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Interactive Art

Title: Rakugaki

Code NO. 312-237/0

Technical realization

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1. Overview

Do you remember a moment in our childhood, when if we found a piece of paper, we used it for a doodle. There is no explanation. We used to do that, without knowing why. We scribbled every kind of character, knights, pets, automobiles and so on. They were a part of the universe, where, in our mind, each drawing has its spirit. We had a dream: how wonderful it would be if those creatures turned out to be alive, moving around, talking to us. It could be a living doodle.

In this work, We tried to realize that, to make a dynamic doodle pad. In our work, doodles are drawn autonomously, according to the sound or music made by the audience. The pad is the screen. The doodle is displayed there.

We chose sound as the means to control the doodle, because it is one of the most primitive of our senses, and doesn't require any skills to appreciate. The pad is constructed in the shape of a cube. The cube has six faces. So, there are six pads on the screen. Each pad already has a drawn background picture of land, sea and sky. The cube turns around with respect to the acoustics. The user can use the frontmost pad as a doodling space. A doodle can be made as follows: When the audience starts to produce any sound, using their voice or some musical instrument, a line appears on the screen. It will stretch and curve gradually as the tone or intensity of the sound changes. When the sound stops, the drawn curve, or doodle, changes its shape, morphing into a character. The character could be one of several wild animals, vehicles etc.

You can fill the pad full of such characters using your voice or any instrument.

We intended to realize a media installation where the audience could feel the pleasure of doodling, and remember its enjoyment as we all experienced when we were young.

The detail of this system are described in the following chapters.

2. The system configuration

The system behind this work consists of two parts. At the first stage, acoustic input is digitized and analyzed according to its frequency distribution and its power spectrum. At the second stage rendering takes place. The rendering system receives analyzed acoustic signals from the first stage, and from this information it determines a doodling signal from the pad flipping signal. The Pad flipping signal is lower frequency and stronger strong in power. According to the signal type, a stretching drawing curve is produced or the pad cube is rotated. Finally, the image is projected to the screen, with computer generated MIDI based sound, which represents the movements of the doodle's curves.

3. Development of the system

The acoustic subsystem was implemented in a PC-based workstation, specifically a Silicon Graphics Visual Workstation and digital media SDK, also from Silicon Graphics. The rendering subsystem is also implemented in a PC-based workstation - a Windows-based PC. The development languages and libraries were Microsoft Visual C++ and OpenGL.

4. The algorithm

4.1 The acoustic subsystem.

This subsystem obtains input signals from a microphone placed at the front of the screen. The signal is digitized and Fourier transformations are made to obtain the energy spectrum in real-time. The signal is sampled at 10-15 times/sec and the analyzed result is continuously sent to the rendering subsystem.

4.2 The rendering subsystem.

This subsystem receives the power spectrum data from the acoustic subsystem to produce doodle drawings. In order to attract an audience, a scribble-like vibrating line is

drawn on the screen. In addition to the doodle curves, the background picture and various characters are also processed in the same way. In the pads, clippings of the moving characters are done to facilitate the perception of characters. Fog effect is applied to the pad cube to implement further reality. The motions of the characters are computed by solving equations of motion, adding virtual mass and buoyancy to each object.

4.3 Sound generation subsystem.

This doodling system is basically a one-way interaction. For the audience to feel the reaction, feedback from the sound generation subsystem is placed at the end of the sequence. Audience members can hear the sound when a doodling curve morphs to the character or the pad cube flips. The sound is generated by a MIDI sound sampler and pre-recorded music in a compact disc.