Color - Light - Music

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ABSTRACT

This project investigates the correlations between sound, color, shape and space. In our work, we are building upon the color piano (Farblichtflügel) project under the direction of the pianist Natalia Sidler at the Hochschule für Musik und Theater Zurich [2]. Natalia Sidler and her team consisting of 19 members built a prototypical instrument to transform the generation of sound into colored and animated images. In this paper, we present a first visualization performance. Therefore, we adapted and expanded the Soundium software based on synaesthetic rules. The generation of color, light and shape results from a digital input via a MIDI interface and the software.

1. INTRODUCTION

Within a project together with the university of Music and Theater, we are developing a visualization software which makes the interconnection of sound and image according to synaesthetic rules possible. As a first prototype installation we adapted and expanded the software Soundium [1] and use a synthesizer. The generation of color, light and shape results from a digital input via MIDI interface and a software program. The different instruments combined in the color piano are simulated with the syntheziser.

2. FARBLICHTMUSIK AND COLOR PIANO (FARBLICHTFLÜGEL)

The relationship of sound, tone and interval to color and color value between color pitch and tone color are investigated and picked out as a central theme since the ancient world. Philosophers, poets, painters, natural scientists as well as musicians have dealt with it. On the one hand, there have been attempts to describe and systematize these relationships scientifically. On the other hand, artworks and concepts such as the all-embracing art form where the vision of a synopsis and cross elucidation of various arts are manifested. Famous artists like György Ligeti, Oliver Messiean oder Wassily Kandinky (*Der gelbe Klang*, 1912 and especially *Violett*, 1924) center this kind of thinking in their artistic producing. Already in the Middle Ages Kircher and I. Newton investigated the idea of a harmony of colors ("Tone is not fixable. Therefore, one has to make the colors movable." - L.B. Castels). The color piano by A. N. Skrjabin used in the /Prométhée op. 60/ from 1908 to 1910 caused the most sensation.

Figure 1: General view of the color piano developed at the Hochschule für Musik Zurich. Photo by Dennis Savini, Zurich.

Under the direction of Natalia Sidler, the color piano (Farblichtflügel) was designed and produced specially for the color-light-sound realization (see Figure 1). This prototype makes it possible to combine sound and picture according to synaesthetic rules [3]. This novel instrument enables accessibility of individual synaesthetical cognitions to a broad public using performance practices. Therefore, color piano clarifies the relationship between sound, shape and space. This instrument was first used in 1999 in the stage composition *Violett* by Wassily Kandinsky in Berlin. Further performances followed in Zurich.

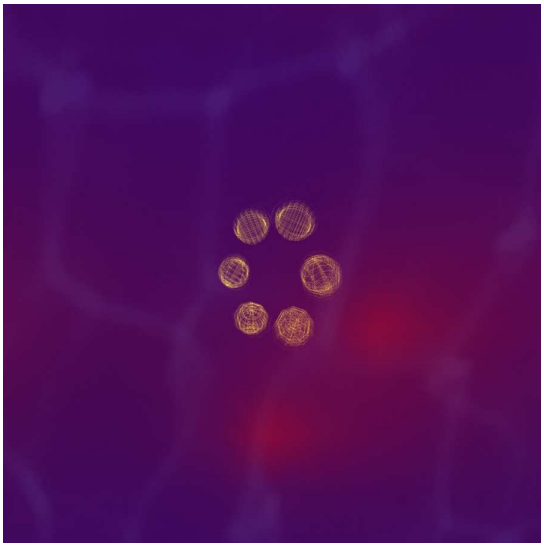

Figure 2: Image created while playing with the cymbal effect.

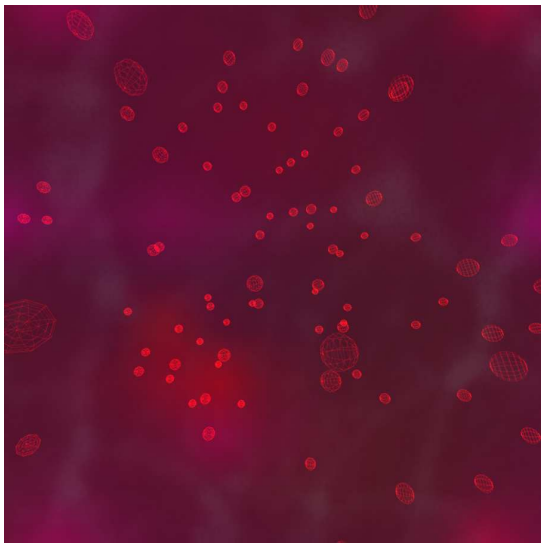

Figure 3: The density of the red balls increases when the sinus wave instrument is used.

3. SOFTWARE

As the basis of the prototype developed in this project serve the applications Decklight and Soundium [4]. These tools are designed for interactive live media art performance.

3.1 Decklight and Soundium

Whilst Decklight provides a real-time multimedia processing engine including audio control, MIDI control and OpenGL rendering, Soundium serves for interactively designing and compositing a scene graph out of objects (so-called bouncelets) provided by the engine. In this project, we extend the engine with new bouncelets desired by the synaesthetic rules.

3.2 Setup

An instrument, in our case a synthesizer, is used as the input device for the image creation. It is connected via the MIDI port to a computer running Linux, Decklight and Soundium. The sound is generated by the synthesizer itself, independent of the computer. The MIDI signals are interpreted with Decklight to create the image.

3.3 Design Details

The mapping of the keys on the synthesizer has been adapted to match the Farblichtflügel. Different keys are associated with different instruments. In addition, the black keys are transposed to map to a chromatic scale. The MIDI signals are interpreted in multiple ways. Each key defines a background color and the type and color of a foreground object. Visual effects specialized to the different instruments are shown. The background is realized with a regular grid. The tone pitch defines the hue, and the velocity the value, of a new color. A source with this new color is placed at a random position on the grid as long as the key is pressed. Special effects like advection, diffusion and fade-out on the discrete grid animate the background. The advection is simulated with the Semi-Lagrange method on a static velocity field on the grid. The two-dimensional diffusion effect is reduced in the vertical axis to create more harmonic images and to allow the performing artist to display different colors that do not mix rapidly. For each key, an instrument is defined. The type of instrument determines the foreground object and additional effects. Pressing a key starts showing the animated object. The color of the object is chosen close to the complementary color of the current background. Using the velocity, effects as the size or the color intensity are modeled. Playing a cymbal, for example, creates a wave-like pattern on the background and makes all foreground objects jitter (see Figure 2). When the black keys are pressed, floating red balls of changing size appear as shown in Figure 3. Soundium allows to manipulate the bouncelet composition during a live performance. Parameters like the advection speed or a diffusion factor can be adapted quickly.

4. CONCLUSIONS

Already this first prototype installation demonstrates that we have to think about new visualization approaches. Regarding the possibilities of integrating effective multi-media inputs and outputs as well as growing computer power and powerful graphics cards, more research has to be done in investigating adequate staging form. Therefore, it is necessary to develop novel algorithms which are able to create a color space taking synaesthetic cognitions into account. The focus thereby is in enabling a color space which allows the audience to immerse herself into an emotional experience considering sound as well as images.

5. REFERENCES

[1] *http://www.corebounce.org/.*

[2] *http://www.hmt.edu/.*

[3] J. Jewanski and N. Sidler. *Farbe - Licht - Musik*. Peter Lang, 2006.

[4] S. Schubiger and S. Müller. Soundium2: An interactive multimedia playground. In *Proceedings of the 2003 International Computer Music Conference*. International Computer Music Association, 2003.