

Research Paper

Soundscape assessment of a monumental place: A methodology based on the perception of dominant sounds



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ABSTRACT

Some monumental sites have unique soundscapes that deserve to be managed not only by their tourist and cultural value, but also for enhancing the visitors' overall impression. These sites can include a multitude of sound sources within a variety of different locations with geometrically different spaces in size and shape, so that the soundscape assessment could be quite challenging. The hypothesis of this study is that regardless of the complexity of sound sources comprising a given acoustic environment, the perceived soundscape quality is driven primarily by the evaluation of the subjectively dominant sounds. This hypothesis was tested in a field study conducted in a monumental site with historical relevance located in a semi-natural environment (the Alhambra of Granada, Spain). The main finding was that, for a given location, the higher the percentage of visitors reporting a pleasant sound as dominant, the higher the reported soundscape quality and overall impression. Moreover, it was found that: (i) the sounds of birds, water and visitors (voices and footsteps) are the sounds primarily reported as dominant, (ii) the throngs of visitors (human sounds) negatively affect the soundscape quality, (iii) natural sounds increase the reported pleasantness, especially water sounds, which significantly improve the perceived soundscape quality. The practical implication is that, with appropriate information on subjectively dominant sound sources to prioritize corrective actions, soundscape management and its enhancement will require much less time and operational effort than other options for soundscape assessment based on the use of extensive questionnaires.

1. Introduction

Monuments are constructions/works sharing an artistic, archaeological, historical or similar value. These monuments can be large area enclosures (e.g. Angkor kingdom, Cambodia) or be limited to unique elements in the landscape (e.g. obelisk in Buenos Aires, Argentina). Monuments of great historical and cultural importance usually become symbols in cities, areas or more extensively of countries, becoming places of great interest and touristic value that receive millions of visitors every year. Furthermore, these monuments can be located in the urban area or in semi-natural or natural areas, which clearly influence the experiences linked to the landscape or environment of the visitor. Our field study has been carried out in the monumental space of historical relevance as is the case of the Alhambra of Granada in Spain (hereinafter referred to as the Alhambra), taken as a representative case study of the proposed methodology for soundscape assessment. This is a monumental space located in a semi-natural area (with little influence of urban noise compared to parks or green areas in the city of Granada), whose surroundings suggest to the visitors to contemplate, walk, rest,

and even relax during their visit. This medieval citadel, declared a World Heritage Site in 1984, is the most visited monument in Spain nowadays.

The term “soundscape” has been recently updated (ISO 12913-1, 2014) as the “acoustic environment as perceived or experienced and/or understood by a person or people, in context”. The context is therefore a key factor for understanding the perception of a certain acoustic environment, so that it should be included in the soundscape assessment process (Brown, Kang, & Gjestland, 2011; Hong & Jeon, 2015). Several works have addressed soundscape perception studies in a variety of environments (contexts), such as urban parks (e.g., Liu, Kang, Behm, & Luo, 2014), urban squares (e.g. Yang & Kang, 2005), natural areas (e.g. Miller, 2008), rural areas (e.g. Lee, Hong, & Jeon, 2014), and indoor locations (e.g. Mackrill, Cain, & Jennings, 2013). While not receiving as much focus there has been some attention paid to historic sites in some research (e.g. Barrigón Morillas, Gómez Escobar, & Rey Gozalo, 2013).

Traditionally, aesthetic beauty has been one of the main attractions of historical monuments. Nasar (1989) identified the aesthetic quality

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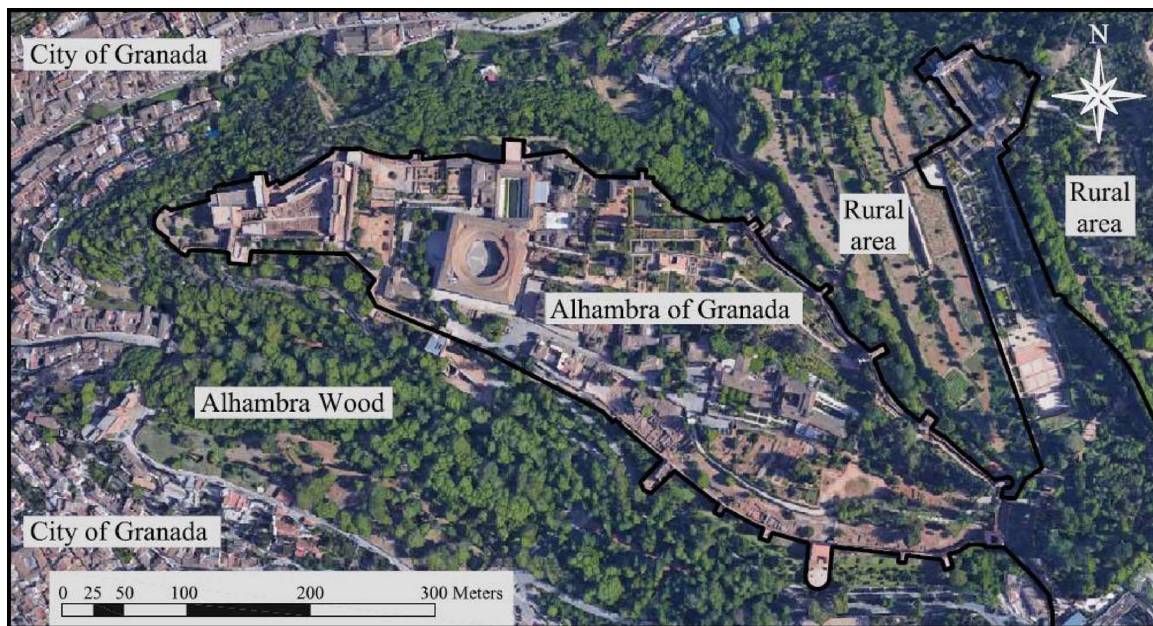


Fig. 1. General view of the Alhambra monumental space and their adjacent areas.

as an important dimension in the perception of the environment, where the pleasure and beauty represent the most influential dimension in the environmental assessment. But, the assessment of a given environment requires a multidisciplinary approach, and sound plays an essential role (Mace, Bell, & Loomis, 1999; Southworth, 1969; Yang & Kang, 2005). A good quality of the soundscape can improve human well-being and offer a more comfortable experience, while allowing to connect the visitors with their environment (Jeon, Lee, Hong, & Cabrera, 2011; Nilsson et al., 2012), enhancing their overall impression. In this context, good planning and design of the soundscape as another piece of the overall landscape of historical places would undoubtedly help maintain their aesthetic, natural, and cultural qualities, whether expected or existing (Kang et al., 2016).

The soundscape of a given location represents both the acoustic environment as perceived by people and the total inventory of sounds present at such a location (Brown et al., 2011). Kuwano, Seiichiro, Kato, and Hellbrueck (2002) stated that an acoustic environment is perceived as a collection of individual sounds. This means that the evaluation of a given acoustic environment requires the identification of the individual sounds (Jeon et al., 2011; Kang, 2011; Liu, Kang, Luo, & Behm, 2013; Szeremeta & Zannin, 2009). Also, other authors (Axelsson, Nilsson, & Berglund, 2010; Davies et al., 2013; Matsinos et al., 2008) have suggested that the identification of subjectively dominant sounds is a crucial feature for soundscape classification. The type of sounds present in these historic monumental sites depends on its location (urban, natural or semi-natural environment), as well as on its own sounds (sounds coming from the visitors or the characteristic sounds, e.g. water sources). In this sense, the soundscape evaluation depends on the personal preferences to the existing sounds, its loudness and other factors, such as the socio/demographic characteristics (Yu & Kang, 2010), so that the evaluation of their soundscape could become a challenge.

In monumental areas with great tourist inflow, the noise caused by the visitors tends to be a frequent sound. The perception of human sounds has been widely studied in urban environments, where these sounds have been found to have a either a neutral (e.g. Nilsson & Berglund, 2006; Yang & Kang, 2005) or positive (e.g. Szeremeta & Zannin, 2009) effect; but also in natural spaces where the reduction of human-related sounds enhanced the feeling of soundscape peacefulness and pleasantness (Axelsson et al., 2010; Kaplan, 1995; Ulrich et al., 1991). Moreover, monumental and historical sites with

adjacent green areas (as in our case study) are sometimes characterized by sound sources, such as birds or water fountains. Aesthetic and sound features of water have been well acknowledged as an important element of the urban environment (Axelsson, Nilsson, Hellström, & Lundén, 2014; Burmil, Daniel, & Hetherington, 1999; Whalley, 1988). Water fountains have been found to mask undesirable sounds, thus improving the reported soundscape quality in urban environments (Jeon, Lee, You, & Kang, 2010; You, Lee, & Jeon, 2010). All these sources emit with a variety of sound levels, thus generating an environmental sound that influences the perception of the soundscape.

Based on these ideas, the hypothesis underlying the present study is that the soundscape quality of historic monumental sites is driven mainly by the evaluation of subjectively dominant sounds. This paper analyses and discusses the extent to which the dominant sounds affect both the subjective quality and other attributes of the soundscape in context. Therefore, this paper proposes and develops a methodology for assessing soundscapes based on the perception of subjectively dominant sounds.

2. Methodology and data collection

This section describes the study area, the data-collection methodology, and how the most representative locations of the Alhambra were selected and then assessed.

2.1. Study area

A series of soundwalks conducted to explore the study area and ensure the selection of a representative sample of the different soundscapes of the Alhambra. It emerged that the Alhambra includes a great diversity of spaces both visually and acoustically. Three descriptive categories of sounds can be found: natural sounds, human sounds (voices and footsteps), and technological sounds. The first two categories of sounds are present in most parts of the monumental complex, while the third one appears in a few locations, such as the case of the walled perimeter and its towers (which are the most exposed to the city of Granada). Its geographical situation and its shape establish a natural barrier for the unwanted sounds coming from the city, e.g. traffic, construction, and restoration works. Fig. 1 shows the spatial area comprising the Alhambra and its adjacent spaces: the Alhambra woodland, the city of Granada and the nearby rural areas.

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