AtmosActions: An Interactive Audiovisual Installation for a Human/Weather Interface

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Abstract

Atmospheric Interactions is a real-time audiovisual installation which uses meteorological data collected from a weather station with instruments mounted to a 10-meter tower atop the PACCAR building at the Laboratory for Atmospheric Research (LAR) at Washington State University in WA, USA. Three artists worked with two atmospheric scientists to realize the project. The weather data is visualized and sonified in real-time. The aims are to reconnect people with their local weather and with weather in other parts of the world, and to support their engagement with climate change.

Introduction

Climate Action is urgently needed to protect life. The IPCC highlighted that "human actions still have the potential to determine the future course of climate" in their Aug 21 press release (IPCC, 2021). This project was designed in consultation with atmospheric research scientists, Professor Thomas Jobson and Professor Joseph Vaughan, at WSU. The PACCAR weather station is a collection of meteorological instruments mounted to a 10 m tower atop the PACCAR building at the Laboratory for Atmospheric Research (LAR) at Washington State University in Pullman, WA, USA. Measurements include temperature, relative humidity, wind speed, wind direction, atmospheric pressure, net shortwave radiation, and net longwave radiation.

With this project, we are exploring new ways of conveying weather information to people beyond the typical audience for such data through computer-mediated art. In this project, meteorological data is rendered as colors, moving shapes, and sounds, and with the use of camera, the viewer is put 'in the picture'. Our project seeks to reconnect people with their local weather as they live their lives indoors, to connect them with a global climate, and support their engagement with climate change, the most important story of our time.

Data at the Laboratory for Atmospheric Research

Data from the weather station is used in courses taught at WSU on air pollution and meteorology and it also supports research activities by faculty and graduate students in the LAR research group. Understanding local weather conditions is often the first step in understanding local air pollution problems. For example the intensity of the sun impacts surface temperature and rates the amount of ultraviolet radiation enhances atmospheric chemistry reactions. So measuring the weather goes hand in hand with air pollution research. The typical weather conditions also determine what we mean by climate so having long term measurements of weather helps us understand changes to the regional climate in eastern WA. The data are publicly displayed so everybody in town can see the measured wind speeds and temperature (Laboratory for Atmospheric Research Data, 2021).

Pullman is located in Eastern WA and the surrounding area is dry land wheat and pulse farming. Farmers depend on weather information for planning planting and harvest activities. In recent years our area has had significant wildfire smoke events, a very visible consequence of a changing climate as the western US forests dry out. Unusually high temperatures and dry conditions in 2021 have meant low crop yields and lots of fires and wildfire smoke. The air pollution impact from burning fossil fuels and the resulting impact on human health and global warming is part of the educational curriculum in the Civil and Environmental Engineering Department at WSU. The rooftop weather station helps us explain how humans are agents of climate change.

Typically, this data is communicated by generating the types of graphical plots commonly used by scientists and engineers. Exploring new ways of conveying meteorology information to people beyond the typical audience for such data, through computer-mediated art, is a new venture for the laboratory.

Data Visualization and Sonification

With this installation, we aim to situate the participant within the data, providing a sensory experience of the atmosphere and encouraging the audience to reconnect with the weather and climate.

Visualization

Weather and atmospheric data called from the rooftop of the PACCAR building are visualized using the software program Isadora. The installation was designed to be installed within the PACCAR building and also to installed in other locations. The viewer sees birds flowing in the direction of the wind, speeding or slowing as the wind does, and in colors that are related to air temperature. The 3D data of wind direction is translated to a 2D monitor in the accepted convention of North being up.

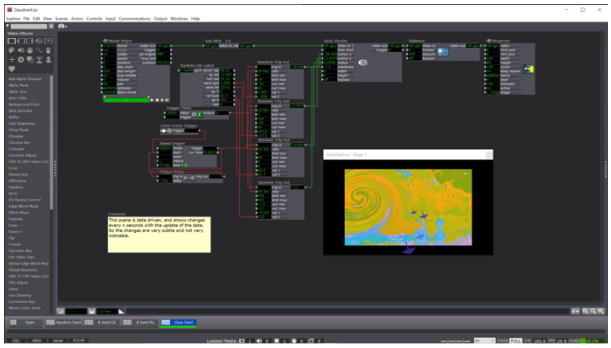

Fig 1. *AtmosActions patch in Isadora,* 2021, Valerie Williams, digital visualization, Copyright Valerie Williams

The visualization pays particular attention to the data, and the camera version scans the corridor where people enter. People are often more likely to pay attention when they see themselves, so the choice to use a camera pulls them to the display where they see an abstracted version of themselves and their movement changing the projection. The rooftop data is called every 60 seconds so there is an obvious connection to the wind direction when the moving objects change direction. Superimposing the visualized data on the abstracted person makes the point that we are affecting as well as affected by the weather and climate. The non-camera version of the installation makes use of a film which is morphed and manipulated by the real-time data.

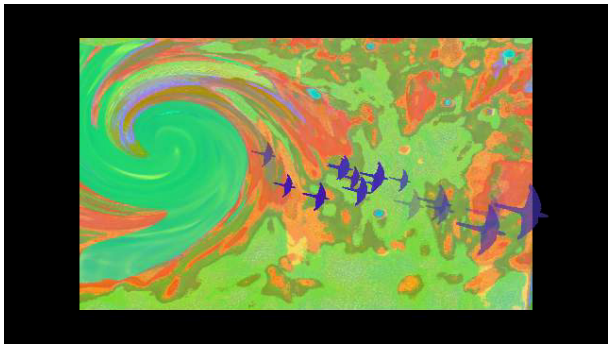

Fig 2. *AtmosActions visualization, 2021*, Valerie Williams, digital visualization, Copyright Valerie Williams

Sonification

The sonification is built using Max. The sound world could be categorized in terms of soundscape and pitched material. The soundscape includes wind, rain and forest environment. The wind is synthesized and mapped to the wind speed. The rain sound is a field recording and the volume is mapped to the amount of rainfall. The forest environment sound is a field recording and is not mapped to data.

The pitched material come from two different synthesizers, Synth 1 and Synth 2. The tempo is controlled by the wind speed, and in Synth 1, the subdivision of the beat is controlled by air temperature. It will be at its fastest when the temperature is high and the wind is strong. Synth 2 is not mapped to a musical scale; the frequencies are mapped to relative humidity, atmospheric pressure, net shortwave radiation, and net longwave radiation.

The aim with the sonification is to be able to tell something about the current weather based on what is heard (speed of notes of Synth 1 and frequency of notes in Synth 2). The wind and rain are easier to understand. However, with listening over time, you can begin to tell more from the sonified data. In this case, the sound aspect of this project sits between auditory display and sonification. The artistic interpretation encourages a deeper engagement, as it requires us to spend longer listening in order to gain a deeper understanding. This is linked to how we understand our climate and how sustained engagement is necessary to understand (and to limit) climate change.

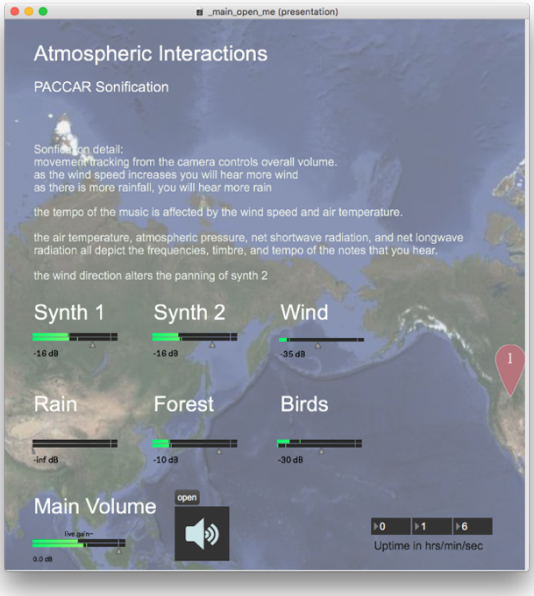

Fig 3. *Sonification Max Patch,* 2021, Jenn Kirby, patch. Copyright Jenn Kirby.

Installation

The audience engages with the installation through viewing the visuals on screen and hearing to the sonification over speakers or headphones. While this was initially designed to be installed at the location of the data collection, we quickly realised the importance of installing at other locations to encourage participants to think about climate change beyond their own region.

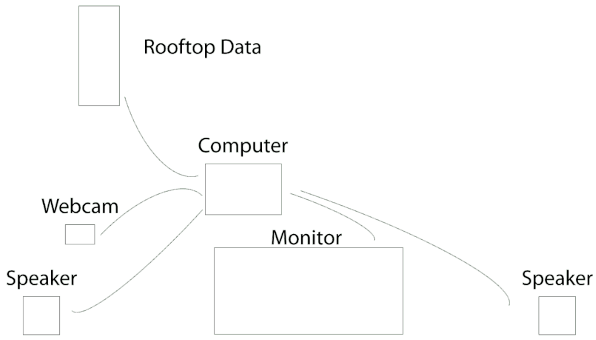

Fig 4. *Installation Diagram,* 2021. Copyright Valerie Williams.

Conclusion

Climate change is slow moving temporal phenomena and difficult for an individual to experience as an immediate problem. So many of us spend our time indoors and in acclimatized environments that we lose connection even to our local weather.

We feel that awareness of the impact of climate change in regions beyond our own helps build empathy and encourages active engagement. It is our hope that this installation helps achieve that.

Given the somewhat standardized approach to collecting meteorological data, it is possible to parse data from another weather station, and install AtmosActions in other locations, interpreting other weather systems. This is something that we are considering in our future art and research.

References

IPCC (2021) Climate change widespread, rapid, and intensifying – IPCC. Available at: https://www.ipcc.ch/2021/08/09/ar6e-wg1-20210809-pr/ (Accessed: 12 Aug 2021).

Laboratory for Atmospheric Research Data, Available at: https://micromet.paccar.wsu.edu/roof/current.txt (Accessed: 12 Aug 2021).

Weblink

Visualization demonstration:
https://midwestartistmgmt.wixsite.com/valerie-williams/video

Sonification demonstration:
https://www.jennkirby.com/atmos_actions

Authors Biographies

Hiromi Okumura is a visual and performance artist, who believes in the power of Art and Science. Hiromi teaches at School of Visual Arts, Virginia Tech.

Valerie Williams is a choreographer, dancer, and director who believes technology should serve people. Working with musicians, composers, designers and artists, she creates interactive environments that respond to dancers' movements.

Dr. Jenn Kirby is a composer, performer, lecturer and music technologist. Her output includes contemporary instrumental composition, electroacoustic music, live electronics and sound art. Jenn is a Lecturer in Electronic Music and Technology at Goldsmiths, University of London.

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