

“Listening” Crowdsourced Knowledge

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Abstract: Bearing in mind the influence of internet based instruments for crowdsourcing, landscape architecture, planning, and urban design fields are progressively applying these tools to obtain better notions and alternatives from the community. Such instruments generally provide considerable data about what community desires. In spite of the fact that, to the best of our knowledge crowdsourced intelligence in landscape architecture has been studied limited.

This research concentrates on University of Texas at Arlington campus soundscape in the heart of 6 million populated Dallas-Fort Worth region to examine the opportunities and applications of performing crowdsourced data. To do this, research team applied mixed methods, the study evaluates the opinions of campus users and determines in which aspects those ideas can be connected to soundscape patterns. After investigating the interviews of campus users, the study integrated the information of perceptions about opinions at the end of the research. The findings emphasizes the challenges, limitations, and opportunities in regard to the landscape architecture discipline. It is noteworthy that several circumstances have implications on applicability of crowdsourced information on soundscape.

Keywords: Soundscape, crowdsourcing, campus planning, Google, community engagement

1 Introduction

Have you ever watched the TV show “Who Wants to Be a Millionaire?” The crowd knows best in this show. While the experts are nearly 65 % right, the crowd is more than 90 % right. So, the power of the crowd has been gradually realized (Surowiecki 2004). Similarly, crowdsourcing is a recent, promising tool for public participation in all aspects/phases of landscape architecture, urban design, and planning fields. Even though these fields help shape the physical and social environment of human beings, is it sufficient to fulfil plans without people’s involvement? At this point, some scholars suggest a heated debate for developing “the wisdom of crowds” to address community preferences and problems (SUROWIECKI 2004). We would like to be a part of this debate by “derailing” the subject more into the landscape architecture field.

Although landscape architects are dealing with public involvement for their projects, it is difficult to obtain community-related outputs unless there is a strict event series, such as a number of public meetings and urban charrettes (HOCH 2007). Another concern in regard to these events is that they need prolonged preparation in terms of time and budget to be successful. Even if landscape architects and planners manage that preparation, it may not be attractive enough for people to participate in the process (RHOADS 2010). These challenges affect landscape architects and planners, who often seek alternative solutions. At this point, crowdsourcing could be one possible improvement for public participation in terms of gathering information, feedback, and preference-related input. Having crowdsourcing can be applied many diverse subjects, including visual and aural assessments.

The term soundscape represents the acoustic environment that depicts a place. General characteristics of a soundscape are having numerous sound sources, such as natural (earth and

animal) and man-made (anthropologic and machinery). Many different fields such as acoustics, physics, psychology, physiology, history, architecture, planning, and landscape architecture have been investigating soundscape since the 1970s. The soundscape studies have used many instruments to obtain people's input, such as sound walking (SCHAFER 1977), interview and questionnaire (KANG 2004), sound and noise mapping (KANG & SCHULTE-FORTKAMP 2016), and experimental units with Virtual Reality and Augmented Reality (LINDQUIST et al. 2016). In recent years, soundscape research has focused on the relationship between human and computer interaction with the applications of sound (MCGREGOR 2011). However, there are still few studies that seek for the relationship between crowdsourcing and soundscape. So, this article concentrates on the University of Texas Arlington campus soundscape study as a case study in crowdsourcing.

Considering the current tendency and state-of-art technologies about performing web-based and crowdsourced knowledge in landscape architecture, the research applies both spatial and web-based analyses to highlight the importance of public involvement. To our knowledge, there are only a few studies focused on crowdsourcing on soundscape in different locations around the world. Furthermore, this study seeks to address the gap between crowdsourcing and soundscape as an adaptation of enhanced technology.

We first revisit a brief synopsis of some theories and applications behind crowdsourcing. Concluding our literature review is a description of how crowdsourcing can be used regarding soundscape. We finalize the study with findings and a web-based tool for campus soundscape, followed by recommendations for further research ideas for landscape architects and planners.

2 Literature Review

2.1 Public Involvement

Public participation has numerous definitions for many fields. Many scholars define public participation as civic responsibility, such as voting (LEVINE 2007) while some others consider the term as developing community organizations, such as neighbourhood associations. Others think that public participation is a characteristic of social capital (Putnam 2000). Main features of public participation, however, involve two-way communication and collaborative problem solving, aiming to accomplish more satisfactory and suitable assessments (KIRK & SCHILL 2011). These are the key features of the traditional public involvement. In addition to traditional approaches, there is also web-based involvement.

2.2 Web-Based Public Involvement

While traditional participation is commonly made through face-to-face meetings, web-based participation is conducted online and is known as crowdsourced information. Social media tools and other communication technologies have radically changed recently (SHIRKY 2008). Therefore, web-based and communication technologies have the potential to accumulate a "smart crowd" to promote people to be part of ideas or solutions to problems (BRABHAM 2009). This transition is the emergence of crowdsourcing. So, what is crowdsourcing?

2.3 Crowdsourcing

The term crowdsourcing is a relatively new idea. Jeff Howe, one of the pioneers of the concept, defined crowdsourcing as the action of an organization that takes a function performed by members of the organization to expand the utilization to a larger body of a "network of people in the form of open call" (HOWE 2008). On the other hand, Brabham defines the term as: "a company posts a problem online, a vast number of individuals offer solutions to the problem, the winning ideas are awarded some form of a bounty, and the company mass produces the idea for its own gain (BRABHAM 2009)."

2.4 Sound and Public Involvement

In addition to several web-based applications, individuals have played crucial roles for soundscape studies since the origination of the concept. Soundscape studies have used extensive public input. To illustrate this, soundwalking is a common practice to provide a better understanding of sounds. In addition, conducting questionnaires, surveys or interviews is another prolonged instrument. The main goal is to gather the sound preferences of community. Sound and noise mapping is a general application for getting help from digital platforms such as sound-relevant software or GIS. In a transition of crowdsourced-based application, participatory noise mapping is another procedure. To do this, many scholars applied participatory sensing systems, such as NoiseTube, to monitor and generate maps for noise (DRASATOS et al. 2013, STEVENS 2012) while some other studies applied different instruments such as Ear-Phone, NoiseSPY, and WideNoise in addition to NoiseTube for a similar purpose. The reason for using such sources is that they are generally open source and publicly accessible, containing both application and web-based platforms (STEVENS 2012, D'HONDT et al. 2012).

2.5 Soundscape and Crowdsourcing

Even though there are many categories of public involvement in soundscape studies, there are still missing features; for instance, recruiting people for soundwalking and informing participants about the essential goals, the general problems of questionnaire and survey methods—such as time and place, asking participants to listen to various sound levels of samples in experimental studies, and so on. Thus, incorporating crowdsourcing into soundscape studies can fill those gaps. There are few studies about soundscape and crowdsourcing. The British Library established a soundmap project in 2010 (OMEN & AROYO 2011) with an aim to identify the changing soundscape of the United Kingdom. So, the British Library asked users to participate by adding sounds using mobile app – Audioboo (OMEN & AROYO 2011). Participants provide sound sources by uploading their preferred sounds and locations.

In a similar approach, The Netherlands Institute of Sound and Vision created a sound archive from the 1950s to the 1990s (OMEN et al. 2013). Then the institute started a crowdsourced service to gather more sound. The community provided more than two thousand sounds in different times and locations in Netherlands. At the end of the study, the institute produced an interface for the community so that they can listen to or use those archived sounds (OMEN et al. 2013).

In another study, the authors aimed to generate a cultural soundscape of Padova, Italy (ORIO 2016). A team of participants recorded the sounds of the city and allowed their position in time to be known by utilizing a web-based platform. A wiki page was created for users to

assign themselves to locations and recordings (ORIO 2016). At the end of the research, the researchers generated an interactive sound map of Padova (ORIO 2016).

Considering some studies in regard to soundscape, the online crowdsourcing strategy offers a promising alternative for utilizing a crowd's "wisdom" (BRABHAM 2009) by eliminating a number of problems such as uniformity of participants, amount of time spent, and the physical venue of public engagement in regard to other types of public involvement (EVANS-COWLEY & HOLLANDER 2010).

3 Study Area

This research concentrates on the potential application of crowdsourced data from a web-based instrument to gather the University of Texas at Arlington campus community for a soundscape study. The University of Texas was founded as Arlington College in 1895 in response to a high demand for education improvement in the city of Arlington (SHANNON 2017). The university has a 420-acre urban campus and is located in the south part of downtown Arlington (SHANNON 2017). The campus is located on the city's street grid. The topography mainly has a south sloping tendency because of Johnson Creek, a branch of Trinity River, coursing through the southern part of the campus (UT ARLINGTON CAMPUS MASTER PLAN 2007).

3.1 Data Collection

Research used a web-based tool for crowdsourcing soundscape data collection to identify the campus community's sound sources with their location. The research applies crowdsourcing individual spatial information from the campus community by requesting participants to use Google in their Android or IOS smartphones (LINDQUIST & GALPERN 2016). Those smartphones are compatible to us through a Location History option that keeps track of spatial information from individuals on campus. "Google Maps Timeline" performs this tracking activity and saves the activity in "Location History" by using the community's information. In addition, Google also can obtain this information by using "Takeout" service.

4 Methodology

This research performed mixed methods for data collection and analysis. Data collection techniques include collecting data from campus users and digitizing those suggested soundscape sources and locations. Since the data collection involves human or other subjects, Institutional Review Board approval was received for this research. The only condition set for eligibility to participate in the research was to have smartphone supported by either Android or IOS (LINDQUIST & GALPERN 2016). Campus users were asked to specify as many locations and sources as possible.

At the end of the research, we obtained fifty-seven location histories with eighty-nine sound sources during the study period. A workshop in regard to Google Location History, Google Maps Timeline, and Takeout services was held for those who do not know how to use the

crowdsourcing tool and the overall goal of the study was also briefed during the meeting (LINDQUIST & GALPERN 2016).

After receiving the data, they were categorized for further statistical analysis by using SPSS Software package and the coordination of each input (by applying longitude and latitude) was geocoded in ArcGIS software to digitize the crowdsourced data. Thus, spatial and content procedures were made by using the information of the campus community for sound-scape sources.

5 Results

Table 1 illustrates the result of content analysis regarding what sound sources campus users provided in several locations. The table represents the output of our content analysis and it shows the overall sound sources with various themes and categories. The numbers demonstrate the percentages for the amount of each sound source as a pattern, based on repeating or similar context. For instance, only 10 percent mention traffic-related sound sources while many individuals emphasized the water features in the campus. The majority of the campus community recognized the bird sounds and footsteps all around the campus. However, they pointed out nearby buildings as crowded and noisy areas. Surprisingly, the campus community also reported that the library location was a noisy spot.

Table 1: Results of the content analysis by sound themes

Sound theme	Nr. Participants	Theme					
		+	O	-	Positive Ratio	Neutral Ratio	Negative Ratio
Traffic	5	0	0	5	0 %	0 %	100 %
Construction	8	0	1	7	0 %	12.5 %	87.5 %
Footsteps	6	0	5	1	0 %	83.3 %	16.67 %
Water	10	9	1	0	90 %	10 %	0 %
Children	2	0	2	0	0 %	100 %	0 %
Bird	8	7	1	0	87.5 %	12.5 %	0 %
Chat/Shouting	5	0	4	1	0 %	80 %	20 %
Vehicle	4	0	1	3	0 %	25 %	75 %
Quiet/Nature	9	8	1	0	88.8 %	11.2 %	0
Total	57	24	16	17	42.1 %	28 %	29.9 %

For the spatial analysis, since 57 individuals participated in the research with 89 soundscape spots, we geocoded the data to illustrate the sound pattern for the campus (Figure 1). The heat map on Figure 1 illustrates the group of sound sources in the provided locations. Even though the map may differ with some adjustments of the map settings, overall it represents the sound clusters.



Fig. 1: Sound sources by semantic categorization (positive, neutral, and negative)

6 Discussion

Landscape architects and planners perform many different public participation methods in their studies. In this study, we applied the crowdsourcing approach for gathering online information. To do this, we would like to draw attention to how community members can use the changing digital and online technology as a powerful public participation process. By using smartphone features as crucial characteristics of digital era, individuals can become part of a two-way public participation. In this research, we provide an overview of public participation, crowdsourcing, and soundscapes by gathering high-quality and reliable output from community members.

In the soundscape aspect, our research might be a tool for campus master-plan analysis. For instance, there are many recent buildings and natural areas as well as constructions on campus. Campus planners and designers can include this document in their decision-making process to take into account the users' contribution for any new addition or construction on campus. In a broader context, these kinds of studies contribute to planning phases both pre-development and pro-development. Furthermore, these types of content and spatial analyses not only help to address the communities' needs and problems, but also create a better physical and social environment for community.

7 Conclusion

Considering crowdsourced knowledge in the landscape architecture field provides many benefits such as quality and applicability of the data, proficiency of examining the knowledge, the importance of the knowledge from landscape architects' point of views, and the ability to

use the digital technology. This research contributes to the literature on performing crowdsourcing approach to landscape architecture and planning by reviewing numerous elements in regard to crowdsourced knowledge.

Since we have only concentrated on the campus community as our study area and analyzed all related information accordingly, the research should be examined carefully. Many professional individuals, including landscape architects, apply sets of abilities, methods, recent digital developments, and data collection techniques in their products.

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