

Aeolian Traces: Listening to the Resonances of Wind and Human Migration

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ABSTRACT

Aeolian Traces is a multimedia artwork installed most recently at the CURRENTS NEW MEDIA festival in Santa Fe, New Mexico. The project collects human migration data to generate gusts of wind around the gallery space and trigger sounds in a database of recordings in the migrants' native languages. A work of data sonification and visualization, this project is a part of the author's long-standing interest in the aesthetics and cultural appropriations of environmental data. In *Aeolian Traces*, wind data is harvested as a metaphor for geographical and cultural nomadism.

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Aeolian Traces is an immersive installation that utilizes a hybridization of data harvesting, physical installation, algorithmic composition and spatial sound. Presented through a combination of a multichannel sound diffusion system and an 8-channel ventilator (DC motor fan) setup, the piece creates wind currents in a gallery space triggered by human migration data. A screen displays the project's informational content, visualizing migration data as suspensions of nodes in three-dimensional space, and displays connections between each node as they come into close proximity with each other.

To establish an ephemeral sense of movement around and about the visitor, the ventilators are synced with sounds of wind, where visitors to the space are able to simultaneously feel and listen to them. On the screen, each node represents a percentage of the migrant population from a particular country, geo-located and set in motion toward their documented destinations. Sound, image and wind are profoundly connected—the directionality of migration is mapped to the movement of all three elements within the Ambisonic sphere. Spoken narratives in native languages are also introduced in the piece as whispers that reveal themselves as they are spatialized across the speaker array.

Aeolian Traces was originally presented as part of the Windward||Windword exhibition at the Jacob Lawrence Gallery after a period of artistic and technical research at DXARTS at the University of Washington. It was also presented at the Seattle Art Museum in conjunction with the Remix festival, in Toronto as part of the Nuit Blanche festival, and most recently at the CURRENTS NEW MEDIA festival in Santa Fe, New Mexico (Fig. 1).

Visualizing Data

The aestheticization of information is not a new phenomenon. Stretching back into antiquity are examples from the arts and sciences that develop information design (with or without computational tools) as a procedural framework developed through a myriad of variegated responses to the environment. From cave paintings, hieroglyphs to graphic notations, animation and film, measuring and inscribing of data involve the physical manipulation of a medium, altering it via predetermined rules for legibility and reproducibility. When data visualization entered the screens, a similar physical constraint existed that limited the representation of data to the confines of the projection surface [1]. Through the setup of the project (and similar data-based projects that I have worked on in the past), I have observed an emerging tension between two primary experiential frameworks—one that involves the embodied sensory system and its proliferation of dimensionalities and sensations, a gestalt fusion of our bodily and cognitive responses to stimuli; and the other that imbues a numerical, measured or digitally sampled dataset with a dimensionality of our choosing. In attempting to bridge these two, I have referred in the past to the work of architect Louis Kahn in the way his creations are insistent on the coexistence between measurable





Fig. 1. *Aeolian Traces* exhibition view, CURRENTS NEW MEDIA festival. (© Joel Ong. Photo: Parallel Studios.)

(physical dimensions, materiality) and immeasurable (sunlight, wind, human factors) components [2]. In the context of such processes like the sonification of wind and other modalities of data transduction of elemental media, these become essential guidelines to research-creation and experimentation.

On the other side of the coin—that of deep sociocultural sentiment and/or poetics, the coexistence of these components is a vital strategy for strengthening our affective responses to digital data. In our era of data saturation, it is impossible to have a global perspective without some metrics of the world. These metrics are most often accessory—but it isn't a stretch to challenge the information design process toward what Orit Halpern calls an “affective rationalism” [3]. Based on these conventional notions of information design, the ultimate goal is to create an ordered reality to help cope with this information overload. Designing data therefore is a process of being able to tell the truth about a certain circumstance, where the data functions as a form of evidence to support a hypothesis. But designers today do not always work within the constraints of factual data, and can manipulate, redesign or package data as they wish. Hence whether the start of a data art project involves factual data or imaginative/original data, the outcome is not necessarily utilitarian, but instead, aesthetic—the designer today must be able to function on both utility and imagination.

Data Harvesting

The work *Aeolian Traces* explores ways of mapping the natural environment in order to create artistic narratives/experiences through computational means. To aid the imagination of global human migration as particles freely floating in space, its gestalt experience fuses wind, sound and image and proposes a symbolic connection between the movements of peoples around the globe and the flow of aeolian, natural currents in order to envision, perhaps even to propose, a world where transnational movement is seen as a naturalized rather than politicized activity.

Through its setup of Ambisonic sound, whispers and narratives break up and join back together in a polyglottic amalgam, hinting at shifting demographics created through globalization. In the visualization,

its inspiration is that of a connective thread that proposes the migrant as a universal, interwoven identity. The project's emphasis on collected, real data through the UN's migrant stock figures allows us to enter these abstractions, knowing that we were contributors to the data in our seasonal travels, and allowing our memories and stories to become part of our intersubjective experience of the piece.

Aeolian Traces began initially in response to ongoing political discourse around topics of human migration and mobility, the treatment of undocumented migrants and an emerging form of nationalism and border-centrism despite the rising numbers of refugees and asylum-seekers that enter our shores. Especially since 2015, around the time of this project's initial conception, the start of the European migrant crisis led to rising xenophobia in the United States and has made migration and human movement an inevitable topic of discussion.

It is within the areas of community, social action and humanitarian need that the project was initially fueled. The state of Washington's refugee resettlement program is seventh in the United States in terms of numbers of refugees [4], and many initiatives in cities such as Seattle support the reintegration of refugees and migrants (documented or otherwise) within the workforce and society. I initially attempted to understand the way border restrictions were affecting the lives of individuals and families around the area by conducting interviews with members of Casa Latina [5], a not-for-profit organization in Seattle's International District working to provide migrant (documented or otherwise) workers from South America with economic and educational opportunities, to understand more about their lives moving and living across the border. In a bid to understand the plight of undocumented migrants, I also conducted interviews with members of the NWDC (Northwest Detention Center) Resistance movement, as well as underwent training with World Relief Seattle to become a volunteer visitor to the inmates at the Northwest Detention Center in Tacoma, Washington [6]. While these activities did not translate directly into material within the final installation (due to a lack of critical mass in the resulting database), they were the subject of a series of installations outside the Tacoma Detention Center and at the Jacob Lawrence Gallery in summer 2016 [7]. They were also very helpful in gaining firsthand experience with the ethical restrictions to research with human subjects for further iterations of the project.

Aeolian Traces develops a visual and sonic experience that contributes to an emotive experience of human migration in the installation space. The project works directly with data from the UN international migrant stock 2015 [8] that presents estimates of international migrant by age, sex and origin for all countries and areas of the world. According to the documentation available from the database, the estimates are based on official population census statistics from each country on the foreign-born or the foreign population present in the country for the year in question. To classify the "international migrant," the dataset referred to the "foreign-born population." Where country of birth was not available, the dataset defaulted to the individual's country of citizenship.

Also, the dataset accounted for the number of refugees by referencing the Office of the United Nations High Commissioner for Refugees (UNHCR) and the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). The project also made use of figures from the Visa Restrictions Index (VRI) of 2015 [9] compiled by Henley & Partners. This dataset was instrumental in determining the extent of mobility average citizens would have entering another country of their destination.

While visualizations of this dataset are not uncommon (one simply has to plug in the search phrase "Human migration 2015 Visualization" into Google Images), the emphasis on a static visual display prevents the dataset from functioning as anything other than an information panel. By expanding the dataset to provide more sensory information beyond an initial visualization/information design, I enriched the data with a sound component and the composition of physical wind.



Fig. 2. Screen shot of the data visualization process. (© Joel Ong.)

Multisensory Aesthetics in *Aeolian Traces*

Aeolian Traces looked to continue the thread of connectivity and digital visualizations with its data from the UN migrant stock and the VRI. Progressive experimentation with the display moved from static 2D “flat” surface infographics to more three-dimensional imaging and finally to dynamically rotating 3D surfaces. In the first series, the points were connected via Bézier curves drawn in 3D.

In the next series, human populations were represented as floating particles, relating the size of these particles to migration statistics. These particles were also animated, inspired by balloons in flight. The final series of visualizations focused on the creation of abstract geometrical shapes by connecting the particles floating in midair (Fig. 2). Organized in time, these experiments explored different options of stretching and connecting lines representing each data point’s movement from origin to destination. Connective threads spread over areas of the globe. In this graph, density is better visualized.

Fans were part of an 8-channel system that the incoming data triggered. They were triggered primarily with directional data corresponding to instances of sonified breezes. Since each of the breezes was a direct mapping of an instance of human movement across the globe, they have a GPS vector for both origin and destination countries. By assuming latitude to be the x-axis and longitude to be the y-axis, I calculated the movement by first drawing a circle with eight nodes equally spaced along the curve. These eight nodes were given vectors in an array: $[[1.0,0.5],[0.854,0.854],[0.5,1.0],[0.146,0.854],[0.0,0.5],[0.146,0.146],[0.5,0.0],[0.854,0.146]]$. By calculating the radial distance of each of these points from the GPS coordinates (scaled) of the origin country, a cascade of values between 4000 (max speed of fan) and 800 (minimum speed of fan) could be determined where the closest fan would run at a speed of 4000 (Fig. 3).

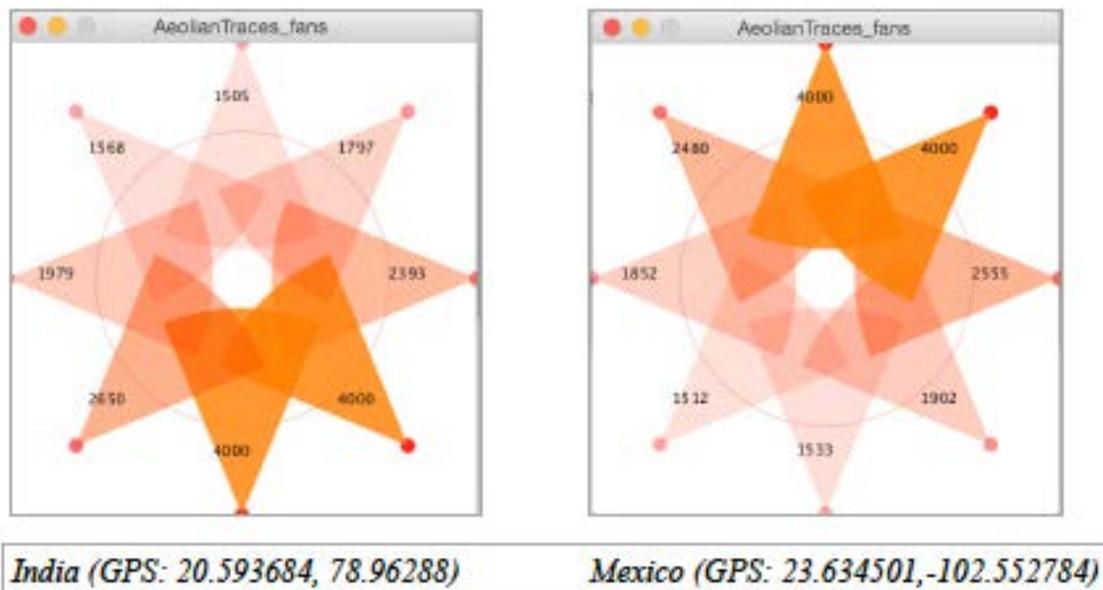


Fig. 3. Graphic visualization of the fan speeds and directionality.

The sounds in *Aeolian Traces* emphasized the layering of multiple textures. I took audio narratives from online sources in multiple languages corresponding to the project’s database of origin and destination countries. Initial composition methods were focused on the synthesis of a believable “wind” that could be moved around in space simply. To create whispers, I used an FFT filter to accentuate certain frequency bands of the incoming audio tracks. I also added a prerecorded whisper track. At the base of the soundscape is a texture that resembles a Helmholtz resonator, imagining what the wind might sound like blowing through resonant tubes.

In setting up the Ambisonic system, the audio shifting was done by mapping the geographical coordinates of each selected country to the First-Order Ambisonic polar array. In this way, the movements of people from one country to the next could directly create a gust of wind in the corresponding direction. Sound and image were choreographed together to promote haptic/sonic feedback for the visual elements. In testing the project’s setup in a controlled environment, I added a delay to the sound to compensate for the time it took the physical wind to arrive at the ideal listening position. I calculated this by mapping the polar coordinates of selected countries to the physical distance between the fans and the center of the listening sphere. The visuals also featured fading that corresponded to the sounds fading away, aiming at an experience of quiet and fragile traces of sound and movement.

Conclusion

Aeolian Traces as a case study of a strategy for creative data aesthetics aims to merge an empirical process of measuring, harvesting and analyzing data with an immeasurable, affective and haptic output. In so doing, it bridges the translational gaps between the immeasurable experience of migration (whether conflicted or otherwise) with the end experience. Having a singular linearity, however, reduces the possibility of interactive elements in this setup. The project (and its research trajectory in the artist’s list of works) has amassed a large amount of individualized data as well as user responses to certain questions about “home” and “belonging.” In the next stage of development, these will factor strongly in the creative strategies used in data visualization/sonification.

References and Notes

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