valid object of this S4 class must meet all the requirements specified in the class definition (e.g., the names of the columns must be called: bed_number, base, top, rock_type, prim_litho, and grain_size. Also, the base and top must be numeric). This class automatically validates the inputted dataset and returns a stratigraphy class object.

Usage

```
strata(x, datum="top")
```

Arguments

`x`	an object (e.g, data.frame) with stratigraphic and sedimentological information to be validated; in the *Slots* section below, see the requirements of this class.
`datum`	string; either 'base' or 'top', case sensitive. 'base' is the case when thickness is measured up from the bottom of, e.g., an outcrop section; 'top' is the case when depths are measured down from the surface, e.g., boreholes and cores.

Objects from the Class

Objects of this class represents basic stratigraphic and sedimentological information for the standardization and construction of a comprehensive graphic log (Johnson, 1992).

Slots

`.Data`**:** object of class data.frame, which holds the minimum required data to draw a lithological profile in SDAR.
bed_number: numeric; it is useful to give a unique index to each bed/layer to facilitate later reference; numbering should begin at the stratigraphically lowest bed.
base: numeric; stratigraphic position measured at the bottom of the layer.
top: numeric; stratigraphic position measured at the top of the layer. *Base and top* defines the thickness of each bed/layer, overlapping between layers is not allowed.
rock_type: string; must include only one of these values: sedimentary, igneous or covered.
prim_litho: string; description of the primary (i.e., predominant) lithology; must include only one of the values listed in table 2 (see *Primary lithology* in vignettes). (e.g., *claystone, siltstone, mudstone, shale, sandstone, conglomerate*), more lithology patterns will be provided at next SDAR version.
grain_size: string; description of the grain size dominant in the layer; must include only one of the values listed in table 3 (see *Grain size* in vignettes). (e.g., *mud, silt; very fine sand, fine sand, medium sand, coarse sand, and very coarse sand*). For siliciclastic rocks it is based on the Wentworth (1922) classification system, for carbonate rocks it is based on Dunham (1962), and for classification of pyroclastic rocks it is based on Wentworth and Williams (1932), and it is represented by the width of the lithological profile (*x-axis*) (Miall 1999, Fig. 2.25). In graphic logs generated by SDAR, grain size is indicated by the graphic scale at the header of the lithological profile.

Extends

Class `"data.frame"`, directly.
Class `"list"`, by class "data.frame", distance 2.

Methods

plot `signature(object = "strata")`

summary `signature(object = "strata")`

Author(s)

John Ortiz

References

Dunham, R. 1962. *American Association of Petroleum Geologists Memoir. Classification of carbonate rocks according to depositional texture.* In Ham, W.E. Classification of carbonate rocks, **1**, 108-121

Miall, A.D., 1999. *Principles of Sedimentary Basin Analysis*, **third edition**, Springer, New York, 616 pp.

Johnson, M.R. 1992. *A proposed format for general-purpose comprehensive graphic logs*. Sedimentary Geology, **Volume 81, Issues 3-4**, Pages 289-298, ISSN 0037-0738.
https://www.sciencedirect.com/science/article/pii/0037073892900764

Wentworth, C.K. 1922. *A scale of grade and class terms for clastic sediments*. Journal of Geology, **30**, 377-392.

Wentworth, C.K. and Williams, H. 1932. *Classification and terminology of pyroclastic rocks.* National Research Council Bulletin, **89**, 19-53.

Examples

```
data(saltarin)
saltarin_val <- strata(saltarin, datum="top")
class(saltarin_val)
```

---

summary *summarize strata class objects*

Description

The summary method displays standard information about a strata class object. It displays a synopsis of the content in the strata object, including total number of layers, thickness of the study section, and number of layers by lithology type. Once the stratigraphy data are loaded into R, and validated as a strata valid object, the users are able to explore stratigraphic information quantitatively (e.g., summarizing it by lithology type or grain size).

Usage

```
## S3 method for class 'strata'
summary(object, grain.size = FALSE, ...)
```

Arguments

`object`	an object of strata class for which a summary is desired. See strata class for details about the requirements of this object.
`grain.size`	default `FALSE`; a logical value indicating whether the data should be summarized by grain size.
`...`	additional arguments affecting the summary produced.

Value

When `summary` function is executed over a strata object using the default options, the returned values are summarized by lithology; they include (i) total number of layers, (ii) total thickness of the section or borehole, (iii) thickness of covered intervals, (iv) thickness of each lithology expressed in percentage, and (v) total number of layers by lithology type. When the *grain.size* argument is setting to `TRUE`, summary details by grain size are included in the results.

Author(s)

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Examples

```
data(saltarin)
saltarin_val <- strata(saltarin, datum="top")
summary(saltarin_val)
summary(saltarin_val, grain.size=TRUE)
```

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