
Behind The Scenes at HCI's Turn To The Arts

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Abstract

Since 2000, Human Computer Interaction (HCI) has seen a turn to the artistic, looking at more provocative, cultural and social experiences. In doing so HCI is increasingly collaborating with artists who engage with real world data. Much of this work focuses on engaging the public in the spectacle of interactive experiences. In contrast, this paper takes a look behind the scenes by studying a collaboration between artists, climate scientists and researchers as they designed a participatory sensing system to interpret scientific data for public presentation. This paper presents this cross-disciplinary approach from the perspective of an artist/researcher on the project.

Author Keywords

Interactive art, environmentally engaged art, environmental data, temporality, sensory, embodied, performance art, sustainable HCI, participatory sensing, climate change

ACM Classification Keywords

H.5. Information interfaces and presentation

Introduction

HCI has increasingly abandoned the confines of the laboratory in favour of studying the impact of systems 'in the wild', turning to the disciplines of arts and design to investigate different approaches to designing

for complex real world experiences and problems. Although some work has looked towards how HCI evaluates the arts [17,19] little previous research has looked directly at how these artistic processes impact on the design of the underlying HCI systems, or evaluated the nature of these collaborations and how they can inform HCI's future design processes. This paper does not aim to provide an art theoretical overview, focusing instead on the practices of artists within these interdisciplinary collaborations. This paper provides opportunities to bring to the fore new thinking about HCI's turn to the arts, so that we can better understand how to design systems that engage the public in complex and ethically contentious scientific data, such as climate data.

This paper presents one such HCI and interactive arts collaboration - *The Relate Project* - a programme of activities aiming to encourage artists to sense and interpret energy and climate data in the UK and Brazil, resulting in the development of an environmental data sensing platform - *Timestreams*. *The Relate Project* was led by a group of artists and HCI researchers who collaborated on building and testing the system. This process was captured through an ethnographically informed study [16] investigating the design process alongside a series of artistic experiments conducted by the artists in parallel to the system design. This study investigates how the artists interacted with the technology, often in surprising ways. It describes how the artists required the technology to remain in the background of their artistic process, whilst bringing data to the foreground, and how these processes impacted on the system design and raised important issues about data authenticity within HCI systems.

Prior Work

Artists and HCI researchers have been collaborating since the 1970's to develop new applications, systems, and design frameworks [21]. More recently new art forms have emerged including digital, interactive art and mixed reality performance, where the lines between art and technology are increasingly blurred [2,11]. Many of these artists work with locative and environmental data as a tool or medium to trigger conceptualizations of complex issues, in response to wider socio-political narratives around urban environments, nature, sustainability, climate and environmental change [8,10,12]. Previously much of HCI's turn to the arts has focused on the outcomes of artworks, the strategies artists and designers use to engage audiences in the '*spectacle*' of their work and the '*trajectory of experience*' of those who interact with the work, particularly in terms of Mixed Reality Performance [3]. This convergence has impacted across the disciplines of interactive art, HCI, interaction design and beyond. It has been proposed that there are subsequent conflicts with the paradigms and approaches across the disciplines of HCI and the arts [17]. Where there has been research into what happens behind the scenes it is predominantly from a design perspective [22], very little is known about the nature of HCI's collaborations with the arts from a cross-disciplinary perspective. Even less is understood about how these artists are increasingly using scientific data as both a new material (to make tangible and meaningful representations) and as a medium of interpretation - as a narrative and performative experience and how these processes impact on such collaborations.



Figure.1 Hackday in Brazil



Figure.2 Hackday in UK

Methodology

'In the wild' research has come to describe practice that seeks to elicit a socially situated understanding of "the mechanisms and reality" [7] of coproduction within socio-technical systems. This paper is written from the perspective of an artist/researcher who led a study, in the wild, whilst taking part in *The Relate Project* - an interdisciplinary collaboration between artists, HCI researchers and climate scientists. This took place across three phases:

- Research: ongoing research and a series of internal workshops between the partners
- Artist Residencies in Brazil: artist collective and one researcher in residence on a farm and conducting hackdays (**Figure.1**) at an arts centre in Rio de Janeiro.
- Hackdays in UK: UK artists invited to experiment with the platform (**Figure.2**)

The study of *The Relate Project* focused on: the role of the artists within the design of the *Timestreams Platform*; the strategies that they used to engage with the scientific data through their experiments; and the impact of their work on the design of the system. This was studied through observations and audio interviews conducted by the artist/researcher, combined with additional interviews and observations conducted by HCI ethnographers. These interviews used a set of pre-defined questions, in order to create a conversation via a semi-informal interview [16].

This research extended the *Performance-Led Research in the Wild* [4] and *Designing from Within* [19,20]. Combining these existing frameworks allowed the artist/researcher to observe ongoing shifts and overlaps

in perspective between artist, designer and researcher, revealing many challenges and opportunities from 'within' this interdisciplinary design process.

Ethnographic content and observational analysis [16], supported a first level analysis and categorisation of the findings, supported by a deeper qualitative thematic analysis which was chosen to provide rich, complex and detailed accounts of the different perspectives of the artists, HCI researchers and climate scientist who participated in the study. Braun *et al.* [6] suggest this thematic analysis allows a flexible approach to the coding of data, providing an effective method for creating a picture of the experience of each perspective. This paper presents an overview of the key themes revealed from this deeper analysis.

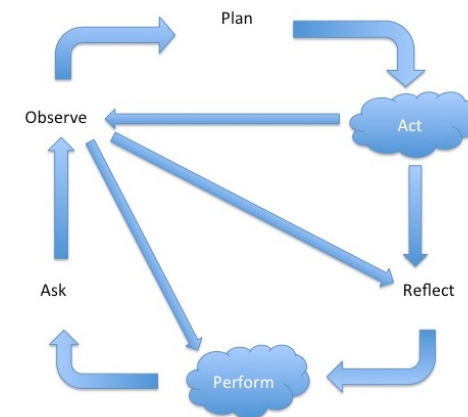


Figure.3 The Practice Research Cycle

Benford *et al.*'s 'Theory to Practice' diagram [4] has been adapted to highlight how the shifting perspectives specifically interacted during the *Relate Project*,

mapping the complex cyclical and dialogical process involved in this approach. This diagram has also been informed by the 'Ask, Observe, Perform' cycle [15] which uses a combination of action research and performance theory to dig deeper into the artists' motivations, intentions and decisions. In this diagram (see **Figure.3**) the points where the public spectacle occurs within the cycle - 'acting' and 'performing' - are differentiated from the theoretical elements. These were considered to be points when potential conflicts could occur between practice and theory and where the artistic practice often took precedent.

Participants

The participants in the study included five artists from the artist collective – who jointly facilitated the artistic activities throughout the three phases of the project and devised a series of artistic experiments that engaged with the *Timestreams* platform. This study also involved interviews with the two HCI researchers who collaborated with these artists to develop the platform, seven additional artists across the UK and Brazil and a leading climate scientist, who acted as an advisor on the project.

Technical Description

The *Timestreams Platform* is a tool for gathering data from scientific sensors in real time, to allow playback of the data in creative, performative ways and to better understand the relationship between energy and climate change. The platform is an open source, online data management system that is integrated with WordPress [5]. It has four core functions: (a) inputting time series sensor data and multimedia using the Timestreams API (b) authoring and management of data and media along timelines called 'Timestreams' (c)

outputting the 'Timestreams' data feeds using the Timestreams API to visualisations (created using Javascript or Unity), mobile phones, Arduino, Processing and Max MSP (d) sharing data between community members and artists.

Participants	Role
Artist Collective	<ul style="list-style-type: none"> • Co-design of the platform • Creating prototype artworks by engaging with the platform • Creating an exhibition • Facilitating other artists to work with the platform through hackdays
Researchers	<ul style="list-style-type: none"> • Investigators • Technical development of the platform • Research into sensor hardware • Facilitating the artists to engage with the platform
Artists Brazil	<ul style="list-style-type: none"> • Engage with and test the platform • Building prototype artworks using the platform
Artists UK	<ul style="list-style-type: none"> • Engage with and test the platform • Building prototype artworks using the platform
Climate Scientist	<ul style="list-style-type: none"> • Advising the artists and researchers on climate data

Table 1. Participants and Roles

Artistic Experiments

The artist collective, and additional artists in the UK and Brazil created a series of experimental artworks



Figure.4 The Prediction Machine, Brazil



Figure.5 Building The Rite of Spring, Brazil

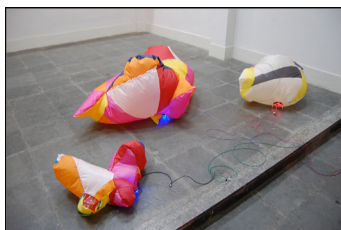


Figure.6 The Inflatables, Brazil

that used or responded to scientific data mediated by the artists through the *Timestreams Platform*. These were then presented to public audiences during an exhibition in Rio de Janeiro, Brazil and Nottingham, UK. The artistic experiments included: 'Before Light' a film of lights being turned on and off in response to CO2 data captured on a farm in the Atlantic Forest in Brazil; 'The Prediction Machine' (**Figure.4**), a prototype of a machine that prints out predictions for the weather based on live temperature and humidity data; Thunder Drum, a drum connected to a motor that is played in response to live humidity data; The Rite of Spring (**Figure.5**), a record player playing Verdi's Rite of Spring where the speed was controlled by data showing global increases in global CO2 data since 1959; The Inflatables (**Figure.6**) - three inflatable sculptures that inflated and deflated in response to live decibel and CO2 data.

Findings

The platform was partly designed in response to an earlier study of strategies that the same artist collective had used to engage the public with climate data in a previous artwork [13]. By reworking these strategies the artists were able to provide a metric by which the aims of the project and goals for the platform can be measured. The following findings explore how the participants responded to these metrics.

Sensory Experience

By creating *sensory experiences* that responded specifically to scientific data the artists were able to embed data in various material and aesthetic ways, responding to the data through the use of metaphors, abstraction and other characteristics: "*It's quite interesting because those datasets have different*

patterns to them and different movements in the ... you're often looking for an algorithm that makes something seem more like this, or like that... some of the data is very lively and some of the data is quite calm and stuff... I don't know maybe there are data personalities." (Artist UK)

Many of the artists described how they saw data as having its own sensory aesthetic that through the platform could be embedded in people, objects and the environment: "*...trying to create a kind of sensuous experience with the natural, the way that humans interface with the natural world and a meeting space with the changes that might be going on there and we have to use technology to make that a kind of more connecting experience.*" (Artist Collective)

Embodied and Embedded Experience

As a result, the platform was developed to enable inputs that could include users' experiential data as time series media (images, text, sound) alongside numerical, scientific data. These were then outputted to APIs that could be used within interactive installations and sculptures as well performances, sound works, video and other immersive experiences. One of the members of the artist collective explains how these strategies for embodying and embedding data can present data on a sensory, human scale: "*...there was always an interest in how to make these kind of seemingly very hard surfaces of digital technologies, these very kind of shiny boxes and all these kind of invisible digital processes... to make that feel more sensuous ...that felt quite a human level*"

Performativity

The concept of '*performing data*' emerged from these

strategies to encompass how these artists work with data that is mediated along a timeline, outputted as a 'live' stream and 'performed' in real time and space. Many of the artists who participated in the project were informed by notions of liveness, presence and influenced by the traditions of performance art which informed these performative strategies *"...instead of free for all documentation of events and places we are looking very much at the data as a performance, that is captured along timelines and therefore can be represented or re-played with a sense of temporality."* (Artist Collective)

Temporality

As the name suggests the *Timestreams* platform is based on time based data, where all data or multimedia is inputted and outputted as part of a timeseries. This occurs as either live data or historical, pre-recorded, modeled and aggregated data. These opportunities supported the artists' desire to magnify, scale, slow down or otherwise highlight aspects of the data, which they suggested can enable different types of sense making: *"...the opportunity here is to throw these into the campus of art as material... transforming it into a poetic construction."* (Artist Brazil)

Many of the artists discussed the importance of using live data and being able to re-present data within a live context, as being a key element of how the platform enabled them to provoke emotional and meaningful interpretations of the data: *"I use live sensors more than captured data, it's just that feedback I think people love to see something happen that correlates with something they did (it) gives people a strong memory of that thing... it allows them to live differently, or it allows them to take on an avatar... with all*

interaction you're doing that... Like you're kind of creating a link between people and objects." (Artist UK)

Multiple Interpretations

Timestreams allows artists to combine multiple datasets, captured either by sensors and/or combined with pre-recorded data uploaded to the platform. These opportunities for juxtaposing multiple datasets allow the artists to experiment with metaphor, abstraction and ambiguity in their interpretations of scientific data, which they also saw as important to being able to encourage conversations, new thinking and dialogue about the data: *"...its not a matter of making a work of art that you know I've pre-meditated and I'm trying to achieve, its really putting the pieces together, the people or places you know and I don't mean like orchestrating this in a kind of very authoritative way but in a way of seducing people like a conversation"* (Artist Collective)

Authenticity

The negotiation of when scientific authenticity was important within the artworks, and when to mediate the data in order to provoke emotional or interesting narrative experiences raises significant questions around scientific authenticity. As some of the artists themselves reflected: *"...it is very difficult to collect data... you want data that is going to tell you a story or that you can tell a story to other people... the problem is that if you have got data that is a very small change over a period of time there is not much of a story in that and so, therefore you are kind of are with this situation of what do I do with this?"* (Artist Collective)

Despite these concerns, some of the artists suggested that it is possible to design constraints within the

platform in order to maintain scientific authenticity: "...there'd be no point in making the platform not authentic, like true to the data, I mean that's why I think it's good that having the scaling in *Timestreams* is quite important" (Artist UK)

Emerging Challenges and Opportunities

One of the emergent tensions was between the artists' approach to working with the platform and how the artists expected the technology to remain in the background of their artistic process. Whilst the platform facilitated the artists to engage with scientific data it was not seen as the most critical part of their process: "*Timestreams* was not really (about) the technology for me, *Timestreams* was the process and the process was about addressing, trying to find sensor interfaces with climate change, with the human in the environment in relation to climate change and how you can kind of start to engage in a process of generating data..." (Artist Collective)

Yet, the technology was seen as key to enabling the 'data' to be brought to the foreground within the artworks: "...that's kind of what you're doing with visualising data, you know, you're making a show out of something that's just there, in a way, but you're making it into a show - you're giving it centre stage" (Artist UK)

Possibly the most surprising way that some of the artists responded to the technology was how they chose not to work with the platform directly. Instead they created artworks that used the data on the platform indirectly or simulated how they had hoped the platform would work in the future. These experiments '*beyond the platform*' clearly provided the

biggest challenge for the researchers: " *if you don't want to use the offering, don't necessarily want the vision of the digital economy and the way it seems to be going how do we build tools for this kind of group? There's a bit of a paradox there.*" (Researcher)

During a system review, one of the artists explained how this work '*beyond the platform*' occurred partly in response to the scientific and technical terminology of the system, revealing how the usability of the technology risked becoming a hindrance to the artistic process. In response to these concerns it was suggested that some of the artists, with less technical expertise, would need to collaborate with a programmer or additional technician in order to support them to interface with the platform directly: "...the language isn't an artist language at all, we're having to use a programmer's language to understand. There's got to be some sort of handover to an artist, (to use) a programmers' language, to be able to engage with this." (Artist Brazil)

The level of the artists' technical expertise and willingness to engage with the scientific and technical language created some tensions. This impacted on how the HCI researchers approached the design of the system, and the way that the artists engaged with the system, often challenging prior assumptions. These frictions that arose throughout the iterative design process informed the integration of API's within the platform: "...early on we kind of said, so what do you guys want to do - infographics?... I can kind of get visualisations and sonifications, I've done some of these before, but machinery or getting other kinds of outcomes you need to get some other way to get your

data out and I guess that's when the API manifested really" (Researcher)

These tensions raise some broader questions about how artists work with technology, what support they might need, and what should start first - the artistic process or the system development? One of the researchers highlighted this tension as a '*chicken and egg problem*' where a working prototype of the system is required first, yet often the artists were unable to give a clear set of requirements until they saw the prototype.

Possibly the most significant challenge to emerge from this research was the ways in which the artists considered scientific authenticity versus creating emotional experiences in their treatment of scientific data. Across all the artistic experiments that were mediated by the platform the artists were found to be experimenting with maintaining the veracity of the '*scientific-ness*' of the data, whilst considering their own artistic integrity - in order to create personal, local and emotional narratives around the data. Observation of this in-practice negotiation led the climate scientist to recognize the difficulty of navigating such tensions, stating: "*...we need to develop a sort of deeper understanding because that is the way we can build something that makes sense scientifically if you want, but is also something that can generate an emotional response ... the potential risk there is that you put together all this data and generate meaning or you tweak your meaning and people smile but (the meanings) are not there in the data"*

Discussion

The study of the *Relate Project* and the resulting

Timestreams Platform provides significant examples of an innovative interdisciplinary design process. This work seeks to explore the increasingly blurred boundaries between the artistic process and HCI research [4], to investigate what happens in the background of these interdisciplinary collaborations, and how this impacts on the design of HCI systems. Some of the findings from the study are supported by other work within HCI that focuses on the way artists and communities use environmental data systems [1,14,10, 12], and the role of artists in designing interactive experiences [4,19]. What is unique to this project is that these artists were invited to engage in an iterative design process from the beginning of the project, which drew on a previous study of these same artists' practices, to inform the technical design of an HCI system.

This paper highlights how artists often respond to technology in surprising ways, requiring the technology to remain in the background whilst allowing the data to remain in the foreground. The findings show how by '*performing data*' artists are able to provoke new thinking and dialogues about complex scientific data, whilst raising significant questions around its authenticity and integrity. DiSalvo *et al.* suggest that a new wave of HCI research is '*looking to the arts for enhancing, or in some cases transforming, our traditionally science-dominated practice*' [9]. This paper responds to this call, revealing the importance of ongoing collaboration to enable these shifts to occur, yet recognising the tensions and challenges inherent in this work.

Conclusion

The strategies highlighted through the findings of this

study provide a set of metrics, in order to inform the design of data systems that support HCI's turn to the arts. This paper begins to define the emerging role that artists/researchers are playing within HCI and how these artists can play a critical role in the technical

design of these systems. This research provides insights into how HCI can learn from artistic processes about the emotional, social and ethical treatment of data within their systems, whilst revealing some of issues that are unique to artists working with data.

Acknowledgements

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Commentary

For alt.chi paper
*Behind the Scenes at HCI's Turn
to the Arts*

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The authors did an excellent job of characterizing the tensions between art and HCI in design collaborations while highlighting opportunities to effectively permeate any barrier between the two fields. In terms of positives of the paper, I think the quotes from artists and researchers did a great job of highlighting different perspectives while respecting the language and viewpoints of each group. I particularly liked the concept of a "data personality." Many of their findings agree with many of my own experiences working with artists and I felt that the authors represented those viewpoints very well.

While this may not be directly related to the review, I think the authors might find interest in the following literature. The quote in the section "multiple interpretations" seemed very linked to Ingold's

(Making: Anthropology, Archaeology, Art and Architecture) view of making as emergent (in his words, "morphogenetic") and how form emerges in a process of "correspondence." I don't think the issue in Ingold's work is quite is about multiple interpretations but rather, about indeterminacy and the way in which artists can set up a "field" within which to discover new forms and ideas.

This study also reminded me of some of the collaborations between art/technologists that Anne Balsamo reflects on in her book *Designing Culture*. While your work offers a detailed description of the actions of artistic practice, her study highlights the way in which "meanings" are deconstructed and reconstructed through design collaborations with artists.

Commentary

For alt.chi paper:
*Behind The Scenes at HCI's
Turn to the Arts*

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I must preface this commentary with a clarification that this is not an area expertise for me. Yet I found this paper particularly interesting and am pleased to be invited to provide this brief commentary. The paper discusses the process of collaboration between artists, climate scientists and researchers and what this means for design. I particularly like the perspective this paper brings to the issue; that while positioned at the intersection of art, HCI and sustainability, it is not drawn on the use of art as a persuasive medium.

Persuasion is an interesting lens through which to view art, particularly in relation to sustainability. I feel that while art in this context is not always positioned as overtly persuasive, it can often be implicitly so. The Nuage Vert project for example visualized Helsinki's power consumption through laser lights projected onto the smoke from the smokestack of a coal-fired power station. The size of the green visualized cloud was proportional to the combined consumption of the city; more green equated to lower energy consumption, less green equated to higher consumption (*Holmes, T. 2011. Digital Encounters. XRDS Crossroads, ACM*). While this is a great use of an artful medium to raise awareness of

energy consumption in the city, it is still implicitly persuasive its nature; i.e. that using electricity is polluting the environment and residents should use less such that the green cloud grows.

One of the reasons I like this paper, is that it provides a compelling discussion on the relationships between art, sustainability and HCI in the absence of a persuasive agenda. The paper in some ways reminds me of Schwartz et al. (2013) who study the visualization of domestic energy consumption through eco-feedback. Schwartz et al. investigate not what technology can do to people, but what people do with technology, in the absence of a persuasive framing (*Schwartz, T. et al. 2013. Cultivating Energy Literacy—Results from a Longitudinal Living Lab Study of a Home Energy Management System. In CHI 2013, ACM*).

Although in a different context, I feel this paper relates to this somewhat; looking not at how art can change attitudes towards sustainability; instead, discussing how art and artists can contribute to technology and experience design. I find this perspective refreshing and I look forward to reading these authors' future work in this area.