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Analysis and classification of open public spaces, a method using perception and measurable indexes

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Abstract

This paper addresses the complexity of contemporary public space types. We suggest a method of urban analysis that systematizes ways of identifying sensitive and spatial characteristics present in open public spaces, in the urban landscape of the city of Fortaleza, Brazil. The morphology and organization of these spaces implies a social structure and relationships that infer affection, and a possible measure of spatial quality. The morphological analysis is supported both by Spatial Syntax research and information technologies such as Geographic Information System platform, bringing 3D tools for urban analysis through information modeling. To analyze the dimensions of the space quality that improve everyday usage, authors like Lynch, Cullen, Gehl and Jacobs are inspirational for the creation of parameters and variables of life in the city. In addition, we suggest a more attentive format of perception of urban poiesis using sketchbooks, a tool explored by Salavisa. As a result of this investigation, starting from the phenomenological study, we seek to present a model of space analysis. Said model connects sensitive aspects of human perception and the abstract and rational approach, formalized in indicators that can be quantified.

Keyword: urban morphology, space syntax, urban space quality.

Introduction

This is an ongoing master's research in the postgraduate program in Architecture, Urbanism and Design at the Federal University of Ceará, Brazil. It focuses on urban morphology and analyzes open public spaces for walking, such as sidewalks and squares.

Walkability is studied by several authors. Their contributions came after the Modernism when functionalist zoning made cities monotonous and segregated (Lamas, 2010; Jacobs, 2011; Gehl, 2015). Since then, studies on the quality of space have been of great importance to restore vitality in the urban environment (Lynch, 2011; Speck, 2017; Gehl and Svarre, 2018).

Given the urban and social growth and its complexity, the use of information and communication technologies that support urban planning and projects is increasingly urgent (Ascher, 2010; Beirão, Montenegro and Arrobas, 2012). These technologies help in characterizing spaces, predicting scenarios and monitoring policies and projects. The iterative capacity seeks to keep up with the problems of an increasingly

diverse society. From this perspective, the use of indicators through data collected remotely and in-person show differences and deficiencies in spatial sections, informing needs and changes in policies or projects for the analyzed location (Jannuzzi, 2004).

However, as well as the constant development and complexity of the city's system, these technologies need to be updated and adapted to new demands. In Brazil, the use of these digital tools, especially the Geographic Information System (GIS), has been expanded in public agencies and universities (Jannuzzi, 2014).

It is understood that the main basis for using these tools are databases. The collection and dissemination of this data has been attributed to a digital infrastructure aligned with the commercialization of the possession of this knowledge (Morozov et al., 2019). Furthermore, there is not a systematized model of indicators that analyze urban quality that considers important characteristics of the perception in walking.

This research approaches a more careful methodology and brings the researcher closer to his object of study, the city. In this sense, drawings made in graphic journals can be translations of human perceptions about the place. When walking through space and letting himself be affected by its morphology, the researcher/designer captures elements that suggest spatial quality.

Given the above, the conduct of research and urban planning closer to the place indicates a better understanding and local belonging. Furthermore, following a process bringing art, science and technique together is coherent with a complex city. Barata (2019) highlights that this interdisciplinarity allows for a better interpretation of the urban phenomenon. The intersection of these disciplines is not commonly present in research and urban planning processes. This variety has always been associated with the idea of city complexity.

Given the themes exposed, some questions guide this research: [1] How to systematize urban indicators that can jointly reveal the urban quality of walking spaces in a more sensitive way? [2] Would information and communication technologies be able to capture perceptual and sensitive aspects of everyday life through remotely collected data? [3] Is looking and drawing an efficient method of investigating the landscape?

The general objective of this research is to propose a quality indicator that includes the perception of walking in the city in search of a more sensitive methodology for urban analysis, with specific objectives: [1] Reviewing literature on the theme of city living; [2] Identify the concepts relevant to the quality of walking; [3] Develop a quality indicator for urban space based on drawing in the city; [4] Systematize simple indicators to compose a complex indicator; [5] Test the indicator on spatial cutouts.

Background

In *A Boa Forma da Cidade*, Lynch (2015) states that there are certain general aspects about the quality of the city's form, and that "certain effects are likely to extend to the entire human race and its separation from culturally innate norms would certainly be very useful" (2015, p. 101). In this sense, he proposes a set of interrelated dimensions that are important to be considered in good urban form, namely: vitality, meaning, adequacy, access, control, and finally efficiency and justice.

In *A Imagem da Cidade*, Lynch (2011), within a cognitive framework, elaborates perceptual categories of spatial quality, bringing the concept of imageability, when landscape elements evoke a strong image. The qualities are summarized in: uniqueness, simplicity of form, continuity, predominance, good visibility, directional differentiation, visual range, kinesthesia, temporal perceptions, names and meanings.

Also within a perceptive approach, Cullen (2008) studies visual stimuli through what he calls serial vision, walking through the city and letting himself be surprised by three aspects: the optics, the place and the content, to study how a person's affections and reactions are processed when drawing up an image of the urban landscape.

Jacobs (2011) deals with the concept of urbanity, where there is freedom and security provided by exuberant diversity on the streets. To achieve these quality conditions in the neighborhoods there should be: a variety of functions and uses at different times throughout the day, as well as a diversity of architectural typology; presence of short blocks that increase connectivity and encounters; and an ever-present high density of people at different times.

Gehl (2015) lists twelve quality criteria for the walkable city following three levels of importance: safety, comfort, and pleasure. First, people are protected from both urban violence and bad weather; second, comfort is sought by expanding opportunities to walk and contemplate the city through good access and good visibility; and thirdly, the pursuit of attractive and stimulating sensory experiences.

The study of these authors provided the comparison and overlapping of the concepts used to qualify the form of the city. The concepts were arranged in a list and later, we chose the 3 most general concepts that fit this research as a study of the quality of urban morphology and walkability. They are accessibility, diversity, and density. However, this work focuses on perception, on the effects that suggest spatial quality. In this way, we determined that the act of contemplating the city as an important aspect to be considered.

Perceptions

Visual perception comes from the meaning of percept. Rodrigues (2016) states that percepts exist regardless of who experiences them, just as affects are no longer feelings, they exist beyond the human. Ferrara (1993) adds that percepts are images of living sensations, singular, one-dimensional, and arbitrary. It does not allow

any freedom of interpretation of its meaning, it distances itself from any subjective or personal character. Ewing and Handy (2009) state that perceptions can be estimated with some objectivity by other people (researchers), while reactions to stimuli are individual and relative. Perceptive qualities are different from feelings of security, comfort or interest. These reveal a reaction related to individual interests or perspectives (Ewing and Clemente, 2013). The perceptual qualities are subtle and differ from gross attributes such as accessibility and density. They need a more sensitive research approach model and closer of walking.

Methodology

Having determined the concepts to be covered, we established a methodological workflow and tools to be used to quantify these qualities as indicators. We split the workflow by applying the chosen tools.

Barata (2019) states that the best way to apprehend spatiality is the direct experience in the territory, through movement. The subtle characteristics of urban quality cannot be captured by geographic information system tools or satellite images, but they are important to measure walkability (Nunes and Vale, 2018). In search of a more sensitive research model, we found a look at the drawing, through the collection of urban illustrations in graphic journals. Drawing allows for the development and exercise of specialized observation, as well as being an investigation method (Rodrigues, 2003). The observation drawing implies the representation of a multidimensional reality in two dimensions, requiring an attentive look at the landscape, decision-making in a process of abstraction. The suggested support is called graphic journal, an appropriate term to designate a sketchbook of daily use where illustrations and words are collected (Salavisa, 2008; Brasil and Guaraldo, 2020).

Urban illustrations communicate visual data and design patterns that can be correlated with the concepts of perceptual qualities studied by the authors, thus considered indicators of quality. The recognition of these patterns are pointed out by theorists or refined over time by designers or photographers. In this research, some categories of perceptual quality were summarized to be related to the patterns found in the drawings.

Are they:

Identity: is associated with the characteristic of imageability and sense proposed by Lynch (2011, 2015), as well as the presence of landmarks, elements that bring recognition and identification.

Openness: refers to the wide visibility of a given location and the security provided.

Enclosure/Delimitation: Refers to the degree to which streets and public spaces are visually defined by buildings, walls, trees, and other vertical elements (Ewing and Handy, 2009). In addition, to perspectives with a view blocked by some elements, also reaching closure.

Variety: Refers to the liveliness of the architectural elements present in the landscape. Through a visual complexity, a mixture of elements, colors, textures, architectural types, a variety is obtained.

Sensitivity on a human scale: the multiplicity of affections on a human scale is addressed. Elements and impressions designed for pedestrians. In addition to sensory and temporal impressions perceived only through walking.

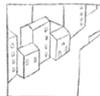
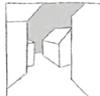
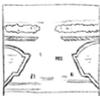
Drawing category	Quality category	Technique	Example	Drawing category	Quality category	Technique	Example
Skyline	-Openness	Silhouette		Delimited perspective	-Enclosure	Confinement. Usually perspective with one point of view.	
Panorama	-Openness	A progressive gradient. Distinctness gradient. Variation in the thickness of the strokes for illusion of depth.		Approach perspective	-Enclosure -Variety	Design of projections and recesses, continuity of the street.	
Detail	-Identity -Variety	Unique small-scale drawing.		Sky clippings/voids	-Human scale sensitivity	Diaphragm/Profile	
Grand/volumetric perspective	-Identity -Openness	Drawings that show the here and the beyond. Dividing the distance into two parts.		Serial view	-Identity -Openness	Draw on frames	
Veiled perspective	-Enclosure -Human scale sensitivity	Enclosure. Element that blocks perspective.		Facades	-Identity -Variety	Front view	

Figure 1. Correspondence between standards of drawing and quality categories.

Figure 1 is one of the results of this research and contributes as a systematization of an indicator of perceptual qualities. The correspondence between quality categories and drawing standards was possible thanks to the constant practice of drawing in the city and access to studies by Professor Daciano Costa (Ferrão and Martins, 2013). After systematization, we analyzed the illustrations made in graphic journals in two neighborhoods in the city of Fortaleza, Ceará, Brazil. Then, we identified in each drawing the number of patterns found. And then, using a GIS tool, we mapped the locations of the drawings.

We drew a 50m visual field at each drawing location by checking the covered sidewalk segments. To quantify these perceptions, we made an average for each sidewalk segment, considering the number of designs and twice the number of categories in each design.

In the theme of walkability, Speck (2017) presents a tool called walk score. It ranks the sites examined by scoring that varies within a rating range, from extremely car-dependent locations to optimal walking spaces. This is an international index, but it was adapted to the Brazilian reality by the Transport and Development Policy Institute (ITDP Brazil). The tool is composed of fifteen indicators grouped into six categories. The categories include road safety, attraction, sidewalk, environment, mobility and public safety. Each category

is composed of indicators ranging from 0 to 3 being characterized as insufficient, sufficient, good and excellent. The combination of these indicators through simple arithmetic mean composes the category score that ranges from <1 to 3, with the same classification as the indicators. The survey and analysis for this tool are carried out by sidewalk segment. This tool was chosen due to its accuracy and approximation to the human scale, as the survey is largely done through direct observation. The sidewalk segments analyzed through the tool had a minimally satisfactory result, even observing some precariousness in each determined cut.

In the scope of urban morphology, Space Syntax research stands out as an indicator of quality, as the configuration of the space can suggest a social structure, and its description is made through quantitative measures (Hillier and Hanson, 1989). In the meantime, through the measure of integration, we obtain the degree of accessibility, understanding the integration or segregation of spaces. Through the Depthmap tool available for the GIS software, axial maps were made for the cutouts of this research. Due to the grid of the city of Fortaleza, all measures referring to the segments of sidewalks under study were considered well integrated.

Place Syntax is an outcome of Space Syntax's research. For Marcus (2007) urbanity is the relationship between form and urban life. Based on the Space Syntax integration principle, he proposes the addition of two new indicators: density and diversity, concepts that have been widely studied (Berghauer Pont and Haupt, 2009; Jacobs, 2011). The correlation between the three concepts would result in the social performance of the urban form, which Marcus names Spatial Capital, referring to the sociologist Bourdieu (Mace, 2017). The formalization of Space Capital resulted in a methodology and a tool.

The tool called Place Syntax Tool was introduced by Stahle et al. at the 5th Space Syntax Symposium in Delft and has since been developed at KTH School of Architecture and Spacescape AB, and more recently by the SMOG group at Chalmers School of Architecture in Sweden (Turner, 2007). This tool was used to seek an approximation with the reality experienced by pedestrians, as it deals with attractiveness and access impedance.

In this research, we chose the Attraction Distance analysis for buildings of cultural-historical value and squares present in the cutouts. Using this measure it is possible to visualize the streets that have relevant historical buildings and squares in an adequate walk of up to 500m (Gehl, 2015).

Unlike the methodology used by the walk score and graphic journal, space syntax and place syntax are measures less sensitive to local detail and idiosyncrasy, but equally important in identifying walkability.

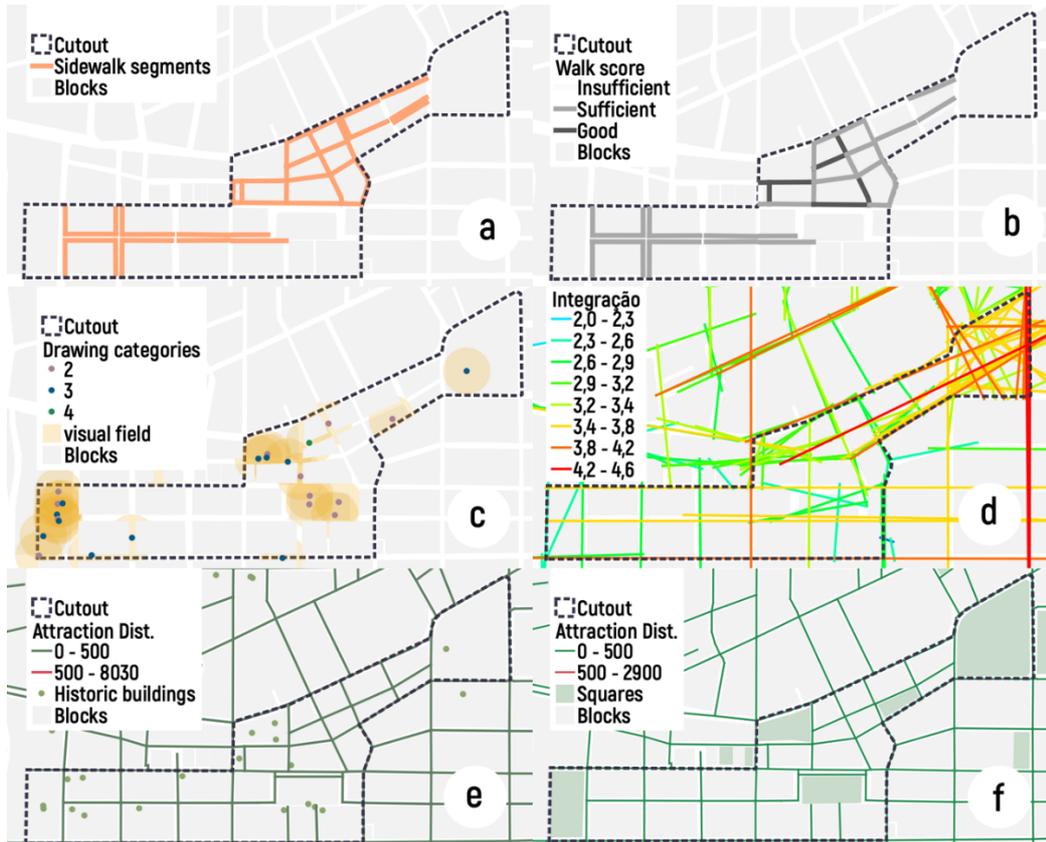


Figure 2. a) Levanted Segments, b)Walk score, c)Graphic journal, d)Integration, e)Attraction Distance buildings, f)Attraction Distance squares.

Results and Discussions

We have demonstrated some segments of sidewalks that have good walkability, including the perception of quality provided by the illustrations, which bring a different value to the research, increasing the sensitivity by measuring the perception encoded in the drawings. Given this, would we have a similar result without the use of illustrations?

Conclusions

Although the walk score and graphic journal indicators can be considered more sensitive because they presuppose an approximation with the spatial clipping and direct observation, due to the need of the presence of a person, most of the sidewalk segments still need to be analyzed. Due to the current health crisis, work has been reduced and was adapted to be follow safety measures.

We will also adapt the methodology exposed to the city information modeling platform already used in the works of the Federal University of Ceará, which, in addition to the possibility of accessing remote databases, such as the GIS presented here, the visualization can be represented in three dimensions.

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