Package 'rPACI'

July 2, 2020

Title Placido Analysis of Corneal Irregularity

Version 0.1.2

Description Analysis of corneal data obtained from a Placido disk corneal
topographer with calculation of irregularity indices. A corneal topographer is
an ophthalmic clinical device that obtains measurements in the cornea (the anterior
part of the eye). A Placido disk corneal topographer makes use of the Placido disk
(Rowsey et al. (1981), <doi:10.1001/archopht.1981.03930011093022>, Rand et al.
(1997), <doi:10.1016/S0886-3350(99)00355-7>), which produce a circular pattern
of measurement nodes. The raw information measured by such a topographer is
used by practitioners to analyze curvatures, to study optical aberrations, or
to diagnose specific conditions of the eye. The rPACI package allows the
calculation of the corneal irregularity indices described in Castro-Luna et al. (2020),
<doi:10.1016/j.clae.2019.12.006>; Ramos-
Lopez et al. (2013), <doi:10.1097/OPX.0b013e3182843f2a>;
and Ramos-Lopez et al. (2011), <doi:10.1097/OPX.0b013e3182843f2a>.
It provides a simple interface to read corneal topography data files as exported by a typical
Placido disk topographer, to compute the irregularity indices mentioned before,
and to display summary plots that are easy to interpret for a clinician.

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Encoding UTF-8

LazyData true

Depends R (>= 3.5.0)

Imports stats, graphics, grDevices, bnlearn

RoxygenNote 7.1.1

NeedsCompilation no

Author Darío Ramos-López [aut, cre],
Ana D. Maldonado [aut]

Maintainer Darío Ramos-López <dario.ramos.lopez@urjc.es>

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R topics documented:

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analyzeFile	*Analysis of a single corneal topography files*

Description

Analyze a corneal topography file. This function combines the three operations of functions read-CornealTopography, computePlacidoIndices and plotSingleCornea.

Usage

```
analyzeFile(path, drawplot = TRUE)
```

Arguments

path	A corneal topography file, as exported by a Placido disk corneal topographer.
drawplot	An optional parameter indicating whether a plot of results should be displayed or not.

Examples

```
analyzeFile(system.file("extdata","N01.txt", package="rPACI"))
```

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analyzeFolder	*Analysis several corneal topography files in a common folder.*

Description

Analyze all corneal topography files in a specific folder. It is equivalent to use analyzeFile for each file in the folder. It assumes all files with the given extension ('.txt' by defualt) are corneal topography files.

Usage

```
analyzeFolder(
  path,
  fileExtension = "txt",
  individualPlots = FALSE,
  summaryPlot = FALSE
)
```

Arguments

path	The path of a folder which contains corneal topography files, as exported by Placido disks corneal topographers.
fileExtension	The file extension of the corneal topography files in the folder ('.txt' by default).
individualPlots	
	An optional logical parameter indicating whether the plot for each file should be displayed or not.
summaryPlot	An optional logical parameter indicating whether a summary plot should be displayed or not.

Examples

```
analyzeFolder(system.file("extdata",package="rPACI"))
```

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computePlacidoIndices   *Compute the Placido irregularity indices of an eye*

Description

This function calculates the individual Placido indices of corneal irregularity PI_1, PI_2, PI_3, SL, AR_1, AR_2, AR_3, AR_4, AR_5, the global index GLPI, and the Naive Bayes Index (NBI) (see references). It requires a dataset in the format given by the function readCornealTopography. The results include the values of the indices plus a diagnose, which is either "Irregular cornea", "Suspect cornea" or "Normal cornea", depending on the value of the global index GLPI.

Usage

```
computePlacidoIndices(datasetRings)
```

Arguments

datasetRings	A dataset containing data of a corneal topography, as read by readCornealTopography.

Value

A dataset containg the aforementioned irregularity indices as well as the diagnose.

References

Castro-Luna, G. M., Martinez-Finkelshtein, A., Ramos-Lopez, D. (2019). Robust keratoconus detection with Bayesian network classifier for Placido-based corneal indices. Contact Lens and Anterior Eye, 43(4), 366-372.

Ramos-Lopez, D., Martinez-Finkelshtein, A., Castro-Luna, G. M., Burguera-Gimenez, N., Vega-Estrada, A., Pinero, D., & Alio, J. L. (2013). Screening subclinical keratoconus with placido-based corneal indices. Optometry and Vision Science, 90(4), 335-343.

Ramos-Lopez, D., Martinez-Finkelshtein, A., Castro-Luna, G. M., Pinero, D., & Alio', J. L. (2011). Placido-based indices of corneal irregularity. Optometry and Vision Science, 88(10), 1220-1231.

Examples

```
dataset = readCornealTopography(system.file("extdata","N02.txt", package="rPACI"))
results = computePlacidoIndices(dataset)
```

| plotSingleCornea | *Summary plot of the Placido irregularity indices* |

Description

Draw a three-part plot summarizing the corneal topography analysis, based on the Placido irregularity indices calculated by the function computePlacidoIndices.

Usage

```
plotSingleCornea(dataset, PlacidoIndices, filename = NULL)
```

Arguments

dataset   A dataset containing the read corneal topography.

PlacidoIndices   A dataset of results as given by the function computePlacidoIndices or analyzeFile.

filename   An optional character argument, corresponding to the file containing the analyzed data. If specified, the filename is displayed on the plot.

Examples

```
dataset = readCornealTopography(system.file("extdata","K04.txt", package="rPACI"))
results = computePlacidoIndices(dataset)
plotSingleCornea(dataset, results)
```

| readCornealTopography | *Read a Placido disk corneal topography file* |

Description

Read corneal topography files as exported by Placido disk corneal topographer. A corneal topographer is an ophthalmic clinical device that obtains measurements in the cornea (the anterior part of the eye). A Placido disk corneal topographer makes use of the Placido disk (see references), which produce a circular pattern of measurement nodes. This function assumes a file structure of 24 rings * 256 angles per ring, which is the typical distribution of commercial Placido disk topographers.

Usage

```
readCornealTopography(filepath)
```

Arguments

`filepath`	A file path to a corneal topography file exported by a Placido disk corneal topographer.

Value

A dataset containing the read corneal topography.

References

Rowsey, J. J., Reynolds, A. E., & Brown, R. (1981). Corneal topography: corneascope. Archives of Ophthalmology, 99(6), 1093-1100

Rand, R. H., Howland, H. C., & Applegate, R. A. (1997). Keratometer and Its Implications for Recovery of Corneal Topography. Optometry and vision science, 74(11).

Examples

```
datasetN = readCornealTopography(system.file("extdata","N01.txt", package="rPACI"))
datasetK = readCornealTopography(system.file("extdata","K04.txt", package="rPACI"))
```

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