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THE CENTER IN MONTES CLAROS (BRAZIL)
A diachronic reading based on configurational features

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ABSTRACT

The aim of this paper is to investigate how the urban fabric configuration influences the distribution of centralities in an urban system, in terms of accessibility. The case study is the city of Montes Claros, located in the North of Minas Gerais State in Brazil. The site, founded in the beginning of the 20th century, has presently almost 400.000 inhabitants and is one of the most important settlements in the region. Based on the strategies of Theory of the Social Logic of Space, the study analyses land use in a diachronic perspective and compares the data with modeled cartography associated with axial and segment map variables. The urban periods explored are: (1) early twentieth century, (2) 1950, (3) 1970; (4) 1980; (5) 1990, (6) 2005 and (7) 2015. Findings have suggested a correlation between the configurational features highlighted by Space Syntax tools and the changes in centralities through the periods investigated. It seems that configuration plays an important role in the urban dynamic of Montes Claros, allowing the use of the approach in an urban planning perspective.

KEYWORDS

Urban configuration, centralities, Montes Claros

1. INTRODUCTION

Urban configuration is believed to be related to the distribution of centralities in the urban space. The paper explores this relation based on the case study of Montes Claros (a city in the state of Minas Gerais, Brazil) by comparing potential and real urban centralities and subcentralities from the perspective of Space Syntax.

Space syntax explores the relation between the built environment and society. The built environment is seen as a system of possibilities for encounters, whose arrangement affects social relations and, in turn, is also affected by them. The tools developed by Space Syntax enable the identification of which are the streets (axes) or street segments with greater potential for concentrating movement, a crucial feature of urban centralities (Barros and Medeiros, 2014).

The paper is organized in four sections as follows: (2) the context of Montes Claros; (2) the methods used; (3) presentation of results; and (4) conclusions.

2. URBAN DEVELOPMENT IN MONTES CLAROS

Montes Claros has approximately 398,000 inhabitants, 95% of which live in the urban area (IBGE, 2016). Founded in the early twentieth century, it is today the most populous city in the mesoregion north of its state. As such, it has embraced the role of regional center, serving as a beacon to other municipalities that have less diversity of functions (Pereira, 2007).

Gomes (2007) explains the development of the city on a time-space axis with distinct periods: "(1) rural city – (2) mercantile city – (3) incomplete industrial city- (4) service city."

The first period is the formation of the urban settlement, with an economy based in agriculture and livestock. In the late nineteenth century, the city became a regional trading post, hence the name 'mercantile city' used to describe this period. Industrialization came alongside electric power lines in 1965, with significant resources from the federal government for the economic development of the region, as it is located in a dry zone of the country (Leite, 2006).

The transition to a 'service hub' came in the mid-seventies, followed by an inevitable urban expansion (Leite, 2006 and Gomes, 2007). Until then, it could be said the city had only one core. Most of the commerce, services and industries were located in the same neighborhoods until the 70s, which generated an intense flow of people and goods. This led to problems with circulation, since the area was characterized by narrow streets (Gomes, 2007).

From the 1980s onwards, the city witnesses the onset of new commercial subcentralities. This phenomenon was a byproduct of the increased population density in areas further away from the city center. The horizontal city sprawl was facilitated by the local flat topography (Leite, 2011).

3. DATASETS AND METHODS

The study of potential centralities was based on the methods and tools of the Space Syntax. According to Medeiros (2006), out of the many ways urban systems could be represented in order to carry out a configurational analysis, "linear [representation] is useful to investigate movement and its related aspects. It is the best suited for large systems, such as the city". Axial and segment maps, the linear representation of the street system, were adopted for the present analysis.

Using the software AutoCad®, some representative maps of the process of urban expansion were drafted: (1) early twentieth century, (2) 1950, (3) 1970, (4) 1980, (5) 1990 and the years (6) 2005 and (7) 2015. The axial maps were produced based on cartography in format DWG, available in the website of the City Hall[1], for the year 2005. The maps for year of 2015 were complemented with data from Google Earth. The remaining maps (1950, 1970 and 1990) were drafted by subtracting axes from the most recent map, based on information provided by the works of Leite (2006) and Gomes (2007).

Later, the maps were processed in the DepthMap software for axial and segment analysis, with focus on the following variables: Global and Local Integration, Choice and relation between Choice and Global Integration.

The system's Global Integration values (Rn HH), measured both for the axial map and segment map, result from the size of the city and its topographical context. In addition, the results highlight important features of the urban layout, such aspects of dispersion and compactness, orthogonal versus organic layout (Medeiros, 2006). The integration values achieved by each line/axis are displayed graphically in a color-coded map, with red hues being the most accessible areas.

Barros and Medeiros (2014) emphasize the importance of check "the layout of the set of most integrated axes", which form the "Integration Core". The authors explain that these most accessible areas tend to concentrate more diversity of uses, such as commerce and services, being thus considered potential urban centralities.

1 Retrieved from http://www.montesclaros.mg.gov.br/infraestrutura/mapas.htm.

The variable Choice allows us to evaluate how an axis or segment may be crossed, considering topologically shorter routes, from all places to all other places, both in the system as a whole and within a predetermined radius (Medeiros, 2006).

Considering that Integration measures represent the potential of segments to become destinations and the measures of Choice represent their potential as routes, the relation between these two variables expresses a streets potential to be destination and route simultaneously. This relation were measured based on the mathematical formula used by Hillier (2008), for three different radius: 400m radius (pedestrian perspective), 1200m radius (cyclist perspective) and global (vehicle perspective).

Moreover, based on the studies of Gomes (2007) and Leite (2006), a map with the centrality and subcentralities of Montes Claros was produced. The areas with predominantly commercial use were then superimposed over the map, based on Leite (2011). As the result, we obtained a map with the real centralities of Montes Claros, considered an actual rendering of the city's current situation.

4. RESULTS

The evaluation of potential centralities was based on the analysis of axial and segment maps. First, an interpretation of the variable Global Integration (Rn HH) was carried out based on a diachronic perspective. In the maps for Global Integration (Rn HH) in each period (Figure 1), it is possible to see that the Integration Core of Montes Claros has increased in size along with the urban expansion. The polygon determined by the set of axes in red hues has historically always encompassed the initial core (the city from the early twentieth century) and expanded outwards, along the present most important roads, which are BR251, BR135 e BR365 .

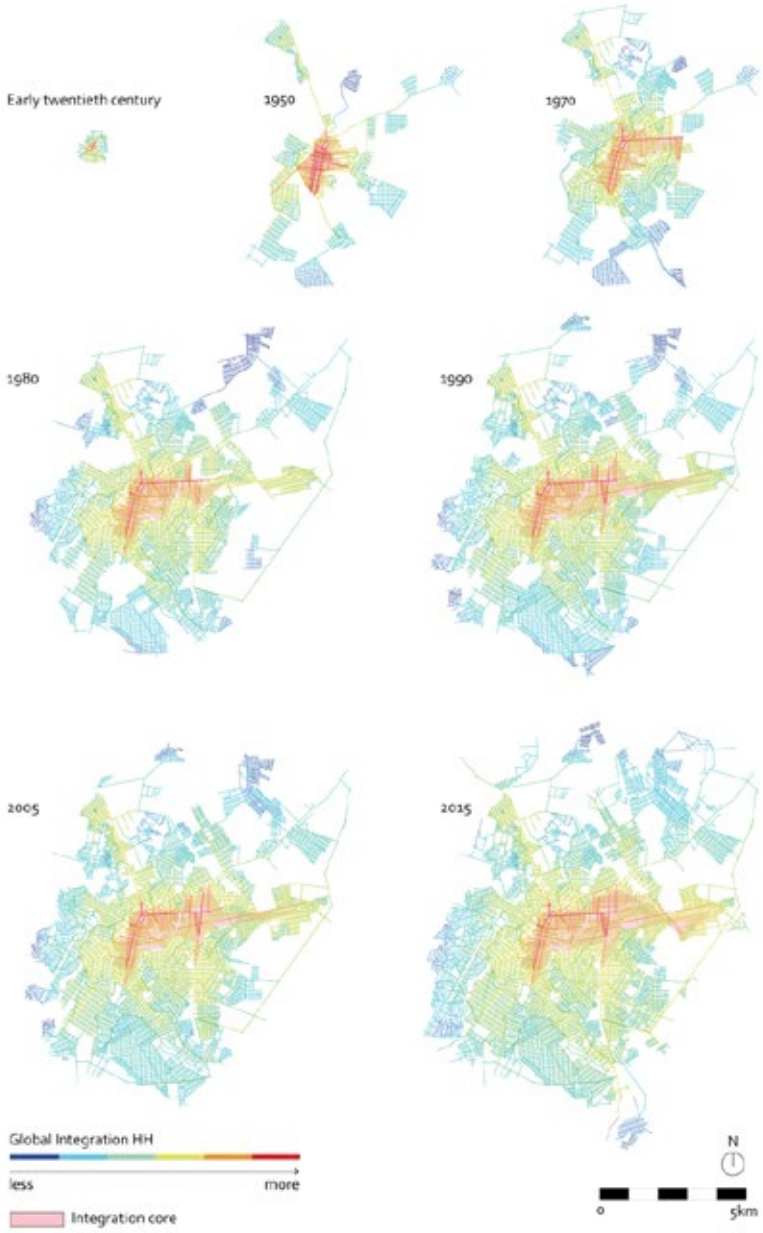

Figure 01 - Diachronic analysis of Montes Claros: Global Integration (Rn HH) and Integration core.

Source: Ramos (2016).

Visually comparing the Global Integration map with the location of the city center and subcentralities (Figure 2), we can see that the city center is encompassed within the Integration Core. In addition, the streets with greater integration values are connected to the subcentralities. The lowest global integration value is 0.39, and the maximum 1.38, being the system's average 0.86. Isolating the axes present in these centralities (or that cross them in one point or another), the average is 0.97. That means these centralities are composed of streets which are better integrated than the others in the system.

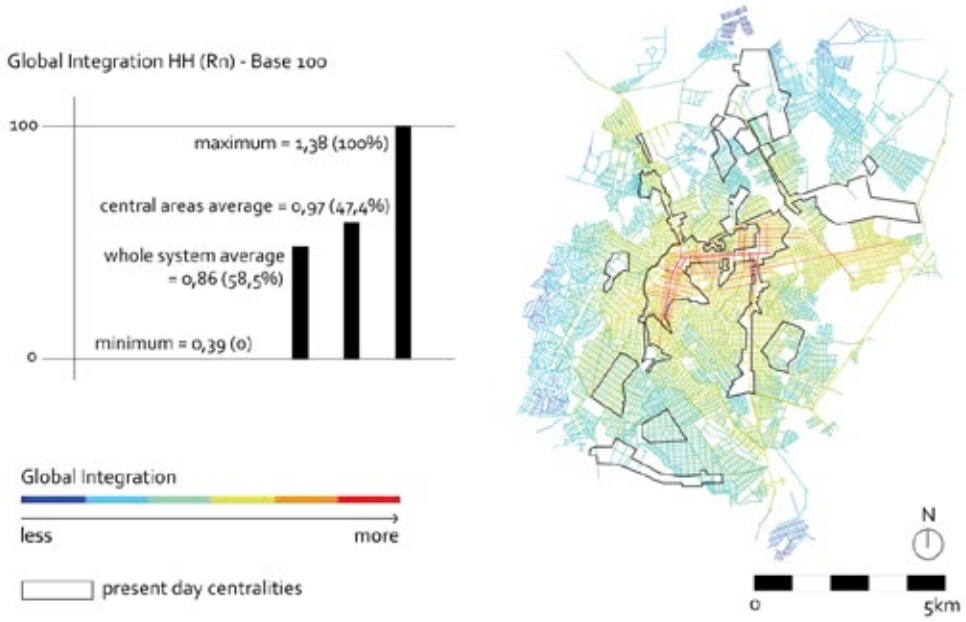

Figure 02. Global Integration (Rn HH) 2015 map, overlapping by the present day centralities.

Source: Ramos (2016).

The interpretations relating the potential for segments to be destination and route simultaneously were developed with the segment map. These maps were then superimposed with the areas of intraurban centralities (figure 03).

In terms of global analysis, there is a visible correlation between the potential and the real situation, since the segments with greater values are comprised in the polygons of the urban centralities. For the radius 400 m and 1200 m, the strength of several potential subcentralities is made very clear. Some of these areas function as a real centrality, whereas other are predominantly residential (circled in the map). The potential of these neighborhoods to attract movement can be crucial to urban planning and government and private resources allocation.

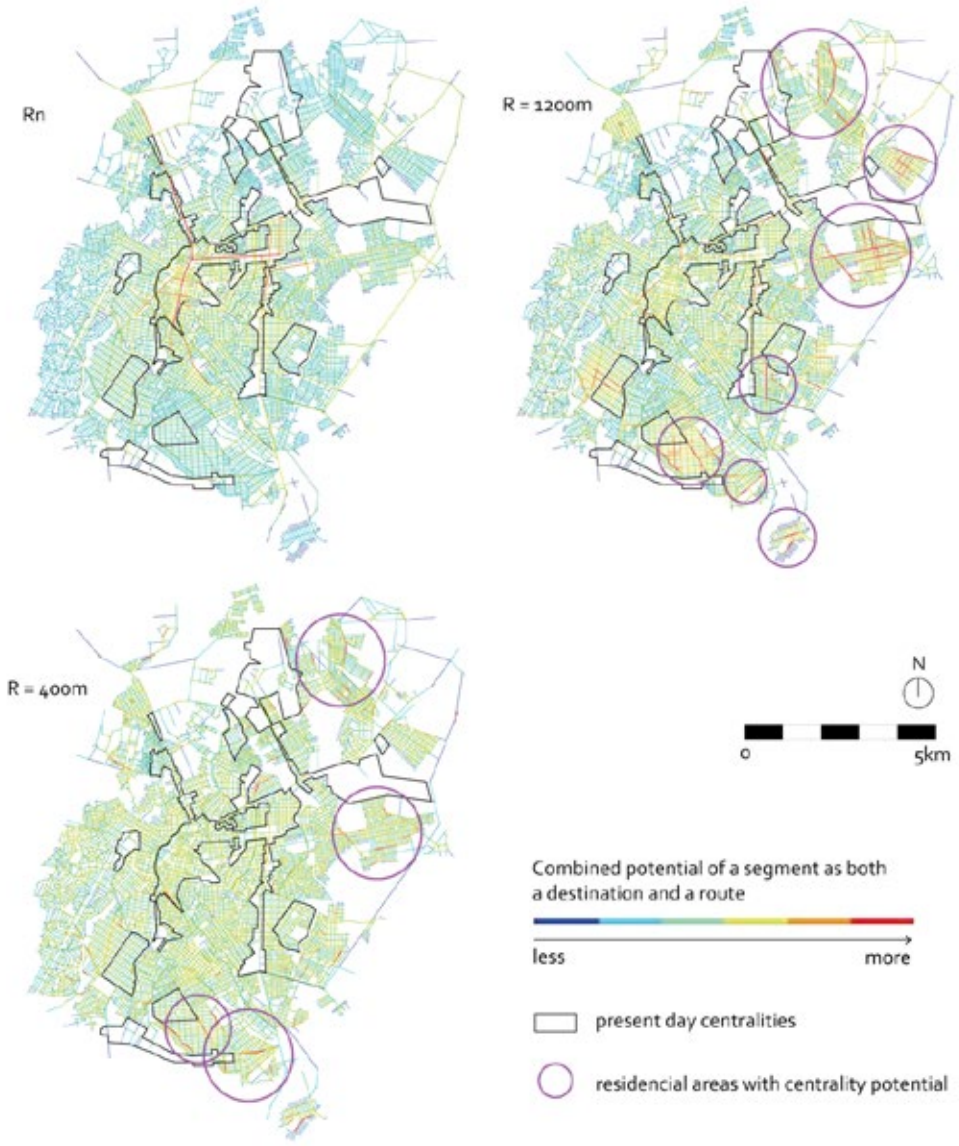

Figure 03 - Relation between Global Integration (Rn HH) and Choice (segment map): Rn, R=400m and R=1200m, respectivaly. Source: Ramos (2016).

5. CONCLUSIONS

During its urban history, Montes Claros has expanded its urban area immensely. The active center has not shifted, corresponding to the site where the city first originated. The interpretation of configurational measures of Space Syntax corroborated that the Integration Core encompasses the original urban core, however it spread towards East and West, which are the main routes out of the city, connecting with federal roads.

The current situation (2015) has allowed us to verify what are the axes or neighborhoods with greater movement potential, using axial and segment maps, thus uncovering the potential for centralities which underlie the city's configuration. These maps were qualitatively compared to the present situation of centralities (based on Leite, 2006; Gomes, 2007 and Leite, 2011) and there was a significant correspondence between potential (from Space Syntax) and the land use reality. Furthermore, some predominantly residential neighborhoods were identified as potential new urban subcentralities.

REFERENCES

Barros, A. P. B.G, Medeiros, Valério A. S. (2014). 'Centralidades e sintaxe espacial: variáveis para a compreensão da acessibilidade urbana'. In: Kneib, E. C. (ed.), *Projeto e Cidade: Centralidades e Mobilidade Urbana*, Goiânia: UFG, p.269-316.

Gomes, F.S. (2007). *Discursos contemporâneos sobre Montes Claros : (re)estruturação urbana e novas articulações urbano-regionais*. (Master's thesis, Federal University of Minas Gerais, Belo Horizonte, Brazil). Retrieved from http://www.bibliotecadigital.ufmg.br/dspace/handle/1843/RAAO-7BMQ8A.

Hiillier, B. (2007). *Using DepthMap for urban analysis: a simple guide on what to do once you have an analysable map in the system*. The Bartlett School of Graduate Studies, UCL.

Instituto Brasileiro de Geografia e Estatística – IBGE (2016). *Montes Claros*. Retrieved from http://cidades.ibge.gov.br/xtras/perfil.php?lang=&codmun=314330&search=minas-gerais|montes-claros<http://www.censo2010.ibge.gov.br/>.

Leite, M. E. (2006). *Geoprocessamento aplicado ao estudo do espaço urbano: o caso da cidade de Montes Claros/MG*. (Master's thesis, Federal University of Uberlândia, Uberlândia, Brazil). Retrieved from https://repositorio.ufu.br/handle/123456789/16265.

Leite, M. E. (2011). *Geotecnologias aplicadas ao mapeamento do uso do solo urbano e da dinâmica da favela em cidade média: o caso de Montes Claros/MG*. (Doctoral's thesis, Federal University of Uberlândia, Uberlândia, Brazil). Retrieved from https://repositorio.ufu.br/handle/123456789/15937.

Medeiros, V. A. S. (2006). *Urbis brasiliae ou sobre cidades do Brasil: inserindo assentamentos urbanos do país em investigações configuracionais comparativas*.(Doctoral's thesis, University of Brasília, Brasília, Brazil). Retrieved from http://repositorio.unb.br/handle/10482/1557.

Pereira, A. M. (2007). *Cidade média e região: o significado de Montes Claros no Norte de Minas Gerais*. (Doctoral's thesis, Federal University of Uberlândia, Uberlândia, Brazil). Retrieved from http://www.ppgeo.ig.ufu.br/node/148.

Ramos, N. M. S (2016). *Centralidades Reais X Centralidade Potenciais: O caso de Montes Claros-MG, sob a ótica da Teria da Lógica Social do Espaço*. (Unpublished thesis). University of Brasília, Brasília, Brazil.