PARTICLE SYSTEM PROTOTYPE - Project Description

by Palle Dahlstedt, Department of Applied IT & Academy of Music and Drama, University of Gothenburg, palle.dahlstedt@gu.se

Performed at the TW@C Workshop, Tällberg Forum, Tällberg, Sweden, June 15th, 2013

This is a preparatory work for a larger installation planned to be performed during the Tällberg Workshop @ CERN in September 2014. The purpose of this workshop is to discuss, on a deeper level, the interactions between science, technology and art, and I was asked to contribute. The workshop is a collaboration between Tällberg Foundation and CERN. It will take place at the CERN facilities in Geneva, and this installation was originally planned to be performed in one of the sensor halls of the Large Hadron Collider (LHC). This is however not finally decided.

I am part of the organizing group at Tällberg Foundation, and I have been invited to contribute artistically to the event. The work presented here was performed during a workshop at the quite well-known globalization forum Tällberg Forum, preparing for the larger workshop at CERN. The participants were physicists, environmental scientists, artists, art historians, politicians and business decision-makers.

Particle physics is very abstract, and is very difficult to visualize, because it does not really let itself be described by the physics most people know. The idea behind my musical work is to develop a virtual particle system, inspired and influenced by elementary particle physics, to understand and communicate some properties of such a system in a form perceivable by the listeners.

This is not an easy task, as there are many particle properties and phenomena that do not have an acoustic counterpart. I wanted to create a system that is not an exact copy of real particle systems, and not a mapping from real measurements, but a system that is happening in real time, can be interacted with, and shows some of the core phenomena, although illustrated with fictional acoustic particles.

Properties and phenomena that I wanted to implement include: energy level , decay into other particles, hal- life, and field interactions between particles.

All of these, except the fields, are implemented in the prototype. I have developed a model for acoustic field interaction, based on spectral and panorama-field gradients, but was not ready for this first version.

There are three fictional particles in this system, named Ping, Ray and Bipp.

Each of the particle types decay, with a certain half-life time, into two new particles, one each of the other types. The energy of the particle is then divided between the two new particles, each of them having slightly lower energy levels than the decaying particle had. Some energy is lost in the sonic output of the decay.

Each particle makes a sound, with a clear attack when it is born, and the possibility of decaying slowly during its lifetime. The sonification parameters, apart from pitch and volume, are editable, and I have experimented with different versions to make the core phenomena as audible as possible.

The "physical" properties of each particle type, such as half-life time, radiation and energy distribution between decay products, are also editable, leading to slightly different behavior. In the sound example, these vary slightly over time to illustrate how different it can sound.

As the system is running, it sparsely injects high-energy particles into the system as seeds, and we hear their real-time decay process. Listeners can also inject new particles into the system. This is currently done with a keyboard, where pitch and energy level, as mapped from key velocity, can be controlled.

The system is implemented in a real time signal processing system (Nord Modular G2), programmed by me. The maximum number of particles of each kind is 32.