Feel & See the Globe: A Thermal, Interactive Installation

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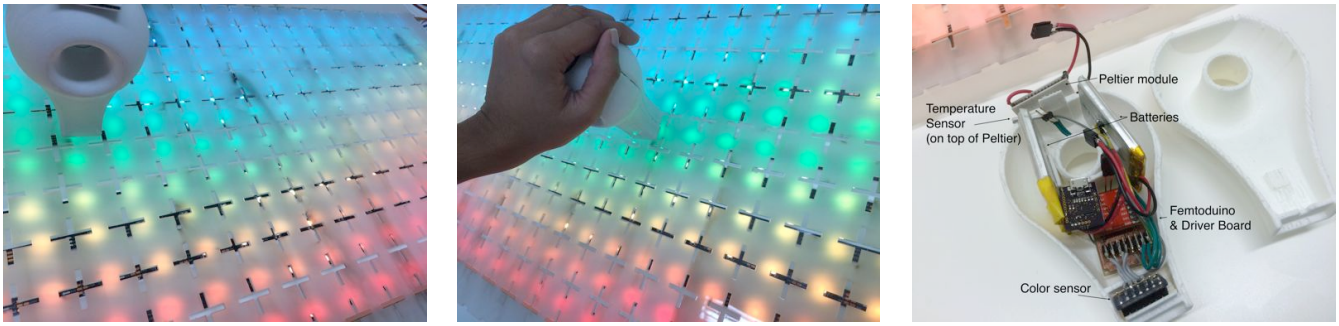

a) Colors map to different temperatures **b) User interacting with the installation** **c) Inside of the handle**

Figure 1. Overview of the "Feel & See the Globe" installation

ABSTRACT

"Feel & See the Globe" is a thermal, interactive installation. The central idea is to map temperature information in regions around the world from prehistoric, modern to futuristic times onto a low fidelity display. The display visually communicates global temperature rates and lets visitors experience the temperature physically through a tangible, thermal artifact. A pertinent educational aim is to inform and teach about global warming.

Author Keywords

Thermal, visual, interactive installation, exhibit

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

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INTRODUCTION

Designed to be explored by hand, "Feel & See the Globe" is a haptic installation that leverages visual and thermal user interactions to convey temperature in regions around the world from prehistoric, modern to futuristic times, e.g. [4]. While the educational aim is to teach about global warming, the technological goal of the project is to understand human temperature perception and to ultimately, effectively enhance the sense of touch and visual representation through thermal feedback.

Exhibits that also leverage on thermal cues to convey haptic information have inspired our main line of work. Most similar to our approach is Thermoesthesia [2], a projector-based installation that uses a thermal display with which users interact to explore thermal properties. There is also a greater body of work on augmenting digital media with thermal cues [5], using thermal feedback for messaging [3] and to facilitate social connectedness [1].

The technical novelty of our installation lies in decoupling the visual feedback from thermal cues: the installation is made up of a low fidelity, pixelated display (cf. Figure 1a and Figure 3) that only displays color information; thermal information is communicated through a tangible handle (cf. Figure 1b, 1c) when it is placed onto the display. In the following, we detail the main concept and implementation.

CONCEPT AND IMPLEMENTATION

The central idea behind "Feel & See the Globe" is to map a thermal world map onto a plane, visually communicate global temperature rates and let visitors experience the temperature physically through a tangible artifact. The world map is pixelated to clearly communicate boundaries and let users easily establish a connection through the fitting handle. The visual display can be easily adapted, e.g. to show thermal maps from different decades and thus communicate the change in global warming (cf. Figure 2).

The display is made up of 2 acrylic layers (1614x822mm) that are placed above each other (5cm spacing) and lasercut to resemble 49x25 large pixels (3x3cm each, 3mm spacing) that make up the display. The first layer at the bottom is a white acrylic that diffuses light emitted by RGB LEDs placed below (each LED resembles one pixel) and the second layer is made up of translucent acrylic that absorbs the diffused light. Figure 3 shows 2 sample visualizations.

Figure 1c illustrates the design of the 3D printed handle. The hardware setup comprises a color sensor (bottom), one Peltier/thermoelectric module (top), a temperature sensor on top, a Femtoduino, a custom PCB that drives the Peltier and two batteries. When the user grabs the handle using her palm and places it onto the display, the color sensor absorbs the light, which is translated to a relative temperature (normalized to an interval between 26 and 38 degrees Celsius). The Peltier module is then steered to that temperature using a PID controller in software.

ENVISIONED VISITOR EXPERIENCE

Visitors are able to feel and see temperatures of different regions through the color they glow in on the map and feeling the land's temperature physically through the handle. The outlines of the regions light up with a diffusive glow. Visitors can also change settings to see and feel the temperature of the globe from different times in history and

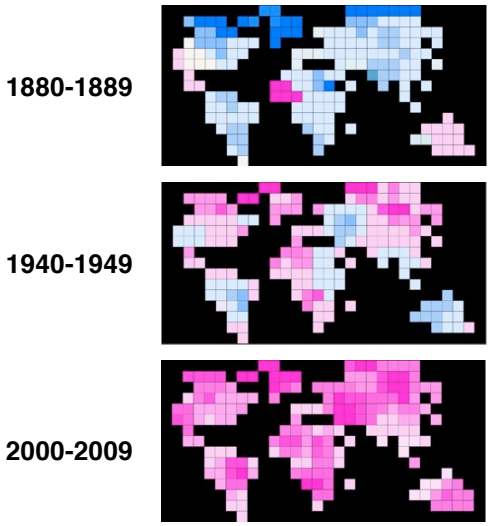

Figure 2. Conceptual sketch of thermal maps from different decades; real data see e.g. [4].

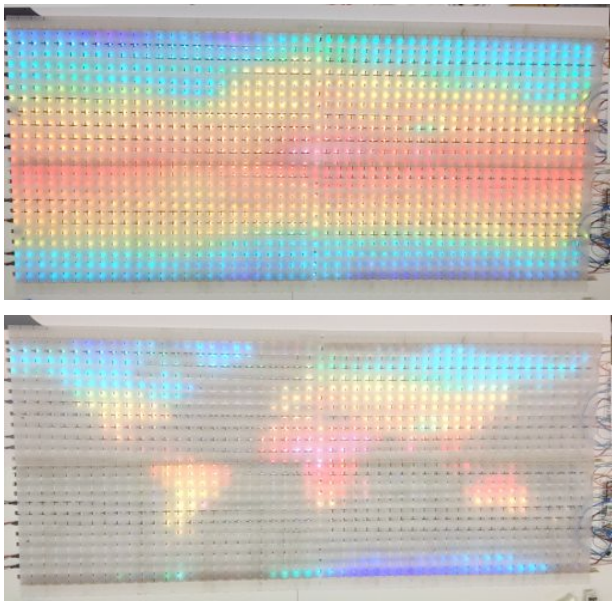

Figure 3. Different visualizations of the installation: a) world-map visualization and b) continent-based

projected temperatures in the future (e.g. through a tangible knob placed besides the exhibit). Consequently, users can step back and see the earth change different colors from a large perspective over time. Auditory educational supplements or sounds of natural environments could also be considered to provide a full sensory experience.

SUMMARY

We presented "Feel & See the Globe", a thermal, interactive installation that communicates temperature in regions around the world from prehistoric, modern to futuristic times. The technical novelty of our installation lies in decoupling the visual feedback from thermal cues: displayed colors are mapped to thermal information, conveyed through a tangible handle placed on the display.

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