

## UNCOVERING AMERICA

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### Abstract

Since 1989, the \*.\* Group develops interdisciplinary works, using technological results applied to artistic purposes. For this event, the group proposes the production of a computer animation using informations from satellite images for sound track composition and transformations over the images suggesting the simulation of natural phenomenons for the animation.

Key words: computer graphics, computer animation, particle systems, automatic music composition, image processing.

### 1. THE MOTIVATION

*" ... while a form of acting, Art approaches Science in its research for new equipment and languages, exploring other analog codes between World and Man, enlarging perception, interpretation and practices. It respects, thus, the echosystem between the World and Man himself. Art chases after a new type of poetry suitable for the new conditions, resorting to an interdisciplinary work and finding in other areas of knowledge the foundations to build its projects of research..."*

Paulo Laurentiz [Laurentiz, 1991]

#### 1.1 The \*.\* Group

An abbreviature that in Computer Science stands for "all dot all", or merely "all", or "anything", adopted by a group of diverse profile people that play specific roles in the execution of complex projects. The group is dynamical, the people are joined according to the project and their moment and affinities. But the group always join people from Art and Technology, and the interdisciplinary projects emerge from the environments where the people live [Franke, 1987].

For this event, the group offers a graphics animation using satellite images, whose informations will be used both for the movement as to the music generation. The proposal of the \*.\* Group is always of working with the means of its time. Because throughout the times, Art has resorted to whatever media were available in the diverse eras to be shaped anew. Their time is now, technology their media.

### 2. PREVIOUS WORKS

The \*.\* Group emerged in 1989 with the Fractal Art project developed for the 20th. São Paulo International Biennial. In 1991, it appeared again in that event with the Foreseen Variations Projects. For a better understanding of its interdisciplinary way of working within Science and Art, we believe that a brief explanation of those two projects is

convenient; more so since the Uncovering America project evolved from those previous proposals.

#### 2.1 Fractal Art

The Fractal Art project was an installation consisting of panels with computer generated images of fractals (hardcopies), music composed from fractal generation algorithms, a video animation using fractal music and images, a sculpture made of neon lamps distributed in space according to a certain fractal pattern and photo-electric sensors which were placed in the base of the sculpture and connected to a personal computer. The music was composed in real time. By means of the sensors, the amount of light in the room was transformed in parameters for the composition. Thus, the presence of people in the room, altering the amount of light interfered in the music that was being composed.

#### 2.2 Foreseen Variations

In 1991, after a few appearances in local shows and events, the \*.\* Group presented, in the 21st. São Paulo International Biennial, the Foreseen Variations project. The group was not the same. People join according to the project and its needs. The Foreseen Variations project was an installation in which a Puma robot would move according to the music composed with the aid of a computer. Beside it, a set of televisions (Photo 1) showed a video in which a (human) dancer made an "electronic performance" with the robot, thus invoking the automation of man and the humanization of machine. A TV camera, placed in a corner, captured the images and movements of the people and the robot in the room. This way, people were electronically inserted in the piece.

### 3. UNCOVERING AMERICA

Continuing with their experiences and interdisciplinary projects, the \*.\* Group proposes for this event the production of an animation based on satellite images. This proposal evolved from a previous one, the Four Seasons project of Paulo

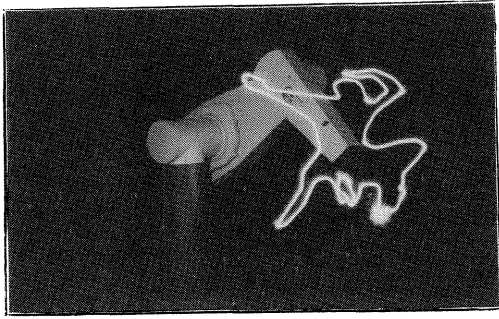


Photo 2 - The Puma robot drawing a centaur in space with a lamp.

Laurentiz (dead in 1991), an animation with satellite images using Vivaldi's concert. As opposed to the previous proposal, we intend to use the information from the satellite images to generate the music also, exploring natural phenomena such as vortex, snow and wind, falling waters and fire [Sims, 1990], suggesting the movement and the music. Thus, musical parameters such as velocity, intensity, duration and timbre will be extracted from the images' information and used for the definition of the various states of a sound context that will be articulated as a result of the images' trajectories. The pixels of the satellite images will be seen as particles in a system [Reeves].

### 3.1 Particle Systems

A particle system is a collection of many minute particles that together represent a fuzzy object. Over a period of time, particles are generated into a system, move and change from within the system, and die from the system [Reeves, 83].

To compute each frame in a motion sequence, the following sequence of steps is performed: (1) new particles are generated into the system, (2) each new particle is assigned its individual attributes, (3) any particles that have existed within the system past their prescribed lifetime are extinguished, (4) the remaining particles are moved and transformed according to their dynamic attributes, and finally an image of the living particles is rendered in a frame buffer. The particle system can be programmed to execute any set of instructions at each step. Because it is procedural, this approach can incorporate any computational model that describes the appearance or dynamics of the object. For example, the motions and transformations of particles could be tied to the solution of a system of partial differential equations, or particle attributes could be assigned on the basis of statistical mechanics.

Particle systems provide for the creation of complex structure and motion from a relatively brief abstract description. They can be used to produce dynamic and "fuzzy" effects that are difficult to achieve with traditional objects made of surfaces and animated with non-procedural motion. They have previously been used to model fire in the Genesis Effect of Star Trek II, tree and grass, breaking waves, fireworks and other abstract effects.

We have a particle system being developed at Fundação CTI that works with magnetic fields. We

will also supply several levels of operations along the spectrum between detailed kinematic control and physically based simulation. The goal is not to strictly obey physics and reality, but to suggest a variety of effects easily created. Physical simulations can create motion in a much more complex and realistic looking than motion achieved by moving objects along spline curves or through keyframes. Objects animated kinematically often are not perceived as dynamically correct, whereas objects animated by true physical simulation will look correct.

### 3.2 Operations with Particles

Operations used to move particles are divided into four categories: those that set the position, those that set the velocity, those that alter the position or "apply" a velocity, and those that alter the velocity or apply an acceleration. In addition to position and velocity particles have state variables that are used by some animation operations but not by others. For example: type, age, mass, spiral-axis, color, opacity and size can be used. Other spare slots exist for information such as initial velocity, a color to fade to, or an age to die at. A valuable component of a particle animation system is a particle preview capability.

### 3.3 The Animation.

The animation will be obtained from the movement of pixels which will be colored using information from the different satellite bands. The trajectory will be associated to algorithms that describe natural phenomena or the transform operations applied to the images [Gonzales, 1977] according to their features. This way the \*. \* Group intend to reveal a new America, invoking technological development, Nature and Man, by means of its knowledge and its sensibility.

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