

Thermoesthesia: About collaboration of an artist and a scientist

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1. Introduction

"Thermoesthesia" is a new style of interactive artwork with an original thermal sense display. In this paper, we describe the collaborative work approach taken in art and science.



Figure 1 "Thermoesthesia "

In late years, by collaboration of an artist and an engineer, development of a new digital technology and production of contents came to attract attention. After starting SIGGRAPH, technology and collaboration of art expression can watch new movement in Japanese VR society or French Laval Virtual.

The thermal sense display has been developed to allow users feel the temperature of the visually displayed objects, which is cool or warm, by directly touching the objects. This project began with suggestion of an artist. Mrs. Kushiyama showed art work "Transparent Blue" which we used touch panel in SIGGRAPH2005. It was a work to touch for an image of fresh and cool CG, but felt vanity of CG and a difference of the touch when we touched it. Challenges from there to a work accompanied with a cold sense to be hot began.

This project consists by an artist, the electrical engineers and the CG programmers. General constitution is announced in form of a work by an artist.



"WAVES"
SIGGRAPH2003



" Transparent Blue "
SIGGRAPH2005

Figure 2 Art works used touch panel display

2. Approach from art

What kind of meaning will you have with a work to touch? By an interactive thing, We changed into an active thing from a conventional passive work. We let a human primitive sense except sight wake by touching it. The work which had thermoesthesia created a work of an unprecedented new sense. We express the four seasons as a theme by talks with environment.

A total concept, directionality, a design of contents, document collection, talks of a method to be realized was performed among engineers frequently from a situation of art.

The primary objective of this work is to enrich the touch expression. "Thermoesthesia" is expected to extend the style of the interactive information access activity in dairy-life that is for ubiquitous information-intensive society.

"Thermoesthesia " offers the audiences experience not only touch-and-feel but also direct interaction with the images using their hands. The interaction with a redesigned and simulated physical phenomenon allows the audiences re-experience the phenomenon in different style from the familiar one, which provides a chance to rediscover the world.

3. Approach from Science

3-1 Thermal sense display

As for the basics device of Thermal sense display, an experimental device was made with cooperation of the student by guidance of an instructor of a department of engineering. The basic concept of the project is to add the actual thermal property, such as cool or warm, to each part of the images projected on a screen. We used Peltier device modules for the thermal display. The thermal display range of the developed device is from 5 to 45 degree C.

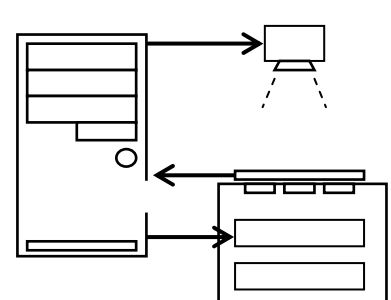


Figure 3 System Overview

3-2 Interactive image generation

Furthermore, the photo-sensor based touch-panel system using infrared LEDs, which is implemented 2mm above the screen, detects the hand position. The hand contact detection allows users to interact actively with the images that have thermal properties.

3-3 CG program

As for CG program, a fundamental program was written by guidance of an instructor of CG by cooperation of the student. As the typical interactive content with thermal sense, "Cold-snow crystal" that is the simulation of snow crystals growth is shown in figure 6. The real-time interactive program was developed using C language and OpenGL library. "Nakaya diagram", was utilized to generate various forms of snow crystals, in accordance with the air temperature and the humidity.



Figure 5 Content Winter "Cold-snow crystal"

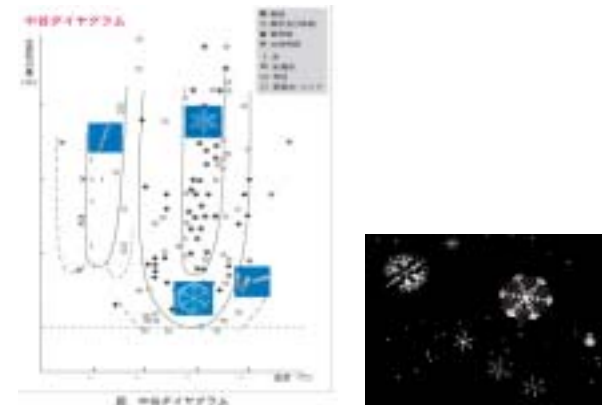


Figure 6 "Nakaya diagram" Nakaya,1954:Snow crystals



Figure 7 Snowcrystals photos
Kenneth G. Libbrecht, Caltech snowcrystals.com



Figure 8 Simulation of snow crystals growth



Figure 9 Ice crystals photos
Kenneth G. Libbrecht, Caltech snowcrystals.com

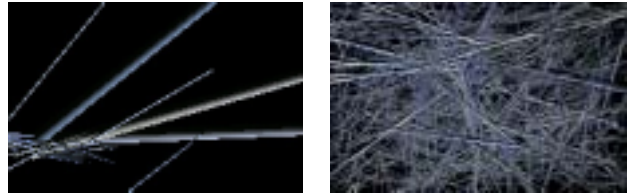


Figure10 Simulation of Ice crystals growth



Figure 11 Content Spring "Warm-plant"

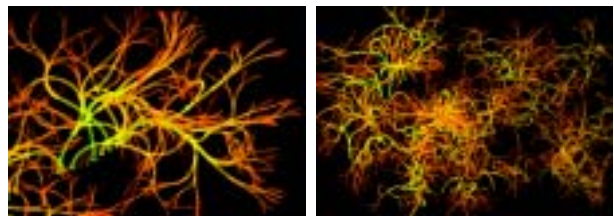


Figure12 Simulation of plant

4. Conclusion

Through "Thermoesthesia" work production, we were able to experience a method of art and collaboration of science. I felt talks and necessity of a place of possible education of mutual understanding.

As Leonardo da Vinci tried creative expression with technology of the then tip, we think that there is the expression that it is possible for only to us who live in the present age. We hope that this project stimulates art and new expression and study for scientific fusion.

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References

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