Acoustic Atlas Artwork for WAC 2019

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ABSTRACT

Acoustic Atlas aims to digitally preserve the acoustics and soundscapes of natural and cultural world heritage sites. The project's innovative approach will make the acoustical heritage of endangered heritage sites widely accessible. It will bring environmental, educational, conservation and artistic benefits by promoting and enriching heritage research and connecting international researchers and sound artists in the field of heritage acoustics. The online web-audio platform enables Acoustic Atlas to run on most computers or mobile devices and utilizes the built-in microphone and headphone output of a device to transport a visitor to the selected heritage site via headphones and live microphone feed. Any participant can thus interact with the acoustic simulation (termed auralization) of each site from a first-person point of hearing. The user can click on an image of a location, control various aspects of the sound whilst singing or projecting any sound in real-time, into a simulation of the selected site, to hear the reverberations, resonances and echoes thus experience it in a direct sensory way. Acoustic Atlas is suitable for presentation on a computer kiosk with headphones as long as there is a built-in or plug-in microphone available on the computer.

1. INTRODUCTION

Acoustic Atlas is a virtual acoustic map, for the cultivation of the capacity to listen to and connect with, remote heritage sites. Acoustic Atlas invites people to sing and emit sound into virtual acoustic environments and experience how their voices, as human sonar signals, reveal the hidden interiors, forms and textures of these heritage sites. Such listening experience allows for a phenomenological connection with the remote site, which becomes particularly relevant for the preservation of heritage sites and for sonic exploration. In the context of acoustical and environmental intangible heritage, virtual reconstructions of world heritage sites are becoming increasingly useful to allow for multi-sensory immersive access, research and conservation [1-3]. The sonic component of the virtual reconstruction of a site is termed 'auralisation' which means rendering a space audible [4]. Examples of uses of auralisations include simulations of ancient and historic sites, to determine the likelihood and nature of rituals and historical actions that may have happened in these sites [5][6], or to monitor how sites may have changed over time [7].

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To date, however, while there are vast amounts of digital visual data such as maps, photogrammetry, 3D models, Google street-view and photos of heritage sites, the number of available and accessible auralisations is sparse. Browse Google Earth to discover spectacular visual details anywhere on this planet. Try to listen to them and it is astonishingly quiet. Should climate change, corporate greed or unforeseen catastrophe alter or destroy important natural and cultural heritage sites, we can remember such sites with masses of already existing visual documentation, however, without any acoustic data, these same sites are under risk to be silenced forever.

Preservation is done by collecting room impulse responses (RIRs) of each location, to enable the creation of auralisations. Field recordings of environmental sounds belonging to each site are also incorporated into the immersive auditory experience. To collect the room impulse responses (RIR), a sine-sweep test signal is played through a loudspeaker and recorded through an Ambisonics microphone. This allows the researcher to capture the spatial characteristics of each location. For a full study of each space, the researcher will choose a set of source and receiver positions. The source positions are where the loudspeaker will be positioned and correspond to parts of the space in which natural or artificial sources are present. The receiver positions correspond to listener positions. A room impulse response is captured for every source-receiver combination, allowing for a full acoustic mapping of each space. These RIRs allow the researcher to derive the acoustic characteristics of the space through the analysis of acoustic parameters such as those determined by ISO 3382-1. To conduct auralisations, dry sound signals are convolved with the RIRs to make them sound as if they were speaking/singing in the selected site.

2. WEBAUDIO

The online Acoustic Atlas platform is created with open source web-audio technology [8], to allow for a browser-based audio application that renders real-time auralisations from a mic input. In parallel, the Acoustic Atlas collection aims to be an inclusive platform: researchers active in the field of recording acoustic measurements of cultural and natural heritage sites are invited to participate and upload their acoustic measurement (RIR) data including additional meta-tagging information to the platform, thus giving their work more 'audibility' whilst allowing for the number of sites available in Acoustic Atlas to expand.

Acoustic Atlas aims to work on any smart mobile device or computer running a web browser such as Chrome or Safari. It utilises the built-in microphone and headphone output of the device to transport a visitor to the selected heritage site via headphones and live microphone feed. The user can talk, sing, hum or project any sound in real-time, into a simulation to hear the reverberation,

resonances and echoes of each site and thus experience it in a direct sensory way.

The aurlisation is realized with tone.convolver. The simplified flow of audio is as follows: microphone input – gain – microphone equalization – convolver – master mixer. When the user clicks on an image of a location, the corresponding RIR is loaded.

Further development of this project will include features such as parallel convolution streams that are cross faded at the master mixer to allow for multiple source-receiver combinations. This would create more engaging virtual acoustic movement. It adds another dynamic layer to the overall spatial realism – by crossfading from one source-receiver position to the next, the overall sound effect is more convincing. As a dynamic musical parameter, such movement can be accelerated, slowed down and used as an added textural quality. Additionally, it is also possible to select and listen to different sound layers of environmental sounds from each site, as the collection of field recordings submitted by the community grows this will be included. Music composed for sites will also be added for listening. Another desired feature will be the ability to record through the Acoustic Atlas website, allowing a user to save their own auralised sounds. This feature will enable participants to upload their recordings to share them or use their audio in whichever way they like, such as their own creative practice or even for the creation of educational resources on the use of caves. Various other interface controls will allow for smart EQ of incoming signal, giving the user the ability to choose to filter out for example, unwanted low frequencies from the mic input.

Acoustic Atlas takes inspiration from archival environmental sound projects with map interfaces [9-11] as well as acoustic heritage auralisation projects that are partly similar to Acoustic Atlas e.g. the Soundgate App [12], or the live auralisation concert of Cappella Romana at Stanford [13].

3. LINK TO WORK

The site under development can be viewed here:

https://acousticatlas.de

4. BIOGRAPHIES

Cobi van Tonder is a practice-led researcher and artist from South Africa/Germany interested in ways of achieving abstraction in music, installation, video and immersive contexts. She experiments with the reduction of phenomena in order to expose human sensuality. This has led her to work with drone, microtonal music, nature field recordings, mathematical patterns as musical material and spatial audio-physical elements of sound. The experience of sound in and as space with attention to artificial (or real) acoustics is a prominent part of the material and overall texture.

Guergana Tzatchkova is an IT Professional. Her interests in the creative uses of media and technology led her to complete a Master in Design of Multimedia and Interactive Systems and a Master in Communication in Barcelona. She has experience in projects combining video, design and web development as well as projects related to gender and politics in Chiapas (Mexico) and Mexico City. She is currently based in Berlin working as Front-End / Creative developer.

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