

CONFERENCE PAPER

NZAAR-UDCP-16-24 ICUDCP 2016

A Comprehensive Approach to the Assessment of Visual Consistency in Townscape

Dheyaa Hussein*, Peter Armstrong

¹Faculty of Architecture, Design and Planning, University of Sydney, Australia

* Correspondence: dhus4848@uni.sydney.edu.au

PUBLISHED IN

The First NZAAR International Event Series on Natural and Built Environment, Cities, Sustainability and Advanced Engineering
International Conference on Urban Design and Cities Planning (ICUDCP 2016)

Pages	127-129 of the volume
Held	26 June 2016, Shangri-La Hotel, Putrajaya, Malaysia
ISSN	2463-5979 (online) 2463-5960 (print)
Publisher	New Zealand Academy of Applied Research Ltd, Auckland

ABSTRACT

This paper provides a theoretical framework for the establishment of an arithmetic tool for evaluating visual consistency in order to tackle the phenomenon of visual disorder in contemporary townscapes. Visual consistency refers to the amount of similarity between townscape components. The paper explores parameters of visual consistency in townscape. It uses arithmetic methods to enable the establishment of an objective method of assessment which depends on the visual perception of users. The paper identifies urban space as a critical factor and focuses on its geometric variables in the evaluation of visual consistency of townscape. The proposed quantitative assessment is based on users' preferences towards these variables as well as the position of observers in townscape. This approach underpins the likelihood of expert's subjective assessment and permits the establishment of a unified framework which achieves a higher level of consistency and satisfaction among the citizens of evolving townscapes.

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HOW TO CITE

Dheyaa Hussein and Peter Armstrong (2016). A Comprehensive Approach to the Assessment of Visual Consistency in Townscape. In *The First NZAAR International Event Series on Natural and Built Environment, Cities, Sustainability and Advanced Engineering*, Putrajaya, Malaysia, 26 June 2016 (pp. 127-129). Auckland: New Zealand Academy of Applied Research. ISSN 2463-5979 (online), 2463-5960 (print).

A COMPREHENSIVE APPROACH TO THE ASSESSMENT OF VISUAL CONSISTENCY IN TOWNSCAPE

Dheyaa Hussein* & Peter Armstrong

¹Faculty of Architecture, Design and Planning, University of Sydney, Australia

*dhus4848@uni.sydney.edu.au

www.nzaar.com

Abstract

This paper provides a theoretical framework for the establishment of an arithmetic tool for evaluating visual consistency in order to tackle the phenomenon of visual disorder in contemporary townscapes. Visual consistency refers to the amount of similarity between townscape components. The paper explores parameters of visual consistency in townscape. It uses arithmetic methods to enable the establishment of an objective method of assessment which depends on the visual perception of users. The paper identifies urban space as a critical factor and focuses on its geometric variables in the evaluation of visual consistency of townscape. The proposed quantitative assessment is based on users' preferences towards these variables as well as the position of observers in townscape. This approach underpins the likelihood of expert's subjective assessment and permits the establishment of a unified framework which achieves a higher level of consistency and satisfaction among the citizens of evolving townscapes.

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1. Introduction

Townscape is the spatial organization and visual appearance of natural and cultural components of the built environment. The paper attempts to tackle a contemporary issue of visual disorder of townscape, resulting from two urban challenges. First is the visual deterioration of the townscape due to the rapid growth of population and advance in the number of motor vehicles. Second is the lack of a reliable visual evaluation of townscape quality and consistency. These challenges necessitate the establishment of an objective assessment of parameters related to visual consistency in townscape. The paper offers a theoretical basis for a practical tool which can alter the current understanding of architectural form and its application in urban space. This tool is currently under development and experiments are required to validate its theoretical approach.

2. Literature Review

Townscape perception is achieved by the observation of its objects, their aspects and the relationships between them. Visual objects in townscape are classified into site

and objects on the site. Objects on the site are organized into four groups: buildings, other outdoor elements, vegetation and humans [1]. The perception of objects depends on their visual aspects, which distinguish elements from their context. These aspects are formal and positional. Formal aspects relate to characters that provide an object its appearance. These aspects are shape, size, colour, texture, material, detail and ornament. The position of objects plays a major role in forming relationships between objects [2]. Visual consistency in townscape involves a group of relationships. These relationships are the most significant in the perception of townscape. They rely on the aspects of objects and their number. These relationships are scale, enclosure, redundancy and harmony. Harmony is a key relationship; it is fundamental in the achievement of the balance between contrast and continuity and, thus, visual consistency in townscape. Providing a method to determine its preferred level is required. The main objective of the research in urban design is to define the most significant element in its visual assessment.

Hence, a better description will be provided to define the way an urban setting responds to alterations and to make a better prediction of the impact of different planning policies. Urban space is the most significant part of townscape. What is perceived as urban space may be considered as a void that is defined by elements placed on a site [3]. Spaces in the city are vital objects since whenever people are in the outdoor environment of a city, they are in and moving through spaces of one sort or another. Cities may contain the same visual objects. However, it is the underlying principles and relationships of their spaces that differ. The quality of the components of townscape defines the quality of its urban space, and vice versa. The paper proposes a method to visually evaluate townscape based on the quality of its urban space which, in turn, is represented by its geometry. Geometry is the three-dimensional structure of urban space that characterises visual objects in townscape, their aspects and the relationships between them. This structure is formed by vertices which are points connected by line segments to mathematically represent three-dimensional surfaces of objects. The number, position and colour of these vertices control all parameters associated with visual consistency in townscape. It is imperative to assess the preferences of the users of a townscape that is under development. These users have a consensus about what they favour or dislike due to common cultural and environmental factors [4, 5]. Thus, data from user preferences of existing or virtual townscape will help to understand the impact of parameters of visual consistency in townscape and, thus, to analyse and improve a proposed development.

3. Research Methods

The proposed assessment of visual consistency depends on four measurements. These are the number of vertices, the urban ratio and the consistency of both the position and the colour of vertices. The

result of this assessment can differ based on the location of the observer. Thus, a virtual line which represents an observer's path and average eye level is the reference for all measurements. This line is identified as the observer's reference line. The first measurement detects the number of vertices which are visible from the observer's reference line. Visible vertices within the cone of observer's vision are more significant and thus will be allocated larger values than those outside it. The second measurement calculates the urban space ratio of townscape. The space ratio is formed by vertices which shape the top visible edges of townscape. The space ratio of each of these vertices is its vertical distance to the observers' reference line divided by the horizontal distance between them. The average space ratio of these vertices represents space ratio of their townscape. The third measurement determines the consistency of vertices' position. The paper employs a statistical method, namely population standard deviation in this measurement. In this calculation, each data point represents the position of a visible vertex in relation to the observer's reference line. The last measure calculates consistency in the colour of visible vertices. The same statistical method, population standard deviation, will be used. A method called colour distance (ΔE) using a formula known as (CIEDE2000) is used to determine the difference between each colour value and the mean. The values resulting from these four measurements will only be reasonable in terms of the consideration of their impact on the visual perception of users. Thus, a group of virtual townscapes will be designed to contain different values of the four indicators. These townscapes will be scored by users through the implementation of the pairwise comparison method [6]. As the score of each townscape and its four measurements becomes known, an equation to predict the amount of visual consistency based on users' perception can be determined using the statistical method of

multiple linear regression [7]. In order to verify this approach, the resultant equation is used to assess and rank another group of townscapes based on their visual consistency. These townscapes are further ranked by the same group of users to evaluate the agreement between the two types of ranking using a method of correlation. The result is an equation to predict the significance of any townscape based on user preferences towards parameters of visual consistency in townscape.

4. Discussion and Conclusion

In response to the inadequacy of traditional methods of townscape visual evaluation, this paper hypothesises an alternative method based on an arithmetic assessment of townscape parameters and their perception. The paper proposes a model to objectively evaluate townscape through two types of data. The first is quantitative; it relates to urban space ratio, the number of visible vertices of townscape and variation in both position and colour of these vertices. The second is subjective and deals with observers' response to the quantitative data. Accordingly, the model constructs a predictive equation regarding visual consistency in townscape. The result is a flexible arithmetical method to effectively represent the visual requirements of townscape users and eliminate the likelihood to encounter unguided individual judgements by decision makers. This paper paves the way for the construction of an online application which predicts public response towards townscape development to assist planners in their design decisions regarding visual consistency in townscape.

5. References

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