Reflections on the Use of Musical Software in Compositional Processes for Light Art

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Abstract. Music and the visual arts are both temporal and spatial arts. My artistic research focuses on the use of light as a medium and in this respect my interests are both spatial and temporal and revolve around phenomenological questions related to the perception of volume and space, but also to the problems of how temporal sequences may be arranged and written into a score. After a short presentation of my artistic production and of my theoretical (and phenomenological) interests, I will try to explain and show how and why musical software is better designed for my light installations, especially because they presuppose the activity of autonomous composition in time.

Keywords: Light installation, Light Art, software, composition, Music, visual arts, phenomenology, perception, space, time, body, score, notation.

1 Introduction

First, let me say that I am neither a musician nor a composer. My contribution will be that of a visual artist and a researcher in the visual arts. I will briefly present my visual productions in order to set the frame of my reflections. This will allow me to show how my reflection and my visual experimentation derived from traditional pictorial questions—such as simultaneous color contrasts—but also from a phenomenological approach focussed on the production of visual phenomena and on the global question of perception, which, as far as my visual productions are concerned, is not limited to visual perception. Indeed, the environments I make, with or without natural light, seemlessly push the beholders to fell space and time and to become aware of their perception, of how their body acts and reacts as it experiences the environment. My research is about how to enhance perception awareness.

This talk will also be about the specificities of light as artistic medium. I will try to describe the problems and the questions raised by the use of its specific technological tools. In particular, I will show how and why technological tools developed for musicians may allow me to attempt to compose and write light scores, although this still is the source of many interrogations for me.

2 A Visual Form for a Spatial and Temporal Experience

Recent artistic productions and experiments show that the temporal dimension is not exclusively musical and that the spatial dimension is not limited to the visual arts. Music and the visual arts are both temporal and spatial.

My visual research is fundamentally temporal and spatial. I build three-dimensional objects designed to enhance our perception of light and color and whose perception is modified by a light score. When I come to think of it, I believe I have never produced a work that was not designed to be experienced in time. The reason for this is that what interests me is change and the phenomenon—as appearance and disappearance—whence my interest in programming tools. This is also the reason why I find many converging points of interest with the vocabulary, the methods, the concepts and the tools used in the musical field—especially since the second half of the XXth century.

To make things clear I will need to describe how time and the phenomenon are related to my artistic practice of light and color-light. I will describe a few light installations I made in the past ten years. The pictures and short films I will present are excerpts of site-specific light installations in which the spatial and temporal dimensions are essential and intertwined in producing a complex aesthetic experience. Needless to say that these images should be seen as utterly imperfect representations of phenomena created for the human eye and not for cameras…

2.1 Moving Light

First, here are two site-specific installations made for the Moving Light exhibition in 2008. Untitled 1 & 2 lasted (Fig. 1, Fig. 2) approximately 20 minutes each. The light score was set in a loop with no perceptible beginning and end. The exhibition was open all day long, and visitors could come in, walk around and go out of this immersive environment at any time.

The two 100 square meter rooms had one massive central pillar which was the main element I had to take into account. I used it to stress the spatial dimension of the installation, but also to focus on the beholder as a moving subject. This led me to focus on the formal, sculptural or scenographic organization of space, but also on the temporal dimension of perception—which in this case is not only visual, but also tactile, bodily and auditory. For instance, in U1 the beholder could never see the three apertures at the same time. The installation was made so that it was necessary to walk around to get a notion of the whole. The constraint of the pillar had been transformed into the incentive to move around, although the visitors were not aware of this. There is something very phenomenological in this insistence on perception as action which reminds me of the Japanese zen garden in the Ryoanji Temple where the fifteen stones can never all be seen at once, there being always one that remains hidden, whatever one's viewpoint on the garden.

Fig. 1. Charlotte Beaufort, *Untitled 1*, 2008, (Fish-eye lens view)

Fig. 2. Charlotte Beaufort, *Untitled 2*, 2008 (partial view)

Concerning this installation, I wish to stress two things : firstly, there was no music ; secondly, the 20-minute light score was very slow. I will later explain why most of my light scores can be described as odes to slowness—although they are not without effects of rupture and rhythm. Actually, here again a technical constraint became a central aesthetic object and I transformed the constraint into an object for research. Let me also briefly note here that I deliberately chose not to introduce music in my light scores for reasons I will evoke later.

In brief, U1 and U2 proposed an aesthetic experience based on three elements : slowness, ambient sound, perambulation. The square rooms in this old slaughterhouse turned into an art center had thick sound-proof walls with clear acoustics. The visitors entered the room through an entry light-lock. In U1 the visitors entered a dark, silent space barely animated by the slow evolution of the light score thus calling for more intense attention to light and ambient sounds and forcing visitors to hush or whisper as they walked around the central pillar to experience the full scope of the installation. A friend of mine who is a musician and a musicologist told me how she realized that the extreme slowness of the light score led her to unconsciously slow down her own moves around the room and significantly altered her whole perception, thus showing that indeed the aesthetic and perceptual conditions of the installation (its immersive quality, a clear acoustics, no music, extreme slowness of the light score) were able to make the beholder think about and reflect upon the aesthetic conditions of his perception and to create an atmosphere for a more focused attention to the environment.

I would like now to explain why the absence of music in most of my installations was a deliberate choice. There is this idea that one of the senses always supersedes the others and that my medium is light and not sound. The absence of music avoids an excess of information to the senses that would lead to the beholder becoming more passive in his experience. My idea was to allow and even push the beholder to be perceptually active. In this respect, I find it very significant that someone who saw my soundless installations in 2008, after she experienced the light and musical score of *Eos* in 2016, mentioned that she had always remembered the *Moving Light* installations as being accompanied by music.

2.2 Diaphanies

The second example I wish to mention here is a series called Diaphanies (Fig. 3, Fig. 4), which etymologically evokes what appears through something else. The Diaphanies are based on the interaction of preprogrammed light and the unpredictable changes of daylight in order to multiply the instances and interplays of appearing-disappearing phenomena—thus continuously producing the ongoing phenomenon that is the work proper.

Fig. 3. Charlotte Beaufort, *Diaphanies* Series, 2012

Fig. 4. Charlotte Beaufort, *Diaphanies* Series, 2012

I will single out two characteristics of this series : The first one is that here again there is no music, but that the work uses two types of light (one is artificial and programmed, the other natural and random) so that one could describe it as a mixed lightscore—much as one would speak of mixed music. Although I had not then thought of the musical experimentations with randomness, it seems to me now that this convergence with mixed music and John Cage's experiments with randomness tends to show that there is indeed something in common between musical experimentation and my own experiments with light as a medium.

The second point I wish to make concerns the motifs in the Diaphanies. Their being figurative or not, or uncertain, is not the point. They only point to an interrogation about what Cage has stated as « Life without a structure is not visible ». In a similar way, such horizon or formal choice, such lightscore serves as a leverage point or structure to make better visible our relation to the world, to life, to extension and duration.

2.3 Light and Music Scores : Eos (2016), Leucosia (2016) Sirius (2017)

I wish now to describe a next field of research I began to explore in 2016 based on the combination of light scores with electroacoustic music specifically composed by Mark Lockett. Mark and I have thus produced three light and musical scores in 2016 and 2017 : Eos, Leucosia and Sirius. These works are plastically based on an initially musicless series of mine called Photospheres (Fig. 5) which I started in 2015.

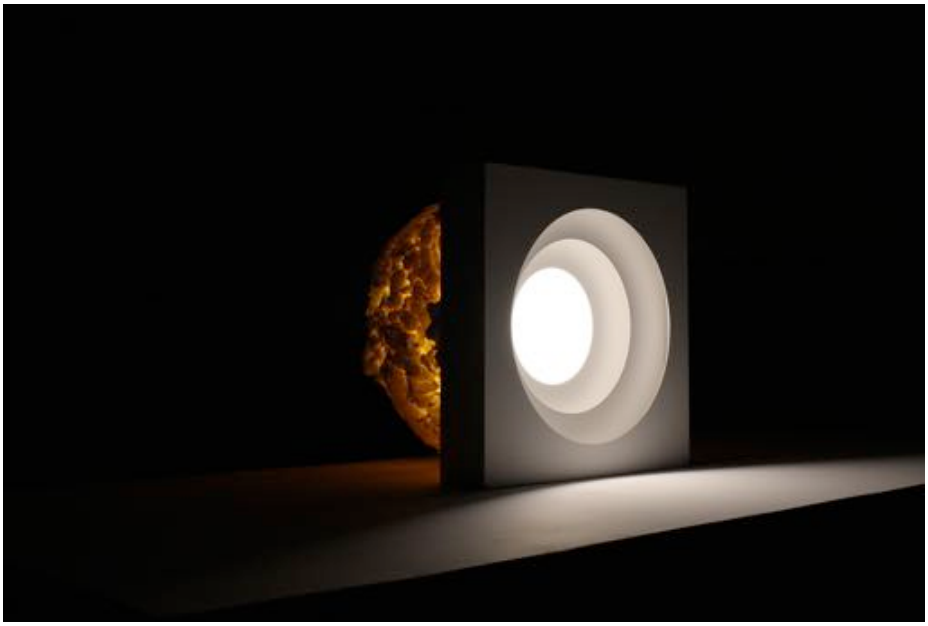

Fig. 5. Charlotte Beaufort, *Photospheres* Series, 2015

The Photospheres are approximately 1 meter by 1 meter by 1 meter. They are composed of three (or more) panels with perfectly circular apertures of varying sizes perceived as so many concentric rings, and of a translucent hemisphere in the back with a contrasting irregular surface. The composition is both spatial and temporal. The formal choice of the circular shape and of the rings' width and proportions make up the structure—it is specific to each photosphere. Each of these pieces has a looped light score of approximately 10 minutes which combines various effects—color combinations, varying intensities, simultaneous contrasts, rhythmic effects, etc.—which may form a narrative sequence and are meant to create sensorial and emotional intensity.

In 2016 and 2017, I created two new works, EOS and SIRIUS. Apart from the hemisphere which I gave up, they are similar to the photospheres but much larger (2.50m x 2.50m) and deeper (1m and 3m) for a more powerful phenomenological impact. One has seven rings, the other has ten.

Based on these installations, Mark Lockett and I created three light and electroacoustic scores—*Eos* (2016 - 16'24), *Leucosia* (2016 - 17'50), *Sirius* (2017 – 14'57) (Fig. 6, Fig. 7) based on a common reflection on the combination of different sensorial experiences, in order to produce three coherent polysensorial works.

I would like now to deal with the specificity of light as a medium and a few questions about light composition which were raised in the course of my collaboration with Mark.

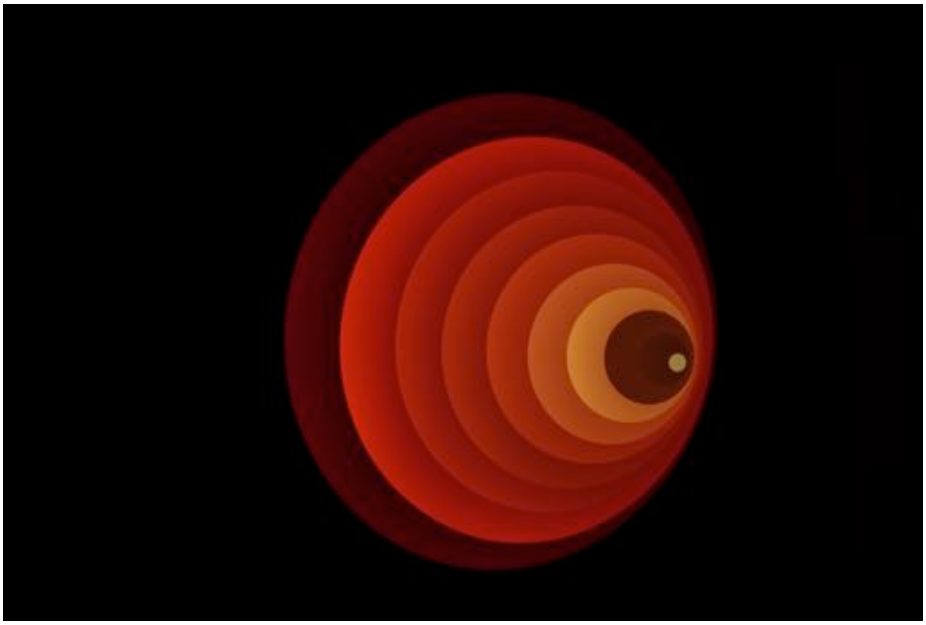

Fig. 6. Charlotte Beaufort, *Sirius* (14'57), *Photospheres* Series, 2017. Music Mark Lockett

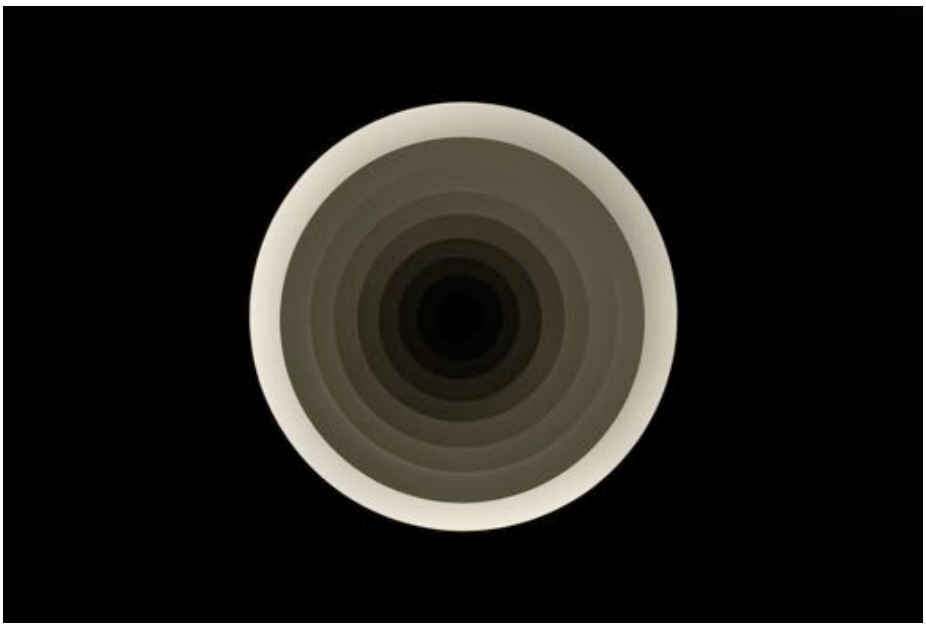

Fig. 7. Charlotte Beaufort, *Sirius* (14'57), *Photospheres* Series, 2017. Music Mark Lockett

3 Reflections of the Writing and Composition of Light Scores

My conception of light as a plastic medium which must be considered as a phenomenon in space and time no doubt comes from my past experience as a light designer. Light, color and change are the fundamental elements of my artistic research, along with form—which is a receptacle, a structure and an instrument—, content and temporal evolution.

Form is important because it is very much linked to content. Content, as I understand it, is not a figurative image but results from the arrangement of form, color and evolution.

An important specificity of my work is that it is not made of a videoprojected image. I work with the omnidirectional emission of light, I try to fashion it in three dimensions, to give it a bodily presence, what I call *voluminosity*. Another specificity, which is yet barely developed in the visual arts, is my focus on writing a score for a work that unfolds in time. An important point for me is how my work may create the conditions for a temporal aesthetic experience that foregrounds our relationship to space and time and how the inhabit the world.

As far as I can tell, there are four ways of composing a work of light art as I understand it :

- the first one, inspired by painting, consists in creating « chromatic objects » through the arrangement of colors ;
- The second one, inspired by music, puts the stress on syntax, temporal and rhythmic organization ;
- The third one relies on the integration of randomness : this was the case in the Diaphanies that involved different « instruments » : the artificial light played its own pre-written, pre-programmed line, while the second instrument, the natural light, kept changing in intensity, color and rhythm in a totally unpredictable way, thus making the interaction between both lights unpredictible.
- The fourth way, which I have yet never wished to adopt, consists in using computer technology in order to compose pieces based on mathematical, algorithmic or geometric formulas, or else by relying on databases. Once the parameters have been selected the composition is an automatic self-making process.

These four methods may be used individually or in combination. In my case, they are closely linked to the software I use. I began to address these questions about composition when I quit the performing arts to become an autonomous visual artist using light as a medium. My work was not collective anymore, I was not determined by the conceptions of a stage director, nor constrained by a text or by predetermined scenographic choices, and the question of writing became central. I had to give up some of my professional techniques and habits and I then realized how much the tools we use determine and often limit our compositional work.

Paradoxically, when I began to collaborate with Mark Lockett I had once more to deal with the parameters of the performing arts. Mark seemed to think of our collaboration in terms of the performing arts. He was excited by the idea of playing his music live and of improvizing with my light compositions. Nothing could have been more catastrophic in my eyes… ! We then had to discuss all sorts of questions about how the work should be presented, how long it should be, about its linear or looped structure, whether it should have a beginning and an end, narrative content and should it be open to interpretation.

All these questions led to fruitful exchanges. They were essential to me because I wanted the final piece, made of sound and music, to make one integrated work. It was capital, in my view, to reflect upon how we should write our two scores so that no medium would gain the upper hand over the other or become the illustration of the other.

These questions leads me now to my next point about compositional tools.

4 Reflections About Technological and Compositional Tools

During my research, I became interested in the question of simultaneous contrasts (especially in painting), of gradation (harmonization), and then in the question of how colors bleed into one another—in space or time. Indeed, I rapidly realized that these questions covered two distinct objects : what happens in a fixed arrangement of colors, and what happens as movement in the succession of colored states. The temporal arrangement of colors creating change or movement in time or duration led me to the notion of the interval and to develop a conception of the intervallary nature of color phenomena. This explains how my research interests, initially close to pictorial questions raised by the fixed image, also led me to questions usually associated with music.

Until now, the tools used to command and record the evolution of several light sources are lightdesign software used in the performing arts (theatre, dance, concerts). The digital protocol used for light is called DMX 512 (Digital Multiplexing), it is different from the MIDI protocol used for sound.

Despite their differences, all light softwares are based on the same principle. They all allow you to record a fixed light state as a cue. This cue is recorded under a number, but it is quite significantly referred to as either an « image » or a « tableau » (or picture). So that when I work on my photospheres, my work consists in creating a number of light states much like a painter composing his picture with a brush on a canvas. And indeed, I may choose to exhibit such a fixed light composition, for every single light state in my compositions has been carefully composed and recorded with precise aims in mind and could constitute a work in itself.

Once several such light states have been created, with the various values of each source determined from 0 to 100%, it is possible to create movement or change from one state to the other—cue 1 to cue 2—by ascribing a given time to the transfer. The simplest example would be when I choose how long it will take for a source to go from a 0% to a 100% intensity. Doing this in one second or ten minutes produces a very different effect. Things become very complex when dealing with dozens of multicolored sources on different planes which constantly and instantly interact and modify our experience of color.

Here are a few examples of the commands on one of these softwares (Fig. 8) :

- Here are my light sources represented by numbers
- I can choose an intensity from 0 to 100
- I then record a cue (as number 10, for example)
- This cue is automatically recorded in a sequential series
- I then record a second cue (number 11, for example)
- I then ascribe a time for ascent or descent
- I then hit « Go » to see what happens on stage

Fixed image 10 ⇔ Transfer - temporisation ⇔ Fixed image 11

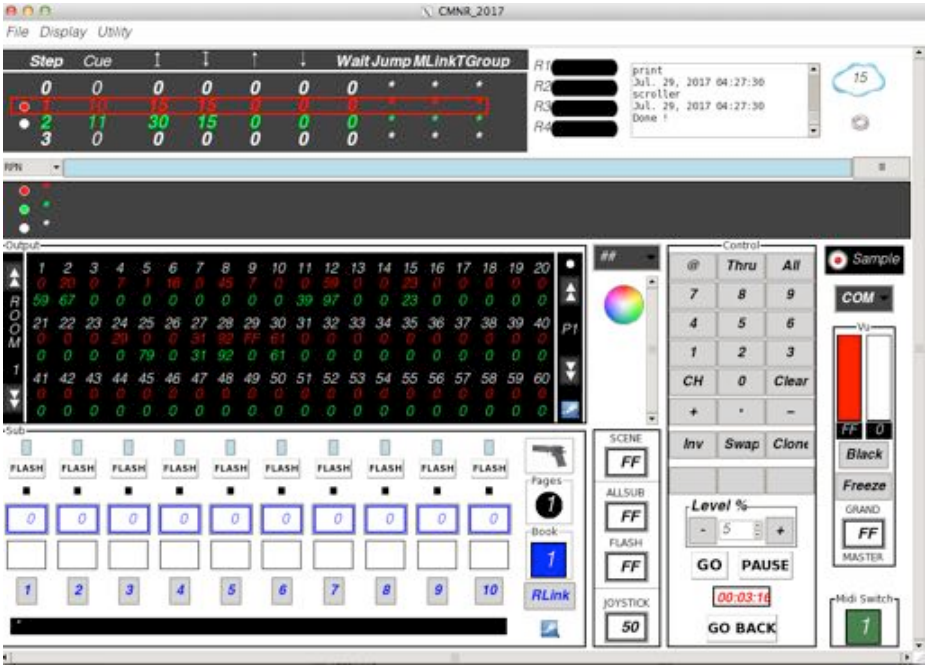

Fig. 8. Screen Capture, Dlight Software

The software I use is Dlight[1]. It's an open source software. One should note that all the vocabulary used on this kind of software comes from the theater.

This short presentation shows that this kind of software is conceived in order to compose fixed states or images and only as a secondary function allow to work on a temporal evolution of light. Some sophisticated software allow to command the moves of motorized projectors but this is totally different from my problems with the composition of light and color in time, because these softwares are not conceived for the purpose of composing in time. This is logical for generally the lighting of plays changes from one scene to the other—from one tableau to the other—or from one moment to another in order to follow what happens on stage. For in the theater, light does not lead, it does not show itself for itself, it contributes to a show whose goals are defined elsewhere. Lighting does sometimes evolve in a continuous move—but frenetically and with no discernible aesthetic plan, in rock or pop concerts.

[1] https://www.nicole-banana.com/

I want to stress that such a tool very rapidly becomes a severe limitation when one wishes to work with light in the temporal dimension—and light keeps changing in my installations, even when we may have the feeling that it has stopped.

Basically this kind of software is useful to compose luminous states, they can be relatively useful to work on the transfer between states and on the interval, but they are very burdensome if one wishes to focus on rhythm or the temporal structure of a piece.

Among the limitations, I would note :

- A very linear form of writing
- The necessity to compose successive states which forbids to think of composing otherwise
- A very abstract and unintuitive interface. Each light source must be programmed individually and is represented by a number.
- Writing thus becomes time-consuming (and leaves no room for improvisation, as one would do with a musical instrument—for my installations are like so many light instruments, after all)
- The software limits creativity. For instance, there is no copy/paste function.

Apart from that, the absence of a timeline and composing with a succession of fixed images also pose problems :

- when working on a collaborative piece, I need to play the whole piece in order to check that light and sound are still synchronized ;
- I would need to have a common timeline for light and sound

The problem is that light-designing software was not able to benefit from the research that was made in the musical field under the impulse of John Cage in the 50s or with the strong institutional support of Pierre Boulez and the IRCAM in France since the 70s. Lighting software remains limited to the performing arts and does not allow to rethink light art from a more global perspective—and the most sophisticated tools on the market are meant for strictly professional use and are far too expensive for individual researchers and artists.

This is the reason why to this day I developed my compositions within the limits of the software's constraints, trying to overcome these constraints or to transform them into objects of research—which revealed itself to be stimulating. Since I could not really work on the temporal or rhythmic structure, I focused on the questions of flux and slowness, composing complex chromatic evolutions through the succession of tableaux, and thus concentrating on the intervallary nature of color and the stretching of temporal experience. I sometimes use rhythmic effects to compose dynamic moments of rupture or combined after-image effects to create absent colors. For indeed, chromatic compositions and temporal evolutions are composed to produce in duration the appearance-disappearance of phenomena, and to provide sensorial, emotional and physical experiences. To a large extent these compositions may be

described as odes to slowness[2]. This mode of composition may remind us of spectral music, and the concepts of spectromorphology developed by Denis Smalley may be relevant to what I do as a light artist.

As I struggled with my light designing software, I tried to find new better-adapted tools. I thought of checking the tools developed by musicians hoping to adapt them to my technical and compositional needs.

In 2014, I tried MAX software. MAX could allow me to develop my own software and to create non-linear evolutions but it was not well suited to my compositional needs. I felt I could not control many parameters and that the compositional means were too often based on loops, randomness and self-writing processes. Moreover, my command of MAX—which, I must admit, is very limited—was insufficient for many of my purposes : for instance, create a timeline, composing a fixed image, creating a more intuitive graphic interface. The tool's complexity kept me away from a more free creative process. I found MAX could be essentially used as an ancillary interface between softwares and could serve my purposes to integrate a composed page or a patch within a composition.

This year, I was able to use new composition software.

Iannix[3] is an open source graphic sequencer for the digital arts and specifically adapted to music and to musical spatialization (Fig. 9). As its name indicates, it was inspired by Iannis Xenakis and the UPIC, an electronic instrument he created in 1977 in order to compose music graphically by drawing on an architect's drawing table, after he was inspired in the 50s by his architectural collaboration with Le Corbusier. The main goal was to reach a form of compositional immediacy. Iannix software, which has been developed since the early 2000s by Thierry Coduys and Guillaume Jacquemin, aims to develop non-linear writing beyond the western linear left-to-right reading model. It also questions the one-slider model and favors polytemporality, and it allows to compose graphically (in two or three dimensions), to have a dynamic score that can be modified in real time.

Although it was not meant to control light, Iannix opens experimental possibilities for me. I can use it to compose light scores with a graphic interface, from a different perspective and with non-linear writing processes. However, like MAX, Iannix does not do fixed images and has no general timeline, which for me is a severe limitation.

[2] *Cf*. Beaufort, Charlotte. « Color in the Interval », *JAIC – Journal of the International Colour Association*, Volume 17 (2017). Special Issue: « Colour and Light ». http://www.aic-color.org/journal/current.htm

[3] https://www.iannix.org/fr/

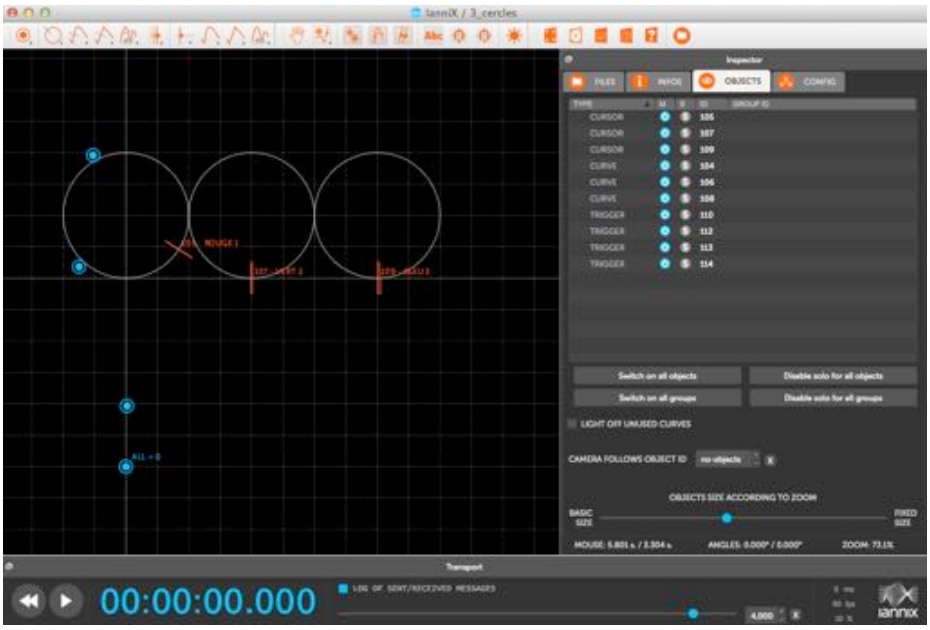

Fig. 9. Screen Capture, IanniX Software

The second software I experimented this year is a kind of hybrid called Vezér[4] (Fig. 10). It allows to create compositions that integrate MIDI, OSC, DMX or Audio tracks based on a common timeline. Vezér is the first software that allows me to have a timeline that may be shared with the sound timeline. When I compose a light score in collaboration with Mark Lockett, this allows me to perfectly synchronize light and sound but also to work precisely with the information of the soundtrack. However, like MAX and Iannix, Vezér does not do fixed images and this considerably modifies the approach to composition—and its outcome.

[4] https://imimot.com/vezer/

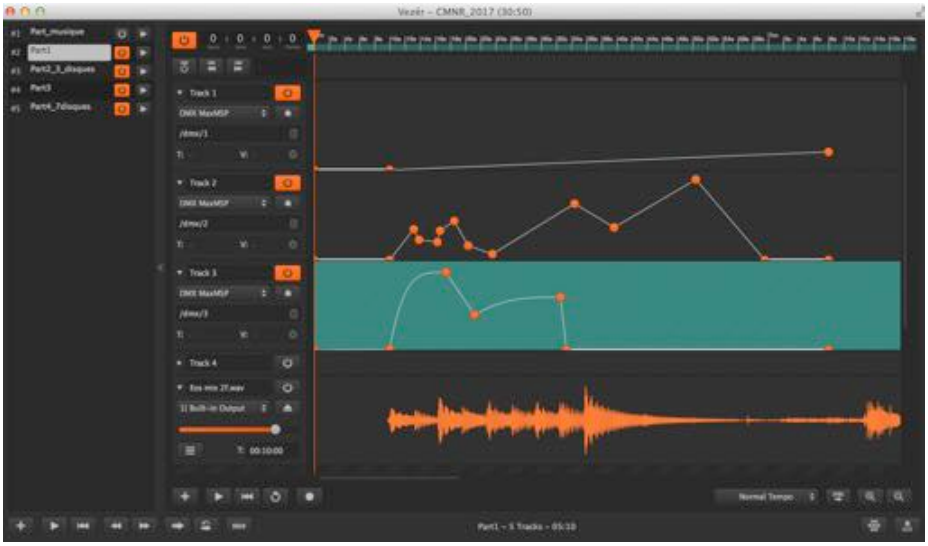

Fig. 10. Screen Capture, Vezér Software

5 Conclusion

To conclude, I would say that if software developed for—or derived from—musical purposes allow me, as a light artist, to better approach the temporal dimension of compositional work, they still raise major structural problems concerning the composition of light scores. From the moment the compositional structure is not based on a succession of fixed images anymore, it must rely on a rhythmic and temporal structure. But what is the nature of these rhythmic and temporal elements ? Are they random or accidental ? Can they be codified ? Do they correspond to a model ?

These questions raised by my experimentation with various softwares seem to indicate that my research as a visual artist confronts two radically different compositional methods : one is pictorial and the other is musical. If the software I used allowed me to measure how different these compositional methods are, the question raised now for me, is perhaps not whether I can find or create the magical software that would allow me to compose both statically and temporally, but whether it is merely thinkable to do so…