Package 'itcSegment'

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Type Package

Title Individual Tree Crowns Segmentation

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Description Two methods for Individual Tree Crowns (ITCs) delineation on remote sensing data: one is based on LiDAR data in x,y,z format and one on imagery data in raster format.

License GPL

LazyData TRUE

Depends R (>= 3.2.0),sp,raster,maptools,rgeos,methods,grDevices

RoxygenNote 5.0.1

NeedsCompilation no

Repository CRAN

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R topics documented:

imgData *Imagery data over a forest area*

Description

A dataset containing a band (at 812 nm) of an hyperspectral image acquired over a forest area.

Usage

```
data(imgData)
```

Format

An object of class RasterLayer.

Details

- imgData An object of class RasterLayer.

itcIMG *Individual Tree Crowns segmentation with imagery data*

Description

The ITC delineation approach finds local maxima within an imagery, designates these as tree tops, then uses a decision tree method to grow individual crowns around the local maxima.

Usage

```
itcIMG(imagery = NULL, searchWinSize = 3, TRESHSeed = 0.45,
  TRESHCrown = 0.55, DIST = 10, specT = 0)
```

Arguments

imagery	An object of class raster on which to perform the segmentation
searchWinSize	Size (in pixels) of the moving window used to the detect the local maxima. It should be an odd number larger than 3.
TRESHSeed	Growing threshold 1. It should be between 0 and 1.
TRESHCrown	Growing threshold 2. It should be between 0 and 1.
DIST	Maximum value of the crown diameter of a detected tree (in meters).
specT	Spectral value below which a point cannot be a local maxima.

Value

An object of the class SpatialPolygonsDataFrame containing the delineated ITCs. The data frame contains a column representing the area of each crown (CA_m2).

Author(s)

Michele Dalponte

References

M. Dalponte, F. Reyes, K. Kandare, and D. Gianelle, "Delineation of Individual Tree Crowns from ALS and Hyperspectral data: a comparison among four methods," European Journal of Remote Sensing, Vol. 48, pp. 365-382, 2015.

Examples

```
## Not run:
data(imgData)

se<-itcIMG(imgData)
summary(se)
plot(se,axes=T)

## to save the data use rgdal function called writeOGR. For more help see rgdal package.


## End(Not run)
```

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itcLiDAR *Individual Tree Crowns segmentation with LiDAR data*

Description

The ITC delineation approach finds local maxima within a rasterized canopy height model (CHM), designates these as tree tops, then uses a decision tree method to grow individual crowns around the local maxima. The approach goes through the following steps: (1) a low-pass filter is applied to the rasterized CHM to smooth the surface and reduce the number of local maxima; (2) local maxima are located using a moving window with size that adapts inside a user defined range (minimum and maximum size) according the pixel height; a pixel of the CHM is labelled as local maxima if its z value is greater than all other z values in the window, and with z greater than some minimum height above-ground; (3) each local maximum is labelled as an 'initial region' around which a tree crown can grow; the heights of the four neighboring pixels are extracted from the CHM and these pixels are added to the region if their vertical distance from the local maximum is less than some user-defined percentage of the local-maximum height, and less than some user-defined maximum difference; this procedure is repeated for all the neighbors of cells now included in the region, and so on iteratively until no further pixels are added to the region; (4) from each region that had been identified the first-return ALS points are extracted (having first removed low elevation points), (5) a 2D convex hull is applied to these points, and the resulting polygons becomes the final ITCs.

Usage

```
itcLiDAR(X = NULL, Y = NULL, Z = NULL, epsg = 4326, resolution = 0.5,
  MinSearchFilSize = 3, MaxSearchFilSize = 7, TRESHSeed = 0.55,
  TRESHCrown = 0.6, minDIST = 5, maxDIST = 40, HeightThreshold = 2)
```

Arguments

X	A column vector of x coordinates.
Y	A column vector of y coordinates (it must have the same length as X).
Z	A column vector of z coordinates (it must have the same length as X). Z must be normalized respect to the ground.
epsg	The EPSG code of the reference system of the X,Y coordinates. Default: 4326 (lat long WGS 84)
resolution	The resolution of the raster on which the first segmentation is carried out.
MinSearchFilSize	Minimum size (in pixels) of the moving window used to the detect the local maxima. It should be an odd number larger than 3.
MaxSearchFilSize	Maximum size (in pixels) of the moving window used to the detect the local maxima. It should be bigger or equal to MinSearchFilSize, and it should be an odd number larger than 3.
TRESHSeed	Growing threshold 1. It should be between 0 and 1.
TRESHCrown	Growing threshold 2. It should be between 0 and 1.
minDIST	Minimum value of the crown diameter of a detected tree (in meters).
maxDIST	Maximum value of the crown diameter of a detected tree (in meters). It should be bigger or equal to minDIST.
HeightThreshold	Minimum height of the trees.

Value

An object of the class SpatialPolygonsDataFrame containing the delineated ITCs. The informaion for each ITC contained in the data frame are the X and Y coordinates position of the tree, the tree height in meters (Height_m) and its crown area in sqaure meters (CA_m2).

Author(s)

Michele Dalponte

References

M. Dalponte, F. Reyes, K. Kandare, and D. Gianelle, "Delineation of Individual Tree Crowns from ALS and Hyperspectral data: a comparison among four methods," European Journal of Remote Sensing, Vol. 48, pp. 365-382, 2015.

Examples

```
## Not run:
data(lasData)

## function takes a while to run
se<-itcLiDAR(lasData$X,lasData$Y,lasData$Z,epsg=32632)
summary(se)
plot(se,axes=T)

## If we want to seperate the height of the trees by grayscales:

plot(se,col=gray((max(se$Height_m)-se$Height_m)/(max(se$Height_m)-min(se$Height_m))),axes=T)

## to save the data use rgdal function called writeOGR. For more help see rgdal package.


## End(Not run)
```

`lasData` *LiDAR data point cloud acquired over a forest area*

Description

A dataset containing the X Y Z coordinates of LiDAR points acquired over a forest area. The EPSG code of the coordinates is 32632.

Usage

```
data(lasData)
```

Format

A data frame with 16907 rows and 3 variables

Details

- X. X coordinate in UTM WGS84 32 N (EPSG code 32632).
- Y. Y coordinate in UTM WGS84 32 N (EPSG code 32632).
- Z. Z coordinate. The Z coordinate is normalized respect to the ground.

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