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# Making Data Physical in the Design of The Prediction Machine

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## Abstract

Artists have been increasingly using real world, scientific data as a material to create physical artworks. The concept of 'performing data' has arisen from these art practices as a term that extends beyond data visualizations towards more tangible, sensory, temporal and performative experiences, in order to build emotional and physical engagements with scientific data. This position paper presents one specific artwork '*The Prediction Machine*', that demonstrates how a physical embodiment of data can encourage dialogue about climate data. This paper presents some of the challenges encountered and describes how the artist navigated issues of supporting the public to engage authentically with the science versus creating emotional and physical engagements with the data.

## Author Keywords

Interactive art, environmentally engaged art, environmental data, tangible, sensory, embodied, performance

## ACM Classification Keywords

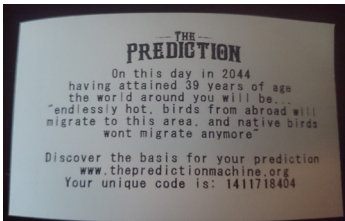
H.5. Information interfaces and presentation

## Introduction

Across the scientific community, the media, the political domain and education there are many controversies about the best way to communicate and engage the



**Figure.1** The Prediction Machine



**Figure.2** The Prediction print out



**Figure.3** Looking at the screen with the data visualization and talking head videos

public with scientific data and more specifically with climate data. Climate scientists are increasingly seeking novel ways to engage the public, where research in this field shows that the global and long-term nature of climate change data defies easy or immediate comprehension within our everyday lives [11,12]. In this space artists are found to be increasingly collaborating with scientists and HCI researchers [3,5] to create conceptualisations of real world data. These artworks can be considered alongside an ongoing interest in infographics and data visualization occurring across broader arts, design, HCI and new media practices [10,13,2].

This paper describes the design of a specific artwork 'The Prediction Machine' and the ways that the artist built the machine to record, mark, interpret and respond to climate data in our everyday lives, discussing some of the themes that have emerged from this process and how they might inform future directions for the design of data physicalisations.

### Background

Much has been written in recent years about data representation, visualisation and infographics [13], supported by research within HCI by Bateman *et al.* into 'visual embellishment' [2] that questions how data is often fetishized as a visual experience without deeper reflection of the meaning, context or deeper discourses surrounding the data. These issues in turn raise questions around data authenticity and how the perspectives of the designer, scientist and technology involved in creating visualization can frame the interpretation of the data.

Existing literature from both Contemporary Art and HCI suggests that artists are using strategies that embody data within their artworks, often as tangible experiences of data. These physical representations of data support human-scale, intimate, situated, emotional and sensory experiences and encourage dialogue around the socio-political issues surrounding the data [4,6]. Hohl [7] proposes that 'it often requires designers or artists to transform these conclusions into communicable formats that capture the public's imagination' suggesting that designers and artists employ two distinct approaches: abstract visualisations (tables, charts and infographics); and concrete visualisations (artifacts, objects and embodied experiences of data). Hohl argues that concrete visualisations can create more engaging experiences of data by: (a) using 'actual data' (b) finding meaning within the process of making and not just the in resulting artifacts (c) using open-ended dialogue. In response, this paper presents one such artwork – The Prediction Machine - and some of the key strategies and resulting challenges involved in its design.

### The Prediction Machine

*The Prediction Machine* is an interactive artwork designed to represent live weather and future climate data, and print out predictions based on this data (Figure.1). Data is recorded at a local weather station and fed to the machine live via *The Performing Data Platform*, a system that enables artists to capture and create 'performances' of data, embedded into artworks and public presentations. The platform uses an API to send the data to a Unity interface running on a laptop hidden within the machine. The machine then prints out the predictions as narrative text, based on this scientific data (Figure.2). The machine also has a screen



**Figure.4** Zoltar Fortune Telling Machine that inspired the design



**Figure.5** Powering the screen with the hand crank

showing a digital visualisation of the current temperature, precipitation and windspeed (**Figure.3**).

The aesthetic of The Prediction Machine is based on 'end of the pier' fortune telling machines, such as the 'Zoltar Machine' (**Figure.4**). The artist designed the machine to be a tangible interactive object that has the data *embedded* in its design, where the machine 'performs' a combination of *physical and digital interpretations* of the data. The sign at the top provides a warning system that indicates increases in air temperature levels and pulsates if an extreme weather event is being recorded. A screen powered by a hand crank (**Figure.5**) provides a visualization of the numerical data combined with 'talking head' videos of observed weather experiences. The machine then prints out predictions for similar conditions in the year 2044, each prediction contains a webcode to enable users to go to the project website to find out more about the climate science behind the predictions.

The Prediction Machine was created by an artist/researcher in collaboration with engineers, computer scientists, climate scientists and researchers. The artwork was developed through workshops with local residents and then presented as a public exhibition in a local library.

### **Design Challenges**

One of the key challenges was the way users of the machine were invited to embody data through their physical interaction with the machine. The hand crank acts as a demonstration of the energy required to power the technology in our everyday lives, providing a metaphor for our ongoing impact on the environment. Yet, it was observed that many of the users,

particularly children, were so fully engaged in using the hand crank that they found it hard to focus on the information on the screen and engage with the data. This revealed an interesting tension between the physical interaction and the data, suggesting that the aesthetic and tangible experience can work against any desire to bring the data to the fore.

The participants in the workshops were also invited to observe the weather and then use this experience to write the predictions, printed out by the machine. By comparing personal, sensory observations with scientific data in this way the participants were engaged in a process of 'performing' and 'interpreting' the data as a physical, logical, emotional and sensory experience [6]. Users of the machine were then invited to take the predictions away with them as souvenirs of the moment in time when they interacted with the machine, requiring them to reflect for a moment on the weather outside and imagine a future climate scenario based on that moment. This process raised some important issues around how to walk the line between artistic interpretations of data and scientific authenticity. By combining observed experience with scientific data the work questions how explicit to make the link between the scientific and artistic interpretations of data and how much to reveal about the algorithms which controlled the predictions.

### **Conclusion**

This paper presents an example of how an artist has created a physical experience of scientific data by embedding and embodying data into an interactive artwork. The process of designing and exhibiting this work has revealed some key challenges and raised some important questions, which we hope can inform

the future design of data physicalisations.

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