Package 'PolyTrend'

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Type Package

Title Trend Classification Algorithm

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Description Classifies trends as linear, quadratic, cubic, concealed, or no-trend. Concealed trends have a quadratic or cubic form, but their net change between the beginning and end of the time period is not statistically significant. The no-trend category includes linear trends with a statistically insignificant slope. The method is described in Jamali et al. (2014) <doi:10.1016/j.rse.2013.10.019>.

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`ex.a` *Site 1*

Description

Example of a cubic trend (Site 1, Jamali et al. 2014)

Usage

```
data("ex.a")
```

Format

The format is: num [1:25] 0.477 0.526 0.52 0.571 0.554 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.a)
## maybe str(ex.a) ; plot(ex.a) ...
```

`ex.b` *Site 2*

Description

Example of a cubic trend (Site 2, Jamali et al. 2014)

Usage

```
data("ex.b")
```

Format

The format is: num [1:25] 0.254 0.267 0.184 0.22 0.208 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.b)
## maybe str(ex.b) ; plot(ex.b) ...
```

`ex.c` *Site 3*

Description

Example of a concealed trend with cubic form (Site 3, Jamali et al. 2014)

Usage

```
data("ex.c")
```

Format

The format is: num [1:25] 0.712 0.726 0.736 0.723 0.739 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.c)
## maybe str(ex.c) ; plot(ex.c) ...
```

`ex.d` *Site 4*

Description

Example of a concealed trend with cubic form (Site 4, Jamali et al. 2014)

Usage

```
data("ex.d")
```

Format

The format is: num [1:25] 0.6 0.54 0.447 0.478 0.457 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.d)
## maybe str(ex.d) ; plot(ex.d) ...
```

`ex.e` *Site 5*

Description

Example of a quadratic trend (Site 5, Jamali et al. 2014)

Usage

```
data("ex.e")
```

Format

The format is: num [1:25] 0.26 0.278 0.196 0.224 0.261 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.e)
## maybe str(ex.e) ; plot(ex.e) ...
```

ex.f *Site 6*

Description

Example of a quadratic trend (Site 6, Jamali et al. 2014)

Usage

```
data("ex.f")
```

Format

The format is: num [1:25] 0.327 0.259 0.212 0.298 0.248 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.f)
## maybe str(ex.f) ; plot(ex.f) ...
```

ex.g *Site 7*

Description

Example of a concealed trend with quadratic form (Site 7, Jamali et al. 2014)

Usage

```
data("ex.g")
```

Format

The format is: num [1:25] 0.147 0.153 0.104 0.123 0.15 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.g)
## maybe str(ex.g) ; plot(ex.g) ...
```

---

ex.h *Site 8*

Description

Example of a concealed trend with quadratic form (Site 8, Jamali et al. 2014)

Usage

```
data("ex.h")
```

Format

The format is: num [1:25] 0.813 0.809 0.753 0.792 0.727 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.h)
## maybe str(ex.h) ; plot(ex.h) ...
```

---

ex.k *Site 9*

Description

Example of a linear trend (Site 9, Jamali et al. 2014)

Usage

```
data("ex.k")
```

Format

The format is: num [1:25] 0.382 0.373 0.228 0.385 0.271 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.k)
## maybe str(ex.k) ; plot(ex.k) ...
```

`ex.m` *Site 10*

Description

Example of a linear trend (Site 10, Jamali et al. 2014)

Usage

```
data("ex.m")
```

Format

The format is: num [1:25] 0.781 0.738 0.795 0.871 0.736 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.m)
## maybe str(ex.m) ; plot(ex.m) ...
```

ex.n *Site 11*

Description

Example of a no-trend (Site 11, Jamali et al. 2014)

Usage

```
data("ex.n")
```

Format

The format is: num [1:25] 0.567 0.625 0.61 0.589 0.569 ...

Source

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Examples

```
data(ex.n)
## maybe str(ex.n) ; plot(ex.n) ...
```

PolyTrend *Trend Classification Algorithm*

Description

PolyTrend classifies the trends into linear, quadratic, cubic, concealed and no-trend types. The "concealed trends" are those trends that possess quadratic or cubic forms, but the net change from the start of the time period to the end of the time period hasn't been significant. The "no-trend" category includes simple linear trends with statistically in-significant slope coefficient.

Usage

```
PolyTrend(Y, alpha)
```

Arguments

Y	a vector of values corresponding to the trend or de-seasonalised component of vegetation time series data.
alpha	the statistical significance level.

Details

An object of the class "PT" is a list including the trend type, slope, direction, and statistical significance.

Value

`TrendType`	the trend type as a number, which can be -1, 0, 1, 2, or 3. The values correspond to a concealed trend (-1), no trend (0), linear trend (1), quadratic trend (2) or cubic trend (3).
`Slope`	the linear slope value.
`Direction`	the linear slope direction as a number, which can be 1 or -1. The values correspond to increasing (1) or decreasing direction (-1).
`Significance`	the slope significance as a number, which can be 1 or -1. The values correspond to statistically significant (1) or statistically in-significant (-1).
`PolynomialDegree`	the polynomial degree as a number, which can be 0, 1, 2, or 3. The values correspond to no-trend (0), linear (1), quadratic (2), or cubic (3).

Author(s)

Sadegh Jamali, Hristo Tomov

References

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. Remote Sensing of Environment, 141, 79-89. http://dx.doi.org/10.1016/j.rse.2013.10.019

Tomov H (2016). Automated temporal NDVI analysis over the Middle East for the period 1982 – 2010. http://lup.lub.lu.se/student-papers/record/8871893

Examples

```
## Following examples are taken from Fig. 3 in Jamali et al. 2014
## Examples of a cubic trend (Site 1 & Site 2)
data(ex.a)
data(ex.b)

pt.a <- PolyTrend(ex.a, 0.05)
plot(pt.a, fig.dates = c(1982:2006))

pt.b <- PolyTrend(ex.b, 0.05)
plot(pt.b, fig.dates = c(1982:2006))

## Examples of a concealed trend with cubic form (Site 3 & Site 4)
data(ex.c)
data(ex.d)

pt.c <- PolyTrend(ex.c, 0.05)
plot(pt.c, fig.dates = c(1982:2006))
```

```
pt.d <- PolyTrend(ex.d, 0.05)
plot(pt.d, fig.dates = c(1982:2006))

## Examples of a quadratic trend (Site 5 & Site 6)
data(ex.e)
data(ex.f)

pt.e <- PolyTrend(ex.e, 0.05)
plot(pt.e, fig.dates = c(1982:2006))

pt.f <- PolyTrend(ex.f, 0.05)
plot(pt.f, fig.dates = c(1982:2006))

## Examples of a concealed trend with quadratic form (Site 7 & Site 8)
data(ex.g)
data(ex.h)

pt.g <- PolyTrend(ex.g, 0.05)
plot(pt.g, fig.dates = c(1982:2006))

pt.h <- PolyTrend(ex.h, 0.05)
plot(pt.h, fig.dates = c(1982:2006))

## Examples of a linear trend (Site 9 & Site 10)
data(ex.k)
data(ex.m)

pt.k <- PolyTrend(ex.k, 0.05)
plot(pt.k, fig.dates = c(1982:2006))

pt.m <- PolyTrend(ex.m, 0.05)
plot(pt.m, fig.dates = c(1982:2006))

## Example of a no-trend (Site 11)
data(ex.n)

pt.n <- PolyTrend(ex.n, 0.05)
plot(pt.n, fig.dates = c(1982:2006))
```

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