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22–26 April, Hanoi, Vietnam

"Geospatial Information for a Smarter Life and Environmental Resilience"

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Spatial Analysis of Forest Fragmentation Using Language R

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TS06G: Land Challenges in Latin America

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INTRODUCTION

Generally, the process of anthropization causes deforestation and destruction of natural resources;

Conversion of forest areas into other uses;

Resulting in the fragmentation of large forest areas, generating several negative impacts on the environment;

Among these: extinction of fauna and flora species, soil erosion, silting of watercourses and local climatic changes, species isolation, habitat loss, edge effects, decreasing biodiversity, invasion of exotic species and decreased pollination.

Importance

In general, the fragmentation process changes the dynamics of populations and communities, ecosystem processes and trophic interactions (Laurence and Vasconcelos, 2009).

. Developing conservation strategies depends on studies of the spatial distribution of forest fragments.

. The landscape ecology metrics that help in the process of understanding the landscape structure of a given location are inserted.

Importanc e

The metrics are important instruments for the definition of management techniques that aim to recover or conserve forest remnants thus contributing to the maintenance of biodiversity (Juvanhol et al., 2011).

For this, several metrics are used to analyze spatial patterns with the aid of geoprocessing and remote sensing tools (Vidolin et al., 2011).

The choise of solution

R language functions for the calculation of landscape ecology metrics are incipient, so it is necessary to implement functions to supply this need.

The objective of this study was to develop an R-language package for the analysis of forest fragmentation, through the calculation of landscape ecology metrics.

Material and Methods

Metric functions developed and their goups

. Area and density (metrics)
. Shape
. Border
. Central area and proximity

Material and Methods

Group	Metrics	Unity
Area and density	Class area	ha
	Number of patches	-
	Mean Patch Size	ha
	Patch Size Standard Deviation	ha
	Patch Size Coefficient of Variation	%

Material and Methods

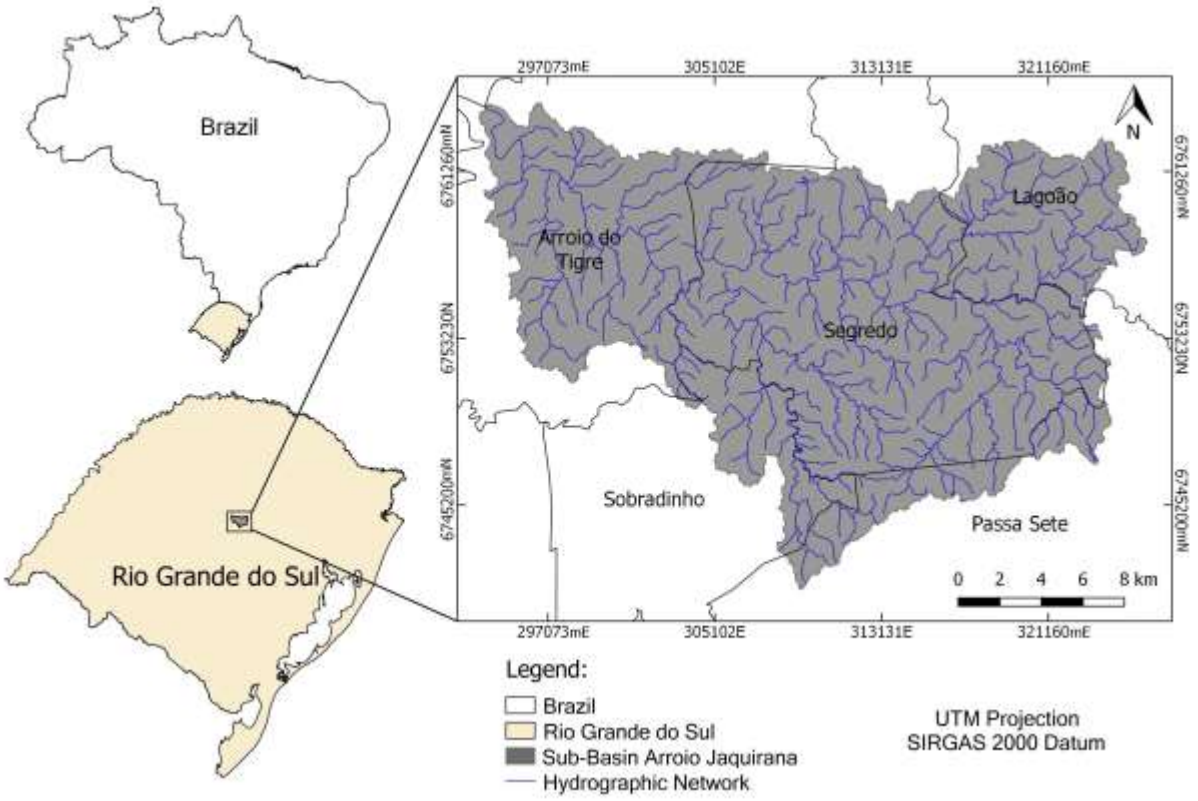
Group	Metrics	Unity
Edge	Total edge	m
	Edge density	m/ha
Shape	Landscape Shape Index	-
	Mean Shape Index	-
	Area-Weighted Mean Shape Index	-
	Mean Patche Fractal Dimension	-
	Mean Perimeter-Area Ratio	m/ha

Material and Methods

Group	Metrics	Unity
Core Area	Total core area	ha
	Number of core areas	-
	Mean core area	ha
	Total core area index	%
Proximity	Mean Nearest-Neighbor Distance	m

McGarigal and Marks (1994)

Material and Methods – Study area



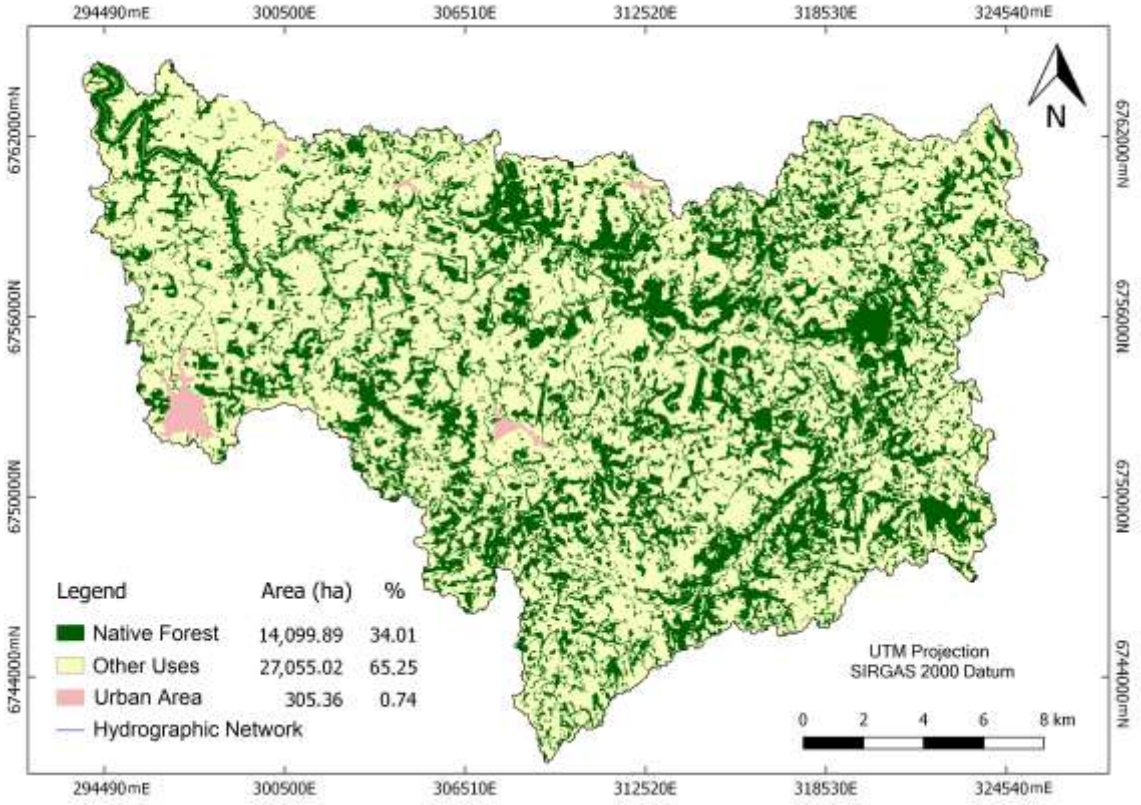
Results and Discussion

The functions only need the raster file (containing the thematic class that one wants to calculate the metrics), with the exception of edge density that still requires the total value of the study area, in hectares.

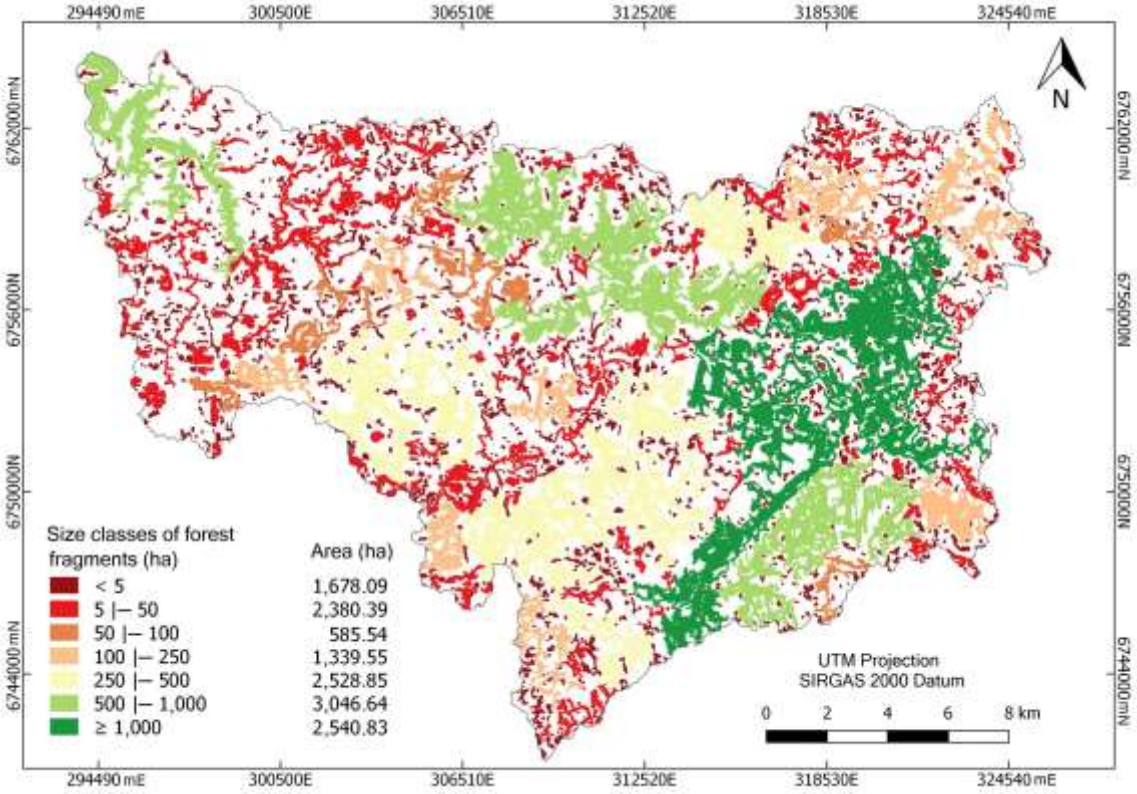
Example: a) Total Edge (TE) > TE(raster)
[1] 4882156 meters

b) Number of patches (Np) > NP(raster)
[1] 1995

Results and Discussion



Results and Discussion



Conclusions

The R language is promising for the spatial analysis of data from remote sensing, which allowed to generate reliable results;

The developed package LandscapeMetrics is easy to use, in which the functions only need the raster file as input parameter;

It is possible to analyze the spatial distribution of forest fragments.

Download Package :

LandscapeMetrics

https://github.com/LandscapeMetrics

Thank you very much for your attention!

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