Sharing ideas about noise management and community design

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ABSTRACT

Noise control has an established role protecting the public from annoying or damaging sounds. But protection from harm is not the same as the promotion of good. The Soundscape concept adds this essential linkage; providing insights and technologies that help communities construct improved acoustic environments. It expands ways of evaluating sound; moving beyond traditional descriptors to include a rich consideration of the diverse ways people experience sound.

The paradigm shift in community noise management is occurring simultaneously with the explosion of mobile and web technologies. These also are changing established approaches to noise control. Phones or tablets can be turned into sound level meters so anyone can measure sound exposure levels. Individuals can record their audio and visual experiences, replicating the “soundwalk”, that is a fundamental tool of Soundscape analysis.

At some point, expert studies or crowd-sourced measurements by individuals must be consolidated so the diversity of experiences can be interpreted into designs and policies. The Interactive Sound Information System, developed by the author, was designed to produce shared aural experiences and a way of collectively imagining future sound environments. It provides one example of how sound management issues can be presented to concerned communities and decision makers.

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1. INTRODUCTION

The noise control engineer’s role in community development is well defined. The purpose of noise community control is, in words taken from a California City’s noise code, “to control unnecessary, excessive and annoying noise” (1). The objective is to minimize unwanted sound. (The same section of the municipal code deals with controls on such things as Underage Drinking, Drug Paraphernalia, Unruly Gatherings and Discharge of Weapons). The ordinance goes on to describe the quantitative standards to be applied to manage noise sources and to guide the siting of new development.

The idea of designing pleasing acoustical environments has an even longer tradition. It is not accidental that R. Murray Schafer, who is credited with inventing the word “soundscape”, was trained as a composer. He envisioned a world in which, “musicians, acousticians, psychologists, sociologists and others would study the world sound-scape together in order to make intelligent recommendations for its improvement” (2). Our contemporary concept of “soundscapes” is grounded on this model.

There have been important changes in the practice of community planning. Plan-making now emphasizes the collaborative involvement of residents in community design. The idea is not to just communicate information to the public, but to engage people and a dialogue where they collaboratively develop programs for civic improvement. This idea grafts easily onto the original soundscape concept, expanding the environmental improvement process to include, not just topic specialists, but also community members.

There have been changes in technology that are also significant. The collection of noise information and its mapping can also include community participation. Phones and tablets can be transformed into sound level meters. People can record acoustical experiences adding personal comments, and share their impressions with others.

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2. SOME ISSUES

But there are structural issues deserving exploration. One is institutional; how might a designated noise control specialist expand their concerns to include the promotion of improved acoustic environments? An analogy might be a community health department official, charged with insuring the cleanliness of food preparation areas, who wants to extend their administrative domain to include nutritional improvements. The municipal code referenced previously makes no provision for promotion of a positive acoustic setting apart from adding an objective of protecting existing quiet areas. Adding soundscape concerns involves an extension of the normal assignments given a noise control specialist.

The boundaries of any institution or profession are not self-determined. The question of whether noise control practices can be expanded to encompass the soundscape concept is determined on one hand, by the commitment of practitioners to making such a transition and on the other, by the expansion space permitted by other institutions.

The inclusion of multiple soundscape sessions on the agenda of Internoise testifies to an active interest in broadening noise management to include acoustic betterment. I could add that a number of the consulting firms engaged in conducting noise control studies also are involved in the design of concert halls and auditoriums. There can be collisions with the vision of architectural designers but the resolutions are typically collaborative.

In the realm of community design there is no indication that city planning practitioners would resist soundscape ideals. The field is diverse and accustom to accommodation of new approaches. The only potential issues have to do with the distribution of limited resources. Acoustic betterment is an excellent ideal but, like the achievement of high-style urban design, it is likely to be an add-on to projects that emphasize economic return. The soundscape ideal would seem to be most readily applied to improvement of public spaces; which is an area already proven to be receptive to its concepts.

Another vexing issue is how to most effectively communicate acoustic information. We know that people interpret acoustic information based on individual expectations and experience. How, in a community planning context, do people effectively communicate their ideas to others in ways that are accurate and understandable? Then how are the concepts presented to decision makers?

3. DELIVERING ACOUSTIC EVIDENCE

Written reports describing estimated noise levels along with creation of noise maps has solid acceptance in the field of noise management. The preparation of environmental impact reports has become standard practice worldwide and, where noise is relevant, any report would include a section on the topic. The European Commission has adopted a directive requiring publication of noise maps are required for noise sources in urban areas. (3)

It is convenient to present noise management information in the form of a written report even if it is an inexact way of conveying understanding to community residents and decision makers. Noise maps help, but not everyone is comfortable with inferring sound exposure from contour lines. Reports and maps do not covey the understanding that comes with experiencing the actual sound environment that is represented by the metrics.

3.1 The Interactive Sound Information System

A technology such as the interactive Sound Information System (interactive SIS), developed by the author, is a way of enhancing understanding of acoustic issues and enabling non specialists to engage in problem solving. It is possible to build noise models and standard noise maps into presentations so the system can supply answers to, “What if?” questions. The technique can also be used as a community design tool where people can “move about” on a map and sample the effects of different sound sources from a multiplicity of locations.

The interactive SIS package is only one way to add such capabilities. Sounds can be added to Power Point presentations and streamed from web pages. Standard GIS systems can include individualized locational information and site photos. The noise modeling software produced by the major vendors include excellent formats for mapping and displaying results. (One vendor is now promoting 3D viewing.) Presenters at this conference and other acoustical convocations are incorporating sounds and video within their presentations. Audible examples are perfect aids to understanding. The acoustic evidence is visceral and irrefutable if accurately presented.

Interactive SIS is a computer based presentation system that was designed to assist noise management decision making. The fundamental idea behind interactive SIS is that noise exposure issues are best represented by real noise examples. Listeners experience sound events via suitably level adjusted, and frequency filtered recordings. The package was designed as a presentation tool for addressing noise issues in a format that can be understood by citizens and by decision makers with no special technical knowledge of noise management strategies (Figure 1).

Figure 1: A Community Presentation Setting

The latest version of the interactive SIS package makes use of the multiple advanced audio and graphic technologies. The sounds are digital and the software includes a digital equalizer to adjust frequency levels. Graphics include virtual reality animations and compatibility with standard Geographic Information Systems. The technology has been applied to many different types of environmental noise problems including airports, roadways, transit, industry, military training activities and protection of the natural soundscape within national parks.

There are sections of the program that describe the basics; the nature of sound, its measurement, and the features of noise management programs.

The most important features of the program are not these basic informational features but the elements depicting the acoustic consequences of activities and noise control strategies. Figure 2 shows an interactive map display from the program illustrating the acoustical impacts of excursion flights over the Grand Canyon National Park. The flyover sounds are audible and modulated for distance and presenter can demonstrate the noise levels experienced in any location within the mapped area.

The National Park Service in the United States employs a number of less conventional metrics in evaluating park experience including the percentage of time man produced sounds are audible. The map popup can be used to display multiple metrics and to overlay man made sounds onto the background of natural sounds. The locational setting is important in interpreting noise impacts. The interactive map depicts some of the most popular visitor attractions and, for these; an appropriate photo of the site is displayed. However, noise information for any point on the map can be displayed and an audio sample presented.

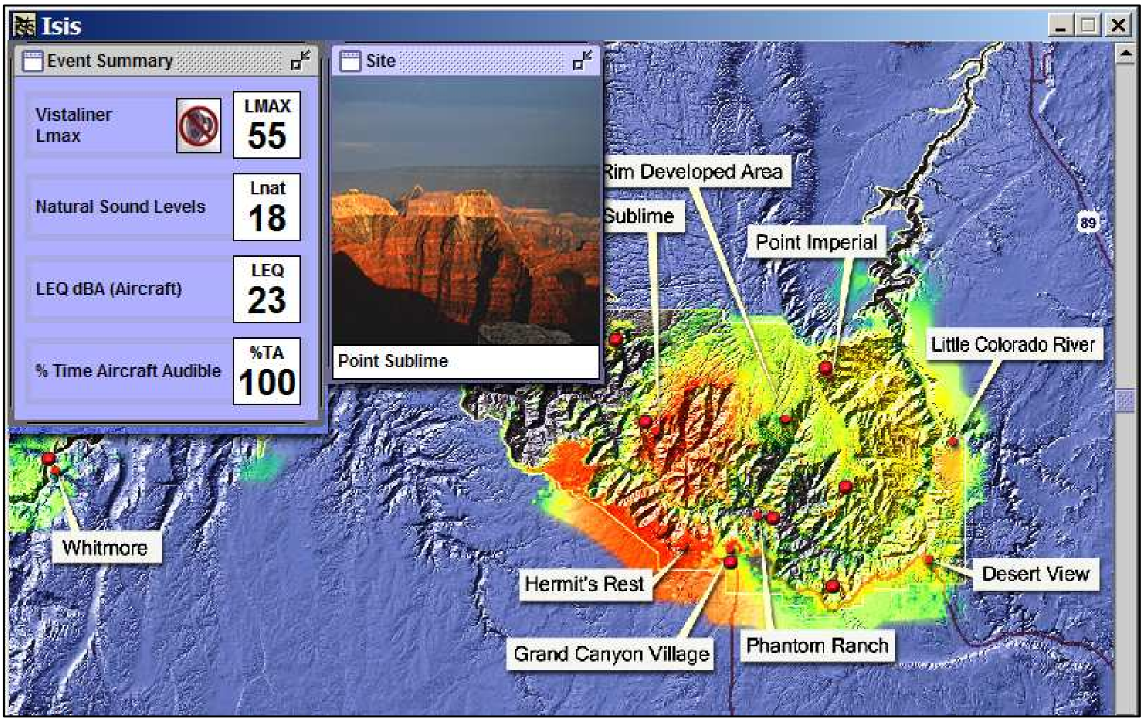

Figure 2: Selection of Listener Location in the Grand Canyon Project

A variant of this same map display is shown in Figure 3. This relates to an airport expansion proposal in San Diego. As with the Grand Canyon project, the acoustic environment can be depicted for any selected map location. The map includes pop-ups with photos of individual locations along with acoustic examples mixing background sounds at the selected location with the sound of overflights of different selected aircraft.

3.2 Addressing the Issues

While presentations, such as described above, are highly effective and informative they have a downside. There are some technical and, perhaps psychoacoustic, issues in presenting acoustic evidence at accurate sound levels. The most practical way of assuring this has been to present acoustic information in a controlled presentation setting, where sound levels can be properly calibrated. They also typically require the presence of a subject expert who can lead the discussion and respond to questions.

But the group meeting mode of presentation is being replaced by technologies that don’t require people to travel to a central meeting place, or to participate in a discussion at a fixed time. Virtual conference rooms, meeting halls and classrooms have become attractive alternatives.

Technology offers a quite different way to construct noise maps and present information. A collaboration between Sony (Paris) and Vrije University (Brussels) developed a phone application called NoiseTube. (4) The name evokes the video sharing program YouTube and the concept is similar. People can download an application from the web page which adds noise measurement capabilities to a cell phone. The application records noise level readings over time and is linked to the phone’s GPS capabilities. The stored time history for the acoustic experience can then be transferred to a processing center where each individual experience can be recorded in a map display. Figure 4 shows a screen capture of a NoiseTube map depicting a walk through an urban area.

Figure 3: Acoustical Comparisons of Background Sounds and Aircraft Overflights

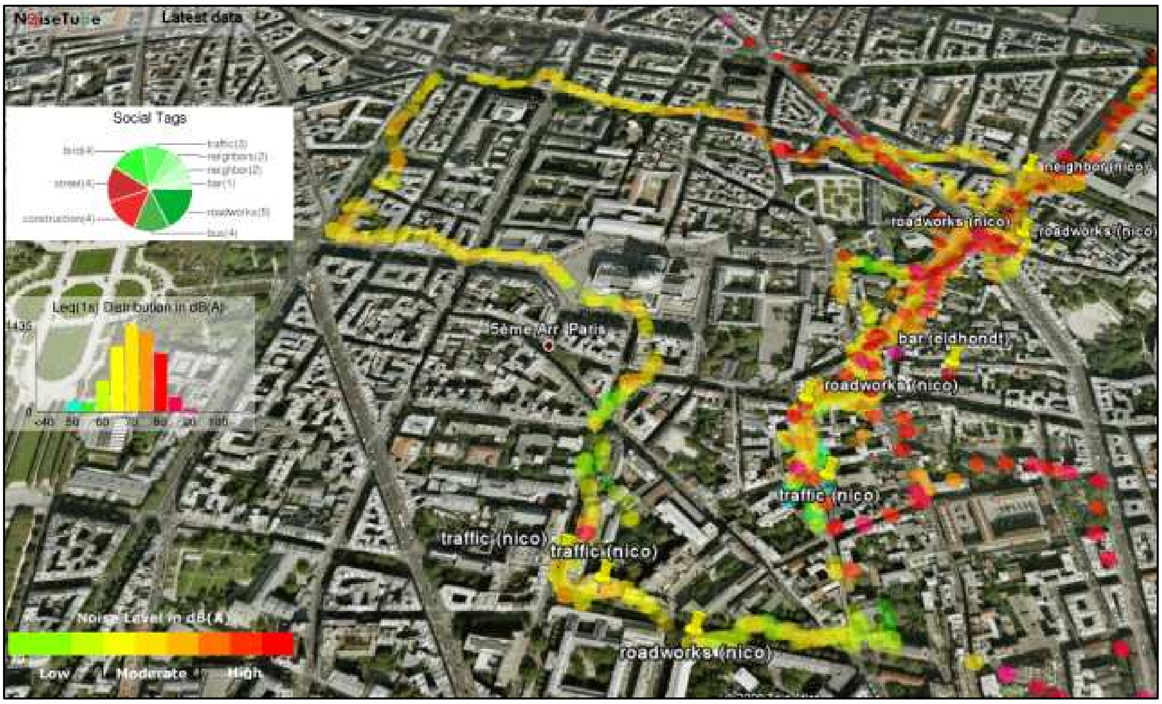

Figure 4: NoiseTube Collaborative Map

While the NoiseTube application doesn’t provide for the playback of sounds this capability could be added as a future improvement. The audio material could be delivered, on demand, to enabled phones. This is potentially superior to the more sterile construction of maps that depict only numeric information about sounds as recorded by technical specialists or predicted by mathematical models. It also makes it possible to virtualize the presentation setting and avoid the need to sponsor presentations in a meeting format.

There are a number of embedded problems in realizing this idea. The major ones have to do with the accuracy with which data is collected and distributed. While a smart phone application can provide sound level meter capabilities, the microphone and audio section for a cell phone falls far short of the capabilities of a sound level meter. The NoiseTube developers have responded to this problem by producing variants of the application geared to specific telephone models. The multiplication of smart phone models and the constant pattern of upgrades make this a trying task. Web comments made on the NoiseTube app complain about compatibility issues.

There are also issues related to the method by which sound environments are sampled. Technical specialists record sounds at fixed elevations and often with equipment mounted on a stable support. The walkaround qualities of samples made by non-specialists would not conform to the professional model (5).

But one greatest advantage of participatory noise mapping is its variability. The food reviews on Yelp might not meet the standards of a professional food writer but reading the variety of people’s reactions to the same setting provides a rich image of both the up and downsides of the restaurant experience. There is plenty of color in the varied reactions.

There is another issue with the extension of “participatory sensing”. People don’t show the same enthusiasm about sharing their acoustical experiences as they do about sharing home videos. With all the attention given to adjusting the NoiseTube application to be compatible with differing models of phones it appears that there is only a limited group of people active in collecting acoustic experiences. The noise maps posted on the web have relatively few contributors and those that show more extensive mapping appear to be the product of academic research projects.

The individualized delivery of sound samples presents similar problems with accuracy of playback. It would be possible for an audiologist to adjust ear buds to appropriate listening levels, but there is no direct way of controlling the listening levels chosen by individuals.

One way of addressing both the problems of accuracy and volunteerism would be to organize the supervised collection of information by groups. This could have the format of a class project or a volunteer opportunity sponsored by a service club. This lessens the equipment calibration issue since it would be possible to adjust individual smart phones to a common standard. Participants could receive instruction on procedures for data collection and assigned areas to be covered. This may lack the free form virtues of crowd sourced reporting but it would resolve some of the issues related to participatory collection of acoustic data and its presentation.

4. CONCLUSIONS

The soundscape concept represents an appropriate extension of the traditional functions of a noise control specialist. There are some institutional impediments to such an expansion but none of these are prohibitive. The major task, it would seem, is to demonstrate the advantages of soundscape thinking to the persons engaged in the processes of city building, park resource development, and civic improvement. The use of structured acoustical examples can broaden understanding. The technology of participative noise data collection adds to the sound walk concept and can supplement laboratory-based studies of how people interpret their acoustic environment. The technology might also unlock the standard metrics and the repertoire of noise impact reporting, adding components of direct acoustical evidence in a form that is suitable for sharing. It is evident these transitions are already underway.

REFERENCES

1. City of San Luis Obispo, Municipal Code, Section 9.12.010.
2. Schafer, the Music of the Environment, (Vancouver, World Soundscape Project) page 34.
3. Directive 2002/49/European Commission.
4. A description of the application and its application in an urban setting is posted at; http://soft.vub.ac.be/Publications/2011/vub-soft-tr-11-03.pdf.
5. Standards for noise measurement are often included in local noise regulations. Professional standards are presented in, ASTM E1014-12, Standard Guide for Measurement of Outdoor A-Weighted Sound Level.