PULSAR KITE

a study case for Sonic Ludic Interaction

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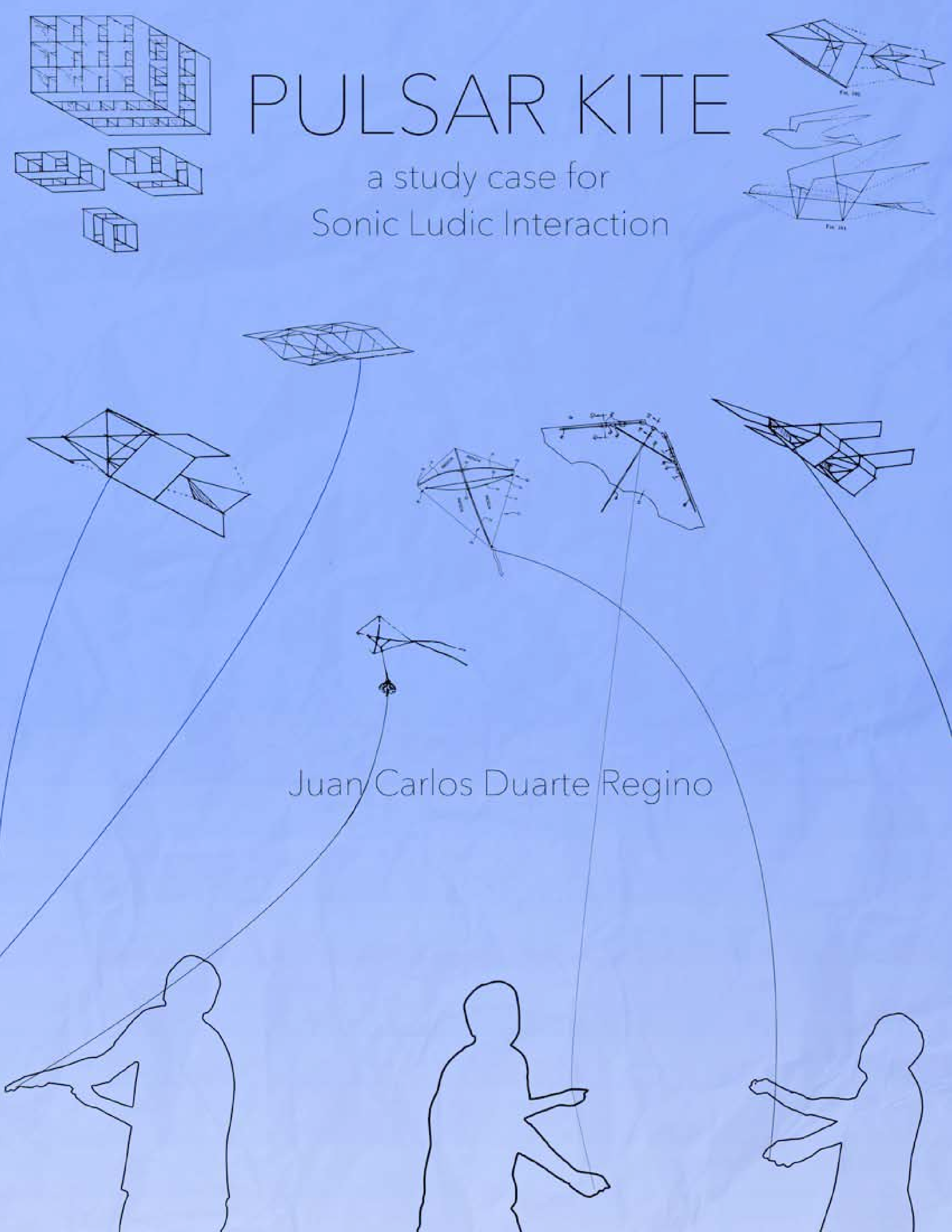

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To my dear family in México.

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Introduction

In the recent decades, the field of designing interactive interfaces for sound has been benefited by technology developments on ubiquitous and portable computing systems, which enable to augment music expressions through the use of electronics and software to engage intuitively with a playful recreation. Although many efforts have been placed on creating completely new interfaces for sound expression, it is yet briefly explored the potential of merging new technologies with previously existing playful objects with a traditional background. Moreover, the new sound and music interfaces hardly challenge the paradigm of performances in a staged scenario, which implies a fixed setup. Whereas a portable setup can improve site specific projects and allow sound art to blend with a playful and nomadic practice.

Pulsar Kite is an ongoing project that proposes to create a sonic interface based on the interaction of flying a kite. The design explores an existing artifact widely used for amusement, and playfulness of it's players. Considering a longstanding tradition of kites across different countries and cultures, Pulsar Kite aims to extrapolate an overall experience of kite flying with the design of an Auditory Display[1]: Then it can also be used as a sound interface shaped around qualities found in the frame of New Digital Musical Interfaces. The importance of designing a sonic instrument based on a kite is relevant for contributing the design of ubiquitous computing interfaces and sonically augmented interfaces, to be explored into media art and sound composition practices.

The present thesis's research question is: How to design Sonic and Ludic Interaction from a kite. To answer this question it is proposed to review two procedures: first by studying methods from sound interaction design, and sonification, and secondly through studying principles of ludic practices and examples of art works centered on using playful themes and interfaces to produce art work. Consequently, by understanding both sonic and ludic components that form Pulsar Kite, it is described the production process carried so far in Pulsar Kite. This approach can be described as an artwork production that develops around the analysis from experiences collected, also known as Practice led research.The experiences collected in the field range activities realized between 2012 and 2015. This way, Pulsar Kite has been showcased in a series of art residencies, performances, recordings, workshops and lectures. The review of these study cases elaborates on decisions taken during the design process and reflects on the artistic results.

The sound framework works around the sonic interaction obtained from the kite, and is composed of an interdisciplinary scope found in between Sonic Interaction Design (SID) and Sonification[2], which is applicable in the context of Human to Computer Interaction (HCI) for Interfaces aimed for sound control. Since Pulsar Kite's interface uses information to produce a sonic outcome, it might to support interaction of users with kites. This affordance should be based on designing of a gestural recognition system and a customizable sound engine. Moreover this chapter indicates potential similarities between a sonic kite and a digital musical instrument.

The Ludic component of Pulsar Kite is introduced by reviewing concepts related to the playful activities coming from game theory, this aims to frame affordances owned by the kite as a game for one or many users. In addition it is presented a list of artworks in sound art that use playful interfaces, these works hints on sources from

1 An Auditory Display comprehends any system for human to machine interaction system to obtain sound in response to data. Including the setup, technical solutions for gathering, processing and computing methods.

2 Sonification is reviewed on the chapter two.

where Pulsar Kite concept emerged.

The production of Pulsar Kite focuses on a series of Artist In Residencies[3] (A-I-R), where Pulsar Kite was hosted. These residencies made possible the experiments and development of the project within a framework of sound art and media technology. Each residency proposed different goals that worked on improving the overall experience and usability of the project. What is more, the intention was to get involved with other participants[4] that were interested on learning about sound technology: from this experience, it seemed suitable to receive input from outside participants to widen its social experience.

Pulsar Kite suggests a future stage of development that features social enhancement: it is a long term goal to develop a workshop where participants get involved in the process of building and flying their own sonic kite. However, there is a number of challenges to consider prior the design this workshop[5]. As a result, by the end of the thesis it is proposed a number of considerations to raise this workshop on sonic kites, which comes from my own experience on arranging workshops on media art technology.

In summary, the organization of the present thesis is arranged in the following manner.

- The first chapter works around the question how to design the Sonic Interaction for Pulsar Kite, by defining methods for capturing data, transforming data into interaction models, and synthesis techniques applicable in the context of the kite flying game.
- The second chapter deals with the Ludic Interaction concepts: categories of playfulness, participatory performance, generative design practices , and gestural control scenarios.
- The third chapter presents a study of sound artworks related to ludic interfaces that use wind force.
- The experience of concept development and implementation is described anecdotally on the fourth chapter: this description aims to facilitate the analysis of problems and opportunities found in the design process.

Before proceeding to read the next chapter, it is advised to look first at the video of documentation included in the DVD annexed on this thesis. This video demonstrates the overall experience of Pulsar Kite, and it is also available online: https://vimeo.com/47652219.

3 A-I-R programs are arranged by cultural or art organizations for all sorts of creative people to have time and space away from usual working environments, to research, collaborate, produce and make public new art work targeted for local communities in the residency environment.

4 Desirably, the participant profile is aimed for “do it your self” makers, interested in sound electronics. Also sound composers and multidisciplinary artists.

5 In a broad sense, the workshops participants would be introduced to develop a project on interactive sonification with open source tools, within the topic of sonic kite making,

Chapter 1.
Sound Framework

1.1 Overview of the methodology

In this chapter is presented a sound related framework that supports the design for sonic interaction suggested with Pulsar Kite. Sound is the main channel for conveying emotions and information. The implementation of a sound interactive system suggests a design and engineering approach aimed to support user's experience in a meaningful relation of a sound manipulation inserted on a given environment. The methods approached here combines Sonification and Sonic Interaction Design, these two fields are employed to deal with the practical side of implementation, but also provide hints related to musical instrument design.

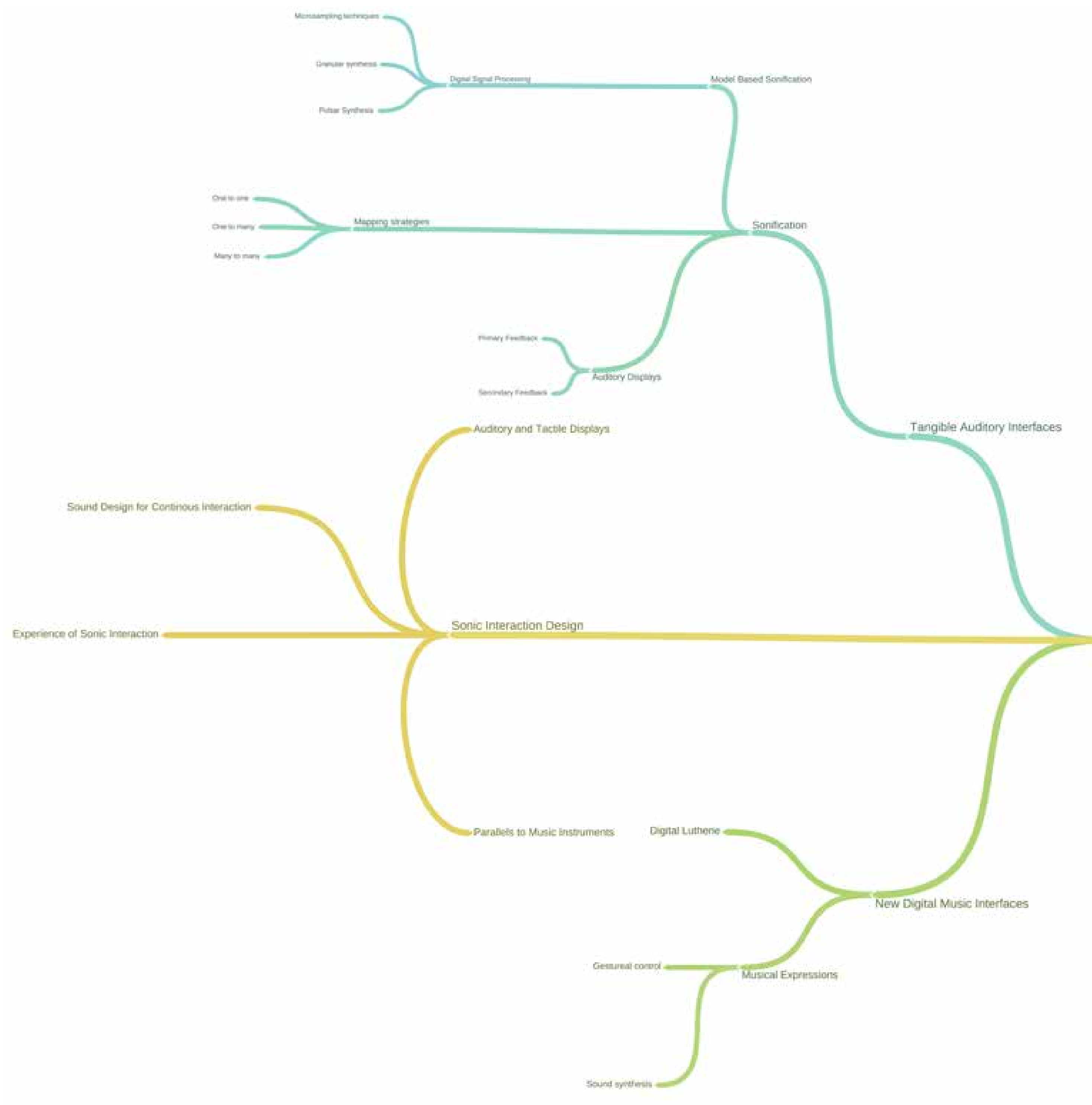
The musical instrument affordances reviewed here provide insights on what could be a later stage of development of Pulsar Kite, as gestural control and feature extraction from motion sensing. Finally, a sound synthesis method known as granular synthesis is reviewed, while avoiding technical overload, the interest of using such technique in sound synthesis offers a potential to integrate with soundscapes captured from the environment, to be used as a sonic material for realtime interaction.

1.2 Interactive Sonification

Thomas Hermann (2011) defines Sonification as a series of methods to convey information through sound. A background experience from the pioneering work of north american psycho-acoustician Sheridan Dauster Speeth (1958-1963), consisted on developing auditory methods applicable for seismology analysis. Speeth's experimental approach to seismology, and later on applied also to study nuclear tests, transposed seismograms into the audible range for interpretation by cellists, who were chosen for their training and trustworthiness in judging auditory data. This rendering of evidence became audible rather than visible form as part of a more general examination of the use of sound and listening as tools of scientific study. (Volmar, 2013).

The potential of Sonification, within the present circumstances of technology, aims for future interfaces which are designed in balance of using available modalities to make sense out of data. The design of better Human to Computer Interfaces is central to achieve a better use of informational systems to support human activities. (Hermann, 2011).

In regard of using sonification techniques on Pulsar Kite, the information obtained from motion analysis leads to convey the use as a musical or sound instrument performance. Although sonification applied into this type of tangible interfaces can be supportive to other type of activities such as sports and augmented games. The support of sonification techniques aims to underline a semantic layer between data and sound design. This means that sonification approach can benefit the sonic interaction for a kite to highlight events and transformations during the performance. In accordance, these methods and techniques are suitable to deal with arbitrary amounts of data, mapping and dynamic modeling. This can open the opportunity of using them in multiple scenarios where sound plays the role of making sense out of data assets. From here, the node concepts of Sonification are presented and exemplified based on ideas that are implemented in the design of Pulsar Kite.



Microsampling techniques
Granular synthesis
Pulsar Synthesis
Digital Signal Processing
Model Based Sonification
One to one
One to many
Many to many
Mapping strategies
Sonification
Primary Feedback
Secondary Feedback
Auditory Displays
Tangible Auditory Interfaces
Auditory and Tactile Displays
Sound Design for Continous Interaction
Experience of Sonic Interaction
Sonic Interaction Design
Parallels to Music Instruments
Digital Luthene
New Digital Music Interfaces
Gestureal control
Musical Expressions
Sound synthesis

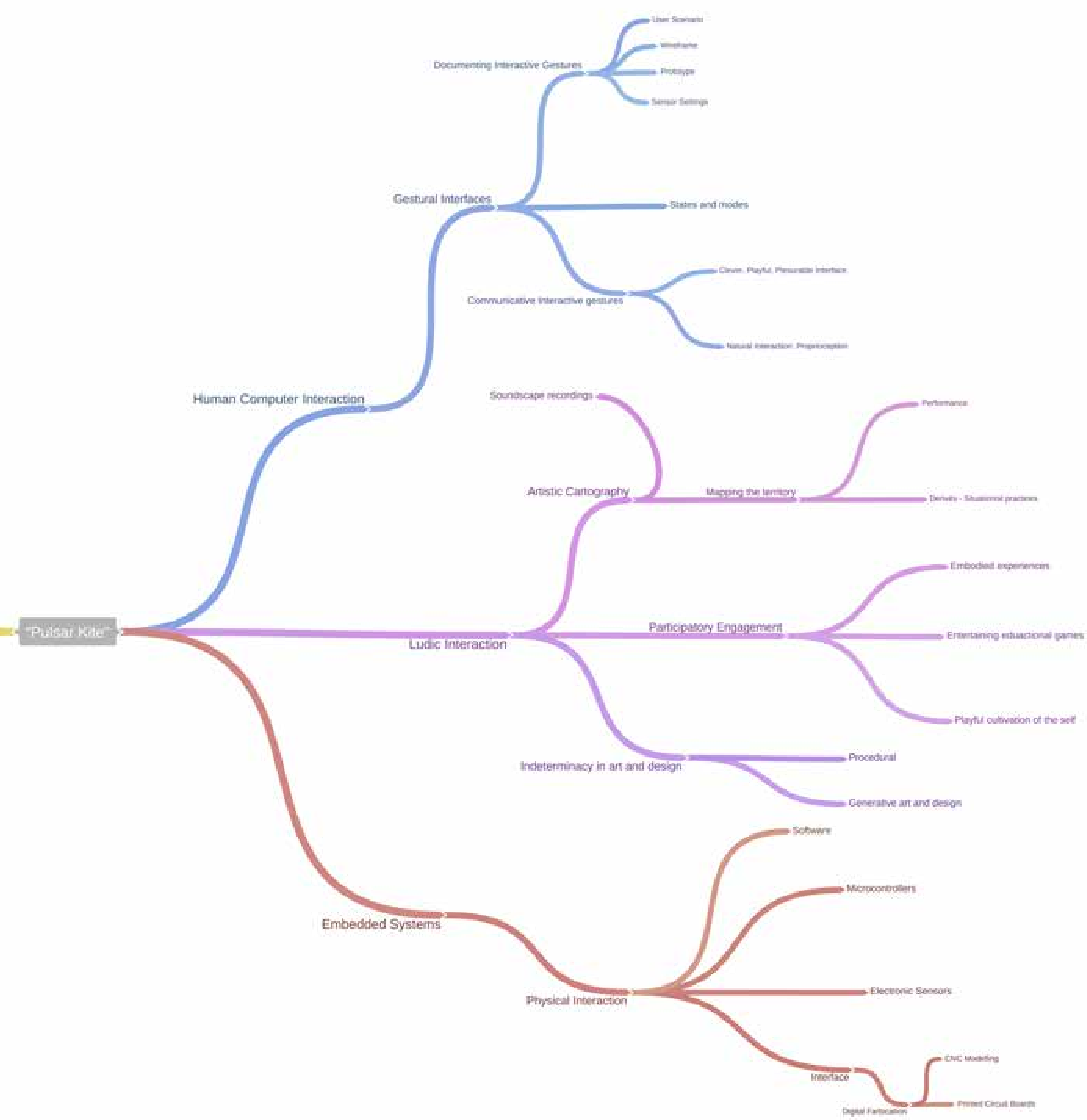


Fig. 1.1 Diagram of the overall Framework comprised in Pulsar Kite

Hermann, Hunt, and Neuhoff (2011) indicate three main sonification techniques:

- Earcons – used for discreet messages, not meant for continuous streams of information.
- Parameter Mapping Sonification – a mapped[6] relation between acoustic events and range of data
- Model Based Sonification[7] – the data is turned into a dynamic model or process which turns into sound. Depending on user's interaction on data structures a certain acoustic feedback is obtained

Sonification Technique	**Examples of application on Pulsar Kite**
Earcons	- Displays when system is ready to be used - Display when kite has reached enough height to be played - Announcement when battery will soon be empty - Switching between sound modules - Adjusting / customizing values to be mapped (pitch, granulation, volume) - Notifying user when a gesture is recognized
Parameter Mapping Sonification	- To provide a continuous sound stream in relation to motion data received. The mapping could be customized by user in order to reach a desirable range of sounds coming from interaction
Model Based Sonification	- This technique can bring a chance to merge different data streams provided from different sensors, in order to shape the sonic outcome within different parameters. - Also it can be the basis for designing a gesture based controller. - Excitatory interactions to this model cause acoustic responses, which convey information about structural aspects of data.

Hunt and Herman (2011) define the following aspects of interactive sonification.

a) Supposes a transformation of data relations into perceivable relations in an acoustic signal for the purposes of facilitating communication or interpretation.
b) It is a data dependent generation of sound, if the transformation is systematic, objective and reproducible.

Walker and Ness (2011) indicate the following Sonification Tasks Types, which are applicable for Pulsar Kite.

- monitoring : namely the ability to listen single parameters of interactions from data received.
- awareness of a process or situation: making understandable the relation between kite's motion and sound transformation, it also can be perceived while swapping in between synthesis presets.
- data exploration: after data is captured from the kite, this affordance might enable to offline review the process obtained during the kite performance.
- trend identification: this task enables user to identify an overall pattern of increases and decreases in quantitative data. Also can be supported by enabling or disabling streams of data affecting the sound.

6 A mapping is used to convey how much of the intended "message" is received by the listener, and how close the perceived information matches the intended message. (Bruce N. Walker and Michael A. Nees)

7 A Model based sonification assumes an structural process from data to sound, instead of a direct translation into sound (Hermann, et. al. 2011).

As a result, interactive sonification follows a scientific rigor where is relevant to define and clarify the following methods.

- data transformation technique in relation of data to acoustic representation
- algorithmic implementation
- interaction itself (user actions, modes and means of control, closed loop between user and system, ergonomics, fun, overall performance and experience)

Furthermore, Hunt and Hermann (2011) make an important distinction: as musical instruments primary function is to transform human gestures into sound for the purposes of expression, interactive sonification system transforms data into sound for the purpose of data analysis. However, by studying the design of musical instruments its possible to explore already tested models of interaction with sound. Then, the art of interactive sonification concerns the design of computer systems that enable human listeners to understand and interpret data by interacting with the data in a natural and effective manner.

1.2.1 Principles of human interaction. Proposed by Hunt and Hermann (2011)

- A control loop, refers to the affordance of providing immediate feedback from objects, while user is in control of being part or not of the interaction. If a control loop is successfully established between system and user, it brings a sense that the interaction object belongs to the real world. This way, users can rely on physical interaction to control the generation and or modulation of sound. In other words, a control loop in sonic interaction can be esteemed as a human diagnostic tool. This way, the sound obtained from interactive sonification makes most of the sense to the user who is in control of the control loop.

- A control intimacy is achieved depending on the quality of interaction: the extent of how interaction modifies the object, how well a human manages control and the time required to spend on learning how to control the object until the flow of usage becomes automatic[8]. In this sense, computer interfaces require an effort to produce interactions more natural and intuitive.

- In the case of digital musical instruments a trade off should be found between a less complex interface that becomes simple and easy to learn, and that enables as much interaction bandwidth as possible, to allow user to be in touch with complexity of the data or sonification technique. A balanced sonic interaction aims to distribute the attention on different components of a multimodal[9] stimulus depending on the task and other factors. The following guidelines can help to describe how additional elements are related to sonification. This could organize the role of components mixed as sensory signals.

8 This type of user's natural automation is also known as disembodied interaction. Mostly found in children and less in adult life.

9 Characterized by several different modes of activity or occurrence.

Multimodal Stimulus Components by Hermann and Hunt (2011)	In Pulsar Kite
What task or activity would be similar in character in real world task?	-Flying kites -Listening to music and playing music
How would your senses be used in this situation?	-The haptic and visual senses are used mainly to keep control on the flying dimension. -Hearing is used in a multimodal way perceive sound manipulation from interacting with the kite, also to perceive sounds from the environment being processed through the same interaction.
What can be learned from the use of sound in the sonification scenario to be designed?	-Relations between music and wind force, while being engaged with a game provided by the kite. -Balance between keeping kite stable or with different types of dynamics of motion. This also can derive in states of relaxation or activeness.

1.3 Sonic Interaction Design

Sonic Interaction Design (SID) brings together the expertise from diverse disciplines that work on and around sound to produce potentially future sonic experiences that emerge in various creative forms in everyday life. SID is a becoming activity that merges traditional spaces in-between tangible and immaterial, everyday sound and music, functional action and expressive gestures, public and private space, and human and nonhuman agency. (Franinovic and Salter, 2013)

The sonic experience spread from Pulsar Kite can be reviewed from emotional or aesthetic qualities that occur in the process of interaction, which is fraught with other complexities. Moreover, the methods from SID will help to understand issues and possibilities related to designing continuous auditory and tactile interaction.

1.3.1 The Experience of Sonic Interaction

Sonic Interaction Design (SID) attempts to make full use of sonic materials, understood as sound properties in their social, aesthetic and physical dimensions. Similarly as in Sonification, sound is conceived as a main channel to convey information and meaning, but also aesthetic and emotional qualities in interactive contexts, where sound is essentially related to creation, shaping, and manipulation. When attempting to describe the Sonic Experience, one must assume an implied relation between Action and Perception, understood as one because they are lived as one. Hence, in sound the primal form of knowing is by using our bodies to interact with the environment. This notion takes as a reference the theory of Enactive Cognition and Perception by the[10] biologist Francisco Varela. As a result, Enactive cognition and perception in sound are dependent on how the world guides or modulates human actions that, in turn, continuously results in the body realigning or remaking that world (Franinovic and Salter 2013).

10 Cfr. More about Varela in this thesis, in regard of the concept of Autopoiesis discussed in chapter third.

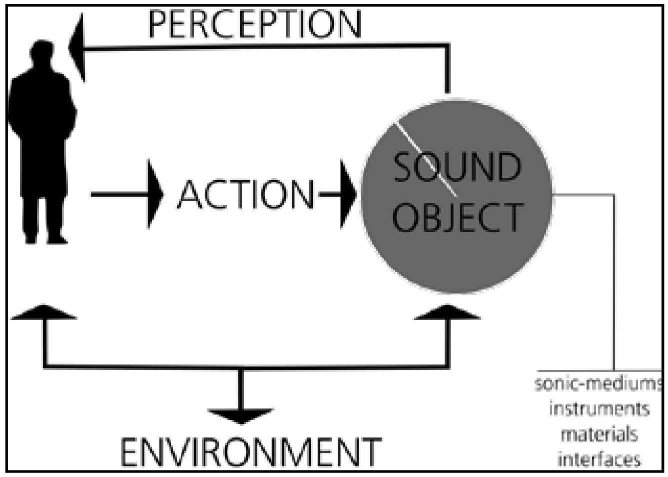


Fig. 1.3 Diagram enactive cognition and perception in sound.

The phenomenological, aesthetic, and social elements derived from the sonic experience are also taken in account while developing New Interfaces for Music Expression (also known as NIME)[11]. NIME's central focus is on the area of designing new sensor-augmented devices. These musical expressive systems make use of highly codified real time computer models that involve sensor input to control musical parameters. The task of designing NIME's may involve techniques for the conditioning, analysis, and feature extraction of sensor signals, and mapping strategies for creating relationships between input and output parameters. A generic and simplified formula to describe NIME's systems would be.

Input (Sensing) -> Mapping -> Output (Sound Synthesis) = Musical Expression

Nevertheless, Franinovic and Salter (2013) recognize that this formula does not take in account the variables from environment that potentially can alter the interaction over a time frame, neither the ways in which the experience of interaction, as a result of expression, may change as a manipulation with or the context in which such relation takes place. In other words, an electronic sensor does not necessarily understand the context in which it senses. By contrast, it is the human body that enables to interact with the environment it finds itself within. Following the previous considerations, Franinovic and Salter propose a list of qualities to expand the Experience of Sonic Interaction that can enunciate Interaction as "a mode of bringing something into being".

1. A spatio-temporal-material process (due to acoustic principles).
2. Interaction as poiesis[12] (an active process of formation/modulation of sound over time).
3. Situated, concrete, and embodied (malleability and modulation of sound by means of being tactilely as well as acoustically perceived).
4. Performative and Emergent (constituted in time through different agencies).
5. Nonrepresentational (not reducible to an act of mimesis, imitation, or symbolic processing).

11 NIME has been consolidated into a annual international conference http://www.nime.org/

12 Poiesis in sound is a continuous process of creative making that involves acts of touch, listening, and movement extended through participation and play.

Sonic Experience Processes by Franinovic and Salter (2013)	Potential Elements found or potentially feasible in Pulsar Kite
Poiesis	• It would be feasible to make an interactive sound composition that is formed over time depending on time based events happening during the kite performance. • A data base of feature extraction built from capturing users with different levels of expertise in kite flying, could drive to a more engaging experience. Where new users aim to unlock features achieved and modeled from more advanced users. • There is an overlapping between the time to produce a human gesture and a sonic impulse in response to energy and effectiveness. This relation can be more evident while using a sound method, e.g. granular synthesis[1], that deals in between micro structures of time against larger time based events.
Situated, concrete, and embodied	• The sound malleability is connected to hands and arms manipulation during flight. However not only hands are not restricted to control, but the overall body posture helps to oppose to wind force to create tension against the kite. • The interaction with kites is necessarily related to a geographical space, wether it happens in a beach, or the top of a hill, this brings new variables that sound can exploit to produce every time a new experience.
Performative and Emergent[2]	• A performance with the kite relates to unexpected wind dynamics, then user needs to sense when is better to use wind currents on his favor. • This open system is in terms of contemporary art, is known as a happening, that mediates in between chances found along user skills and environment conditions. • Moreover, there is a potential of using of string oscillations and tension between user and the kite that can be augmented as a sound material, to be later included in the sonic outcome. • The role of sound / music interaction works in parallel with a popular activity that can be easily learned by children or adults.
Non representational	• The non linguistic dimension of kite flying is a common value owned as a primitive playful activity. Yet, as a ludic activity offers a frame to become a more complex game to improve oneself skills.

1.3.2 Continuous Auditory and Tactile Displays

Visell, et al. (2013) studies on human to computer interfaces are supported with tangible and haptic feedback. The use of tangible interfaces might benefit users to allow an interdependence of vision, hearing and touch. Since human systems works better together, our eyes provide high resolution information around a small area of focus (with peripheral vision extending further). Sounds, on the other hand, can be heard from all directions: above, in front, or behind, but with a much lower spatial resolution. Auditory and tactile feedback are particularly important when visual attentions is unavailable, such as in mobile computing contexts, when users may be walking or driving. In such cases, visual information may be missed while the user is not looking at the device, whereas if it were presented as sound or vibration, it would be delivered as "Eyes free".

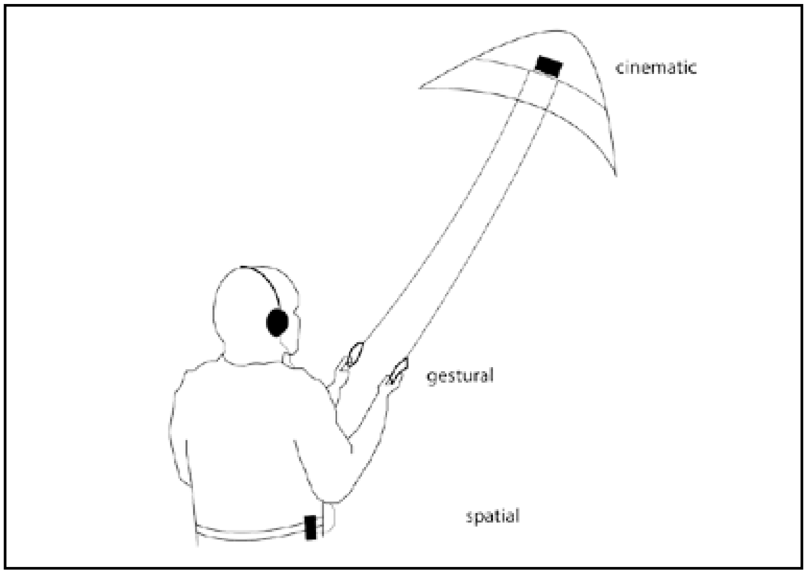


Fig. 1.3.2 Illustration Auditory and Tactile Feedback Modalities in Pulsar Kite

Auditory tactile advantages by Visell et al (2013)	Applied on Pulsar Kite
Temporal resolution	"In certain cases reactions to auditory stimuli have shown to be faster than reactions to visual stimuli" (Visell, et al 2013). Thus sound provides immediate awareness about changes in speed or another transformations while controlling a kite that is 20 meters away from user.
Visually undemanding	This feature is essential to keep users focus on controlling and modulating sound without requiring to attend any visual notifications.
Underutilization of auditory and tactile modalities	The use of sound messages produced by vibrations could better organize the ecology of information provided not only by headphones but also by using external speakers embodied by user.

1.3.3 Parallels to musical interaction

A musical instrument is a device that generates sounds in a continuous fashion while it is being interacted with it. Concepts relevant to the design of such interactions are:

1. Efficiency[13] needed to produce response.
2. The role of a human gesture as way in which the sensor data is mapped to sound synthesis parameters.

The issue about using feedback systems, is that non intentional gestures might be also sensed. And these may communicate little or nothing about the intention of the user but might end up generating feedback. Real functional devices need to offer a low entry costs in terms of difficulty. That is to say, they need to be simple and intuitive: desirably they should accommodate increasing skill levels, by exposing additional functionality as their interfaces are mastered by their user.

1.4 Digital Lutherie: Crafting sound digital instruments.

Luthier is the title someone formerly acquired while working on the craftsmanship of building or repairing violins and other string instruments, in a traditional and artisan manner. In acoustic instruments the sound producing element (e.g. the resonant wooden body of the violin) is usually coupled with the control module (e.g. the arm and strings that are bowed, plucked or played in different manners). Räisänen (2011) indicates that instrument creation implies a double value on creation, in one side, a work that depends on the expertise in acoustics, on the other side, the visual and usability design: this second value makes any instrument worth to be played and suggest what types of possible sounds and interactions can be potentially obtained from playing with it.

In contrast, electronic instruments do not comply with coupling principle between sound and control modules, which are not necessarily part of the same unit. Thus, electronic and digital instruments can be designed separately between control surface and sound engine. The notion of a Digital Lutherie[14] is a term that refers both to the craftsmanship of developing sound engines and also to the art and design of interfaces that users play with: this activity might employ a wide range of techniques and tools from electricity and computational components, sensors, software techniques and other ways of transforming human gestures into signals that can be used in musical expressions. In other words, the craftsmanship of the new musical instruments of the future addresses computer and electronic engineering merged with design principles.

Sergi Jordá, one of the creators of the Reactable[15] a collaborative instrument, proposes that new instruments from digital era can take the advantage of providing users to control complex sonic processes over simplified human gestures, from a perspective which is oriented to boost the efficiency of a musical instrument. In engineering, the term “efficiency” is commonly understood as the ratio of useful energy, between output to

13 More on Efficiency in the section on Digital Lutherie of this chapter

14 Digital Lutherie is the title of Sergi Jorda’s doctoral dissertation on crafting musical computers for new music performance and improvisation.

15 http://www.reactable.com/

energy input. (Jordá, 2004). Hence, in HCI[16] the efficiency can be measured according to the work performed or outcome from a given interaction. The amount of input from user's point of view can be considered both as mental or physical effort to complete a given task. Moreover, there is a turn on the role from the music performer who no longer needs to control all the smaller details, can control instead the processes that control details of sound such as frequency, amplitude and shape of the oscillation. Also any imaginable timbre can be rendered theoretically; it can change abruptly or evolve continuously, and even smooth transitions between any set of distinct timbres can be achieved. (Jordá, 2005)

Fig. 1.4 Sormina by Räisänen and Reactable by Jordá

On the interface and controllable surface, Räisänen (2011) underlines that many existing instruments have an attractive visual appearance associated to the good sound qualities, as many classical instruments originated hundred years ago that have developed a traditional craft in their making, and, thus achieved a remarkable results while connecting sound with visual domain. In this sense the first thing a musician notices while starting to play an instrument is the touch or the feel of the instrument, however the notion of feel might be ambiguous and subjective, it should be related to intuitiveness and easiness. Then a new instrument designer must take usability and users's design features into account.

The feel of the instrument is part of the usability of the interface. However an easy instrument is not a good attribute by default, it is still important to think about the measures and natural paths of movement of the human body. Better usability means better control and greater accuracy. Creating new musical instruments is a task that combines visual and design with musical questions. The visual design of new digital instruments should be connected to the quality of the sound. In this regard, Jordá remarks that music controllers are only the components of the instrument chain that look more like instruments, thus are often mistaken as such. However, they are not instruments. They are only one of the components of the chain, mere controllers; not even musical. It is in the part of gestural controllers that is possible to focus on affordances between design and sound modules for new digital instruments.

16 Human to Computer Interaction

1.5 Gestural Controllers

Eduardo R. Miranda (2006) describes guidelines to design physical interactions placed in between a control surface and a sound engine. In other words, it is by designing a gestural controller that is possible to define what expressions a New Digital Musical Instrument (NDMI) are suitable to produce.

Gestural Units by Miranda (2006)	**Applicable in Pulsar Kite**
What gestures?	1) When raising up the kite 2) When landing the kite 3) While flying, when spins are produced 4) While flying, when kite is flying in slow motion 5) While flying, when kite is flying in fast motion
Capture strategies	1) By using an altitude sensor that detects a certain threshold, for example, above 10 meters. 2) Also with the altitude sensor when detects a threshold lower than 2 meters. 3) Using the accelerometer to detect rotation changes over a period of time. 4) Using the accelerometer to detect a decrease on changes of values within a short range 5) Using the accelerometer to detect an increase of values changes, within a large range
Sound Synthesis Methods	1) digital signal processing is on 2) digital signal processing is off 3) Spins can equal the amount of played simultaneous sound layers 4) A slow motion can be related with lower pitch sounds. 5) A fast motion can be related with high pitch sounds
Feedback modalities	1) Can be noticed visually turning a led on at the users interface surface. 2) The same light can go off. 3) A haptic feedback (from a vibrate-tactile motor) can trigger a notification corresponding to the number of spins produced with the kite over a period of time. 4) An LFO (low frequency oscillation) is displayed with the led to denote the low pitch sound linked with the low speed of the kite. 5) A high pulsing rate led denotes when high pitch sounds are produced.

1.5.1 Physical gestures

To some extent any movement or change in position can be considered as a gesture. But also, gestures are mainly actions before becoming means of communication. On one side, empty handed gestures do not imply physical contact with a devices or instruments, whereas physical gestures imply the a series of possible changes effectuated (positions, orientation, shape) number of hands involved and indirection level: direct manipulation or manipulation through another object or tool. Whereas Prehensile and Non prehensile gestures depend on the duration of grasp and type of grasp: that is level of precision, and number of fingers involved.

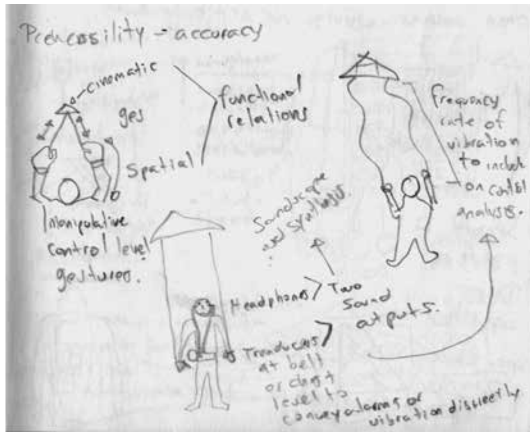


Fig. 1.5 Possible gestures to be designed in Pulsar Kite

Gesture Categories by Miranda (2006)	Applicable in Pulsar Kite
Physical gestures	• Manipulative. This can be obtained from a continuous interaction between user and kite, which depends heavily on the tension between handlers, strings and kite. • Semaphoric gestures: it can be useful to describe when the kite reaches a minimum of height required to manipulate sound processing functions, or detect when has landed to ground in order to deactivate the sound processing functions.
Descriptive Gestures	• Cinematic: When the kite reaches a faster or slower speed it can produce, for example, more or less sound dynamics. • Spatial: It can be implemented with a GPS sensor, for example, to detect when user moves around in different parts of a field where its playing with the kite. This values can be used to manipulate sound presets or different timbres depending on users position in an open environment. (See Fig.X) • Frequency range. This could be a function to detect the number of times that certain movement produced with the kite occurs over a period of time. For example, the number of spins produced over a minute will determine the amount of sound processing over a current sample.

1.6 Granular Synthesis

1.6.1 Overview

On sound perception, granularity is a term which refers to the microstructure of any sound event. For humans, sounds which are less than 20 milliseconds are heard differently from those that are longer. The Granular Synthesis (GS) as a technique comes as a result of research on acoustic quanta by the mathematician Dennis Gabor, and eventually was implemented on experiments by Iannnis Xenakis (1971), who used short fragments of recorded magnetic tape. Then by Curtis Roads and Stockhausen in 1978, by using early computer techniques instead, and more recently by Barry Truax in 1988, who worked on using granular synthesis to explore new possibilities of transforming soundscape recordings from the nature.[17]

17 The list of musicians that use granular synthesis techniques is not limited by the above mentioned, and extends to other

GS is a method that follows the concept that by producing a periodic short timed sound bursts (known as grains), some perceivable tones and sound textures shapes emerge. The equivalent of GS in visual arts would be pointillism, where perception of continuous dots give the sense of lines and shapes, as well while using points of different color depth and size overlapping textures appear on a canvas.

Farnell (2010) emphasizes that the advantage of granular synthesis methods is the possibility of creating organic textures with synthetic sound. As a disadvantage there is high computational costs and lack of precision. Along these lines, Curtis Roads (2001) indicates that the grain duration parameter in granular synthesis has a strong effect on the perceived spectrum of the texture: the perceived result of particle synthesis emerges out of the interaction of parameter evolutions on a micro scale. Yet, it takes a certain amount of training to learn how operations in the micro domain translate to acoustic perceptions on higher levels. Similarly, Truax (1990) claims that GS is in a unique position to mediate between the micro and macro time worlds.

Barry Truax (1998) experiments with GS in the context of soundscape recordings indicates that the granular description of sound shares some Ecologically-based granular synthesis properties with sample-based techniques, such as the possibility of shaping the spectrum from the time domain, or controlling the micro-temporal structure of sound. This approach was considered to be used in Pulsar Kite, as it offered a chance to merge sounds from to be captured from the environment and be processed as a material for controllable processing, based on the multimodal interaction coming from the kite.

composers as Horacio Vaggione, Manuel Rocha Iturbide and Petri Kuljuntausta, and from widely known artists such as Aphex Twin and Autechre.

1.6.2 Granular Synthesis Implementation for Pulsar Kite

By following an online tutorial of Pure Data by Johannes Kriedler[18], GS is explained on how to work around from pre recorded samples to live input stream. In order to understand the basic components of GS, the test is explained in three different test phases that increase complexity on sound processing and computational tasks.

The first test explains how to play a sample within its original duration but with variable speed. This technique is based on playing a sound sample in certain intervals, which take the role of grains, the size of this grains is referred as "grain size" or "window size". The size of these grains belong to the micro scale of sound, produced continuously in large quantities that are perceived as a constant signal, yet discreetly manipulated. Once a grain is played, there is a jump to the next position, taken from a "sample and hold" function.

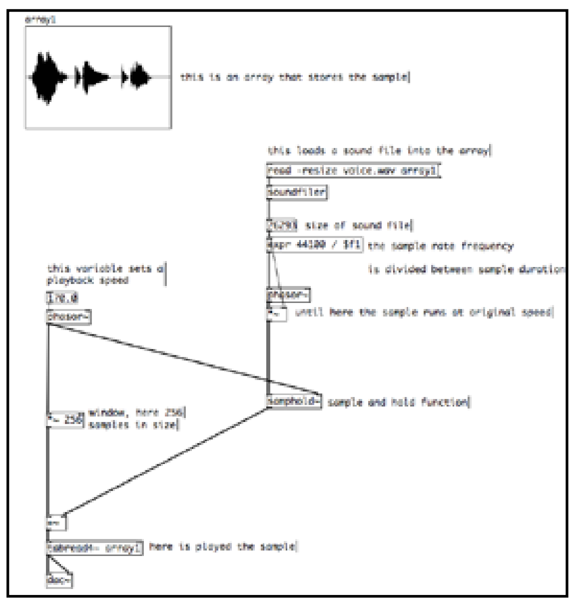


Fig. 1.6.2.1 First test: variable speed sample player patch in Pure Data

18 http://www.pd-tutorial.com/english/ch03s07.html

This second test includes a Hanning window, which is a bell shaped waveform used to smooth the transition in between grains, it is used to avoid undesirable clicks in sound. Moreover this method includes an additional grain reader that is shifted at 50 percent in relation to the main speed control. Finally, this methods allows a variable duration of the sample.

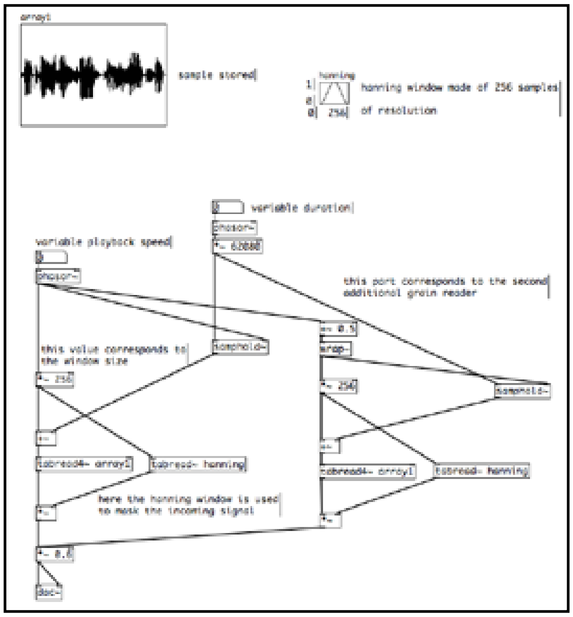


Fig. 1.6.2.2 Second test: Including a Hanning window,
additional grain reader and variable sample duration

Finally a third test, that was implemented in the first recording of Pulsar Kite, makes use of a variable delay to feature live granular synthesis. From the previous one the main changes are: 1) the algorithm is optimized in order to work around only two variable input values: window width (or grain size) and transposition (or speed of play of temporary sample). 2) The hanning window is optimized by reducing its expression as the product of a cosine function minus one and multiplied by .its half 3) The sound input is stored in a variable delay and is played while is modulated from the previous mentioned variables. 4) a feedback loop is included to produce long decayed sound textures.

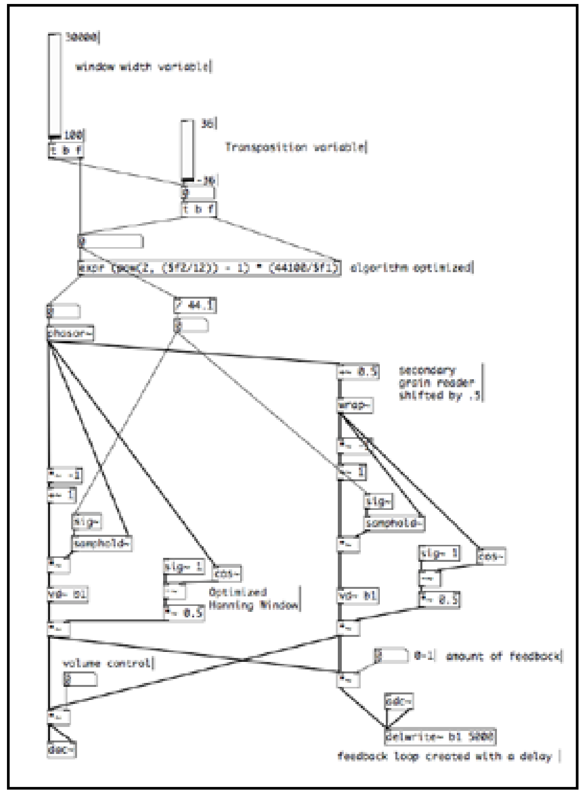


Fig. 1.6.2.3 Third test: Optimized algorithms, and Live Granular Feedback Synthesis

1.6.1 Pulsar Synthesis

Besides of implementing the first computer version of GS, and coming from that experience Curtis Roads created a synthesis method know as Pulsar Synthesis which is based on the generation of trains (or sequences of sonic particles). Pulsar synthesis is named after the spinning neutron star that emit periodic signals in the range of .24 to 642 Hz. By coincidence, this same range of frequencies - between rhythm and tone- is of central interest in pulsar synthesis. Roads (2001). As might be expected, reading about pulsar synthesis methods inspired to have it as half of the name for Pulsar Kite. The advanced method of Pulsar Synthesis combines multiple pulsar trains and convolution with sampled sounds. De Campo[19] and Roads designed a program for pulsar synthesis called PulsarGenerator[20], which was used in the first test of Pulsar Kite, however a Pulsar Synthesis implementation still needs to be found, learned and implemented with Pure Data.

Whereas GS, where the potential is to obtain complex textures of tones, the basic pulsar technique can be deployed as rhythmic sequences, or, when the density of events is sufficiently high, in sustained tones, thus allowing composition to pass directly from microstructure to mesostructure. To conclude this part, both granular and pulsar synthesis are affordable methods to be implemented using the current setup of Pulsar Kite. They will intend to produce a sonic outcome that relates sonic materials from the environment with user manipulations coming from the physical interaction with the tangible interface that the kite supposes.

1.7 Chapter conclusions

The framework in sound provided insights to develop the core functions of sound interaction and sonification. Moreover it was possible to articulate a comparison between digital instruments design and the interests aimed in Pulsar Kite as a sonic interaction interface. The considerations reviewed here highlight the need to converge efforts into a sonic experience that relates user in a continuous, and feedback loop interaction. This model was elaborated in the ecological approach of enactive cognition and perception.

The articulation between user, sound object and environment its further guided along the perspective of digital musical instruments design. However, understanding or not Pulsar Kite as a musical instrument should not be a restriction, yet it shares many qualities described in the frame of digital lutherie. In other words, it is presumed that the strategies proposed in this chapter can lead to a oriented experimentation conducted to improve user experience on an intuitive and easy learn path.

19 http://medienhaus.udk-berlin.de/pages/Dr._Alberto_De_Campo

20 http://clang.mat.ucsb.edu/software.html

Chapter 2.
User Interface and Experience Design

2.1 Overview of methodology

After elaborating on the sound interaction part, this chapter reviews the play-element from a kite, which in terms of interaction design is an interface that enhance users to play a wide variety of games. However the present framework borrows from game theory to define more accurately what affordances are implied with the kite as a game and play. This way some categories from game theory will be used to describe specific game affordances found in Pulsar Kite. Then, the value of participatory performance is reviewed in relation to Pulsar Kite.

Moreover, play element owned in Pulsar Kite besides of being defined as self amusement, it can be related to an experience aimed to produce learning. As seen in the previous chapter, in the section related to Sonic Experience, it is within a process of cognitive enactment that humans can learn from meaningful interactions with objects that imply an ecological approach on interaction in between user, interface and environment. The learning outcome of this experience can be, in the case of the kite, aimed to improve motion skills to control the kite, or social collaboration when the play implies multiple participants. Hence, unlike video games or other kinds of screen based interactions, Pulsar Kite as a play-game values the tangible realm to emphasize the importance of lively experiences enacted ecologically with oneself or with others.

Rawlinson et al (2012) research on playful elements in urban spaces describes two usual ways of understanding play, one as a force of chaos and the other as a force of creativity. The first one tries to limit social disorder and potential destruction of urban facilities, the second one values play activities as an immeasurable benefit to the cultural, sensorial and emotional generation of city narratives: play's inherent to creativity, requires the participation of the individual 's imagination to make play work. Moreover, play requires the brain to navigate imagined and metaphysical barriers, as well as real physical ones.

2.2 Ludic Playfulness

Chris Salter (2010) establishes that Performance in a broad sense can be potential method that challenges traditional knowledge transmission. The shift owned by performance is from immanent learning, or knowing about or knowing that, to a knowing how model. In art, for example, Allan Kaprow 's work sought to elaborate public performances towards an integration of art and life, in an attempt to break audience passiveness and the selfish and subjective artist personality. Salter (2010) proposes that the link between performance and art takes as a reference notions of play raised by Johan Huizinga in his book Homo Ludens ("Man the player"). The thesis of Huizinga points out to the need of the play-element for the generation of culture. Consequently, Huizinga's (1938) seminal work described three main categories to describe playfulness.

1. Play is in fact freedom, is distinct from "ordinary" (life both as locality and duration).
2. Play creates order (demands order absolute and supreme).
3. Play is connected with no material interest, no profit can be gained from it.

Roger Caillois (1961) elaborated on the previous work done by Huizinga to further categories about play.

Caillois Play Categories	**Related to Pulsar Kite**
"Agon" (competition)	Although in Pulsar Kite its not aimed to have competition between opponents, traditionally kites have been used in social and religious ceremonies as in the Japanese kite festivals in the cities of Hamamatsu and Sagami, and Makar Sankranti in India and Nepal. These competitions are centered on a skillful use of kites to cut the kite rope's from opponents, until the last remains as a winner.
"Alea" (chance and mimicry-mimesis)	Here chance and Indeterminacy are roles implied by the uncontrollable element of wind currents. The juxtaposition between indeterminacy (within a range of framed random possibilities)and sound production, has been explored in sound art as a method for producing unique works in a systematic but also playful manner.
"Mimicry" (mimesis)	In kite play or game there is not mimesis expected from the user, since its more relevant the skills that user put into motion and manipulation to control the kite. However the design of kites, frequently, aims to transform kites into animated shapes, as birds, dragons, or any sort of flying creatures.*
"Llinx" (whirpool)	This category refers to the sense of vertigo, or perception alteration which is more relevant in Pulsar Kite, than in traditional use of kites. Since Pulsar Kite employs a motion to sound synesthesia, which can result in an engaging experience of modulating and transforming surrounding sounds, through a multimodal interaction.
"Paidia" Uncontrolled fantasy	A Kite Festival as the one celebrated in Helsinki in August 2015[4] far from aiming for competition, is diverged along the aesthetic pleasure of populating the sky with colorful objects, merged with a socially relaxed event that integrates families in a outdoor environment activity.**
"Ludus" (Effort, Skills, Patience)	The skills from using a kite can start from a social learning process, usually during childhood from the parents or teachers. However to develop skills it might be required the effort and patience of an individual undertaking, produced on private time or own pace, in order to learn from all variables involved in the game – play involved in flying kites. On top of that, Pulsar Kite, requires an additional layer of expertise where manipulation is connected to sound.

* See also the Kite Festival in Helsinki 2015
https://helsinkifeelings.wordpress.com/2015/08/23/colourful-kites-and-happy-people-at-the-kite-festival/

** http://www.helsinginjuhlaviikot.fi/en/tapahtuma/kite-festival/

2.2.1 Play-space

Walz (2010) studies enriches Caillois and Huizinga's work, while developing games around architectural spaces. The notion of "PLAY-SPACE" (Summing Playing and Space in a single term) defines a necessary relation between these two elements and the human practice (the player). Furthermore, Walz (2010) defines a number qualities of Play-space, that deal with parameters of play, practices to give play a rise, design of the space to play and relation between game and play.

Play-Space Category by Walz (2010)	In Pulsar Kite	User Agencies by Walz (2010) Applied in Pulsar Kite
Play as ambiguous	Considering that players are also learners, a different agencies can be derived depending on the level of involvement and expertise around Pulsar Kite. The meaning of this games depends, in part, on previous ideas of those coming from who think about them. This way some people might find more convincing one sounds over others based on the same principle of interaction. The ambiguity suggested of flying kites fits into other practices to blend with such as sound art performance or music production, this connection allows to experiment and seek for new levels of meaning found in between disciplines, such as digital lutherie.	1) solitary play – here user can develop own skills and silently perceive the sonic environment merged with sound processing. 2) informal social play – multiple kite players interacting with each other suggests an scenario where interaction of one influences others sonic outcome. 3) vicarious audience play – this one implies a less involved role by observing how one player manipulates sound with the kite. It can be useful to learn the overall experience of Pulsar Kite. 4) performance play – this scenario supposes that an experienced user of Pulsar Kite, performing for an audience, with a setup similar to a concert outside. 5) celebrations and festivals – similar as the one in Helsinki, Japan or India, this supposes a larger installation setup where multiple simultaneous kite users perform freely, without a fixed scheduled, for an audience who can be or not interested on learning how to use pulsar kite. 6) games and sports – this could be possible by designing a competition between at least two kite players, who attempt to test advanced skills on a sonic kite manipulation.

2.2.3 Play as movement

This category merges the three main elements that concern an interactive experience: player, object, and environment. Walz (2010) defines possible scenarios where movement relates the three elements can come into play. Likewise these elements will help to define user scenarios for Pulsar Kite.

Play-Space Category by Walz (2010)	**In Pulsar Kite**	**Factors that modify Rhythm and Kinetic Dynamics by Walz (2010)**
Play as Rhythmical kinesis	Play is a particular kind of rhythmic movement which relates player with the environment in time and space, and a rhythmic play with the kite, or with another player, or observer. In this sense a play-game is a structural framework which can correspond to the development in time and space in which a sound performance unfolds.	1) Playing with someone provides a frame of limited timed: the game is over until one or many participant lose their interest in the play or until the performance reaches certain predefined goal to reach. 2) Play dynamics between tension and termination of an Interactive rhythm is produced from the dynamics of user or kite motion gestures, such as intensity, pace, proportion, and pattern. 3) Play is rooted in surprise, the wind currents define spaces and moments when flying a kite is possible or can reach more or less intense events. 5) Attraction to deliver – this can be mostly related to the idea of producing a sound composition, then the game is completed a series of sounds achieved satisfies the player. 6) Playing by rules – as seen in non determinacy sound compositions , although there is an ambiguous frame to interpret notation or rules, events in time and space can define when the kite play unfolds a round a narrative. E.G. once certain number of spins or sounds are achieved by one player, then the game or performance is over. 7) Space and time limits (magic circle) – Its clearly that the kite play and needs to be enacted around a right timing and space where is possible to steer the kites and where currents are mostly favorable. Besides the sonic outcome might be perceivable in a certain range in which both participants or observers need to gather around.

2.2.4 The role of Participatory Performance in Art

The participatory element in performance art was widely spread during the situationist movement lead by Guy Debord at the mid of the 20th Century in Europe. Derivés is a name of a play-game from the situationist movement that took place in european cities guided by ambiguous rules to explore new meaningful layers about transiting through urban spaces. The game was supported by a conceptual framework that guided to an aesthetic experience composed from bits and pieces of daily life micro narratives. The surprise elements, as the rhythm imposed by other participants while aiming to complete the tasks suggested in the game was a developed an art work practice that depends necessarily on a group people to be activated.

In this sense, Boris Groys (2009) remarks the need for artists to recognize the role of people in art, by presenting early claims of Richard Wagner in "The art work of the future" dated between 1849-50. In Wagner's (1849) words: "Artists must recognize that the people, as an entity, are the only true artist: "not ye wise men, therefore, are the true inventors, but the Folk; [...] All great inventions are the people's deed; whereas the divisings of the intellect are but the exploitations, the derivatives, nay, the splintering and disfigurements of the great inventions of the Folk."

Furthermore, Groys (2009) indicates that the difficulty of arranging a participatory performance oscillates between a disordered chaos and the over conducted and simplified interactions between an art work and audience. Despite the many possibilities of falling (and failing) between chaos and over simplification, a participatory performance might open possibilities in Pulsar Kite to develop unique ways as a sound instrument that can fit into a range of interests of users, who can further the design on the sound modules and sensing capabilities of ubiquitous computing systems.

2.3 User Experience supported by Gestural Interfaces

While interacting with a kite, it is normal to not depend on any screen surface. Recently this type of interaction is named as surface-less, or in short faceless interaction (Janlert and Stolterman, 2015). Furthermore, Faceless interaction deals with a smoother and analog interaction compared with touchscreen and buttons from Graphical User Interfaces (GUI), however the cost of analog interactions is the lack of precision. Examples of analog interaction are activities that can be easy to try to hard to master as drawing and painting, or in the case of electronic instruments the theremin, which allows free gestures with a high resolution but at the cost of becoming annoying if the player is not familiar with the instrument.

To support precision on surface-less interaction, Janlert and Stolterman (2015), consider the need for a feedback provided by some kind of physical support and resistance. In this regards gives a relevant example with kites: "Holding the string [of a kite] gives haptic feedback that can be seen as coming from a surface."

Free gestures might leave room for endless variations and subtle nuances, also open for more or less spontaneous expressions and reactions. While designing towards a more natural interaction, it can be useful to rely on gestural interfaces (Saffer, 2008). These following guidelines might help to produce a more fun experience while interacting with digital systems.

Affordances by Saffer (2008)	Description
Discoverable	Along with simple tasks as turning on/off the system, and raising up and landing the kite sound related functions.
Trustworthy	It is required the design of a solid and stable interface with knobs, speaker, jacks for headphones and LED's that display visually when the system is ready to be used o had finished operations
Responsive	It is the continuous interaction between motion and sound the most transparent gestural affordance in Pulsar Kite. It is also the main channel to provide feedback to and engage with users.
Clever	As possible It is required an effective mapping between the control of the user and reactions of the system. This way an adjustable mapping of sound should be included in the interface so user can find the most suitable scale of sounds to be played.
Playful	The interface should invite users to be explored, and feel relaxed to engage in play. Errors need should be difficult to make while operating few controllable inputs: volume, mapping values, switch in between synthesis presets.

2.3.2 Wireframe

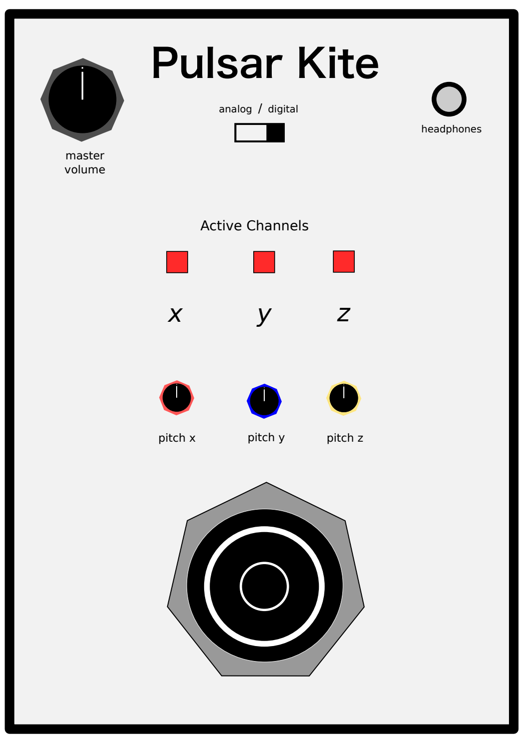


Fig. 2.3.2 Diagram for the user interface design

2.4 Chapter conclusions

This chapter described a the ludic values owned by traditional kites and also around Pulsar Kite. understood as a play element that belongs already to the kite as a traditional game object. Considering kite's own affordances the design of an augmented sonically object corresponds to improve the existing interaction while providing elements that can blend with user control to modulate functions that works in between the kite and environment.

Also it was defined the kite's range from total freedom (ambiguity) and ruled based, and from individual to participatory frameworks. The user experience in Pulsar Kite, for reasons of scalability in complexity of implementation, it should aim to start with the solitary user scenario and could raise towards a participatory performance modality in future development.

Chapter 3.
Aeolian artifacts for ludic interaction

"There is no such thing as new music and there has never been one. Otherwise, when did it start? Was it in 1766 when the futurist Intona-rumori were first designed by Donato Stopani for Drottningholm Theatre in Stockholm ? Few decades earlier, when minimalist idea of combination tones were first theorized by Giusseppe Tartini? Or was it in the 13th century when Cage's chance operations were presupposed by Raymond Llull[21] in his figures? Earlier?"

Michal Libera.
Introducing to Avant Garde[22]

Fig. 3.0 Athanasius Kircher's Kite. Extracted from his book "Phonurgia Novia"

21 Raymond Lull's :"Lullian Circle," invented in 12^{th} century a system of divination based on a mechanical circle of possible combinations to produce symbolic alphabet results. These combinations could lead to all possible truth about the a subject of inquiry.

22 http://z-a-m.eu/avant-avantgarde.html

3.1 Introduction

This chapter will put in place a number of sonic ludic experiments in art and design that use wind as a force for creative generation. In general they relate with Pulsar Kite as they share the principle of creating sound from artifacts that are excited by wind force. Their relation with New Media Art connects with the ideal of using technological developments to convey scientific principles, mainly related to sound obtained throuhg automated procedures. Moreover the choice of presented works and projects here draws a perspective of auto-poetic systems, that range from fully automated to semi controllable interfaces from the users perspective. Here, auto-poetic systems is a term applicable for self creating content agents, furthermore, the concept emerges from the work of the biologists Maturana and Varela (1973) to describe behaviors of microcellular, and informational systems:

In "Autopoiesis and Cognition: the Realization of the Living", Maturana and Varela (1972) define an auto-poetic machine as a system organized, defined as a unity. As a network of processes of production (transformation and destruction) of components in which through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them. The auto poetic system is constituted as a concrete unity, which its components function as a network. Consequently "Autopoietic" as a category can be useful to define the type of cases reviewed in this chapter.

3.2 Aeolian Harps

The Aeolian Harp is a musical instrument played solely by the wind force, its normally composed by a resonant box and stretched strings to produce harmonics. Aeolian harps can be regarded into the category of musical automated devices known as Musical Automata: Barbara Bogunia[23] describes Musical Automata as a type of a mechanical device aimed to create art. The earliest among of them were "natural" automata[24] in which "the sound is generated by the unprompted wind or the water flow affecting the mechanism composed of e.g. strings or pipes. Archaic aeolian instruments such as flute-kites or wind harps (later designed by Athanasius Kircher as well are one of the earliest inventions of this kind..."(Bogunia, 2014).

Automated devices usually comprise a self compositional system based on artifacts that employ energy sources (wind, solar, hydraulic, mechanical, electrical energies) to produce sounds. Since 17th century Musical Automata have been the subject of studies in early experimental science merged with art, Athanasius Kircher. The result of Kircher's work is compiled on two books related to acoustics and sound instruments: Musurgia Universalis and Phonurgia Nova. On the first book, Kircher writes: "Mechanical musical creation is nothing but a certain strictly defined method which I invented to let anybody, even without any musical knowledge, to compose melodies using instruments which produce music." Bogunia indicates that Kircher's "Musurgia Universalis" is often cited as a precursor of contemporary computer generated music. The importance of automatically generative machines In the subsequent centuries, gave people the feeling of being in control of the whole knowledge accessible to them (Bogunia, 2014).

23 Bogunia, Barbara. 2015.Automating the sound. Ars combinatoria and mystical automata. Glissando Magazine #24 New Music Magazine. September 2014. ISSN: 1733-4098

24 From greek automation: self moving, self propelled, a term describing mechanical, sel functioning machines including musical ones.

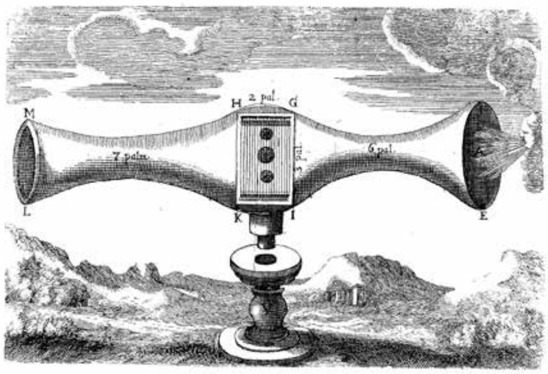


Fig. 3.2.1 Athanasius Kircher's Aeolian Harp

More recently artists such as Gordon Monahan (born in Ontario Canada in 1956)[25] and John Grzinich[26] (born in New York in 1970) have worked on range of analogously self played wind instruments: Grzinich's and Monahan's work on aeolian harps are based on intervening site specific spaces. They use found materials such as metal strings attached to abandoned structures of buildings.

Grzinich's self made aeolian harps are presented as recordings from a video, that composes a series of of audio visual landscapes made out of long-standing drones from aeolian harps that are amplified by contact microphones to perceive their subtle oscillation. Monahan's Aeolian Harps are installations amplified "naturally" by resonant metal plates found on the rooftop of abandoned buildings, making the sound audible from the interior of these rooms.

According to Grzinich: "Listening takes a special effort, possibly more effort than looking at something. […] Given the right motives and context, everyone benefits from deeper more attentive listening, whether the source of sound is a person, instrument, animal, environment, art object and so on." Alan Licht (2009) also remarks on the role of listening: "Sound and hearing are phenomena that extend far beyond the human experience – all life forms may experience sound, and sound may even exist in areas of the universe where there are no life forms – which leads to the egalitarian nature of sound art."

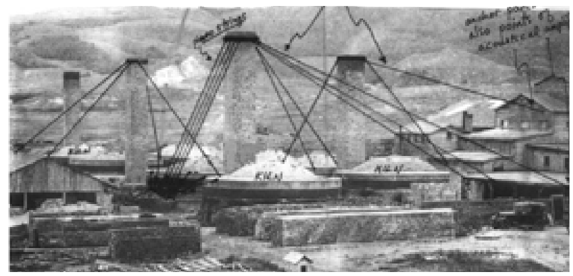


Fig. 3.2.2 Monahan (top) and Grzinich (under) Aeolian Harps

As an additional note, on the relevance of Athanasius Kircher, he also designed mechanical artifacts and a list of Imaginary Musical Instruments[27]that were part of a collection of studies on acoustics, amplification devices and music automation systems (Ars Magna Sciendi, Sive Combinatoria). Kircher 's works offered a lively experience with artifacts that involved uniformly the artistic development and scientific knowledge of late renaissance: "Kircher created metaphor machines for the display of fantastic images in a museum of paradoxes, beguiling mixed media experiments in optics, hydraulics

25 http://www.gordonmonahan.com/pages/claybank.html

26 http://maaheli.ee/main/

27 Museum of Imaginary Musical Instruments, http://imaginaryinstruments.org/

and automation, and acoustics." (Stafford, 1994). As a connection between Pulsar Kite and the Aeolian Harps, Stafford (1994) suggests that our present times digital artifacts-inventions can to learn from Kircher's principles around the wonder of material things experienced bodily in common: this revolutionary notion, appeared during the Enlightenment era[28] as a common philosophy to persuade people to learn more effectively while working on meaningful projects that employ sensory experience as essential for learning throughout life. Similarly, Miller (1914) claims that kite making can bring more life likeness to school's relation between professors and young students.

3.3 Umbrella phone / Umbrella Bubble

Niklas Roy[29] is a media artist self called an inventor of useless things, his projects employ physical computing along with "do it yourself" made machines for the amusement and joy of participants in interactive installations, ludic and playful interfaces to create sound and visuals. In Umbrella phone (2012), Hyyppä[30] and Roy, create an an automated instrument based on the function of an anemometer[31] but made out of ordinary umbrellas. takes advantage of wind forces to create kinetic sculptures powered by wind[32]. Umbrella phone's converts the uncontrollable wind force to subtly play a mechanical music box or to blow a soap bubble wheel mechanism. A similar automated instrument is the HumBug by Danny May made in 2009, it consist of a helix mechanism to play also a music box but amplified with a horn metal resonator.[33] Compared with Pulsar Kite, Umbrella phone is a fully automated installation, that has is no user input or human interaction at all. Its agency, however is a transparent translation of wind force into music progression from the box.

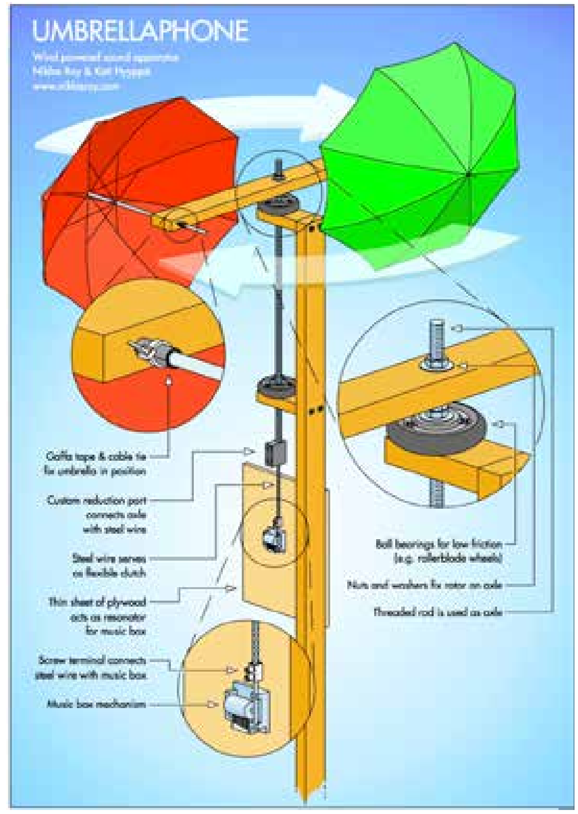


Fig. 3.3.1 Nilkas Roy's Umbrella Phone Diagram[34]

3.4 Audible Forces

This exhibition[35] was presented in 2012 by the Sonic Art Research Unit[36] (SARU) from Oxford Brookes University to show a landscape of wind-driven sound installations made from kinetic, sonic creations that portray natural force life into them. The showcase was presented at the Brighton Festival and Without Walls. The exhibition has a

28 The Enlightenment could be characterized by a tendency of artifact creation to demonstrate scientific knowledge and to keep the education as a learning process carried throughout life.

29 http://www.niklasroy.com/articles/133/umbrellaphone-umbrellabubble

30 http://katihyyppa.com/

31 An instrument for measuring the speed of the wind, or of any current of gas.

32 https://www.youtube.com/watch?v=oE0z-0aLDEs

33 http://www.dannymay.co.uk/shop/product/automata-art/

34 http://www.niklasroy.com/downloads/umbrellaphone_workshop_handout.pdf

35 http://www.audibleforces.blogspot.co.uk/

36 http://www.sonicartresearch.co.uk/

selection of works that provide a varied landscape of sound installations automated around wind force poetic outcome. From using different types of musical automata recreating and playing with the settings of existing instruments as aeolian harps, resonant bowls played as resilient reeds, a set of sonically augmented anemometers, and wind flutes attached to pigeons. Exhibitions documentation[37] shows an interesting and boldly produced variety of soundscapes based on simple variations for wind powered music automated systems. This exhibition works are also fully automated in relation to wind force, and as in the previous case, its virtue is on demonstrating a direct relation between sound and motion produced by wind.

Fig. 3.4.1 Overview of works from Audible Forces.
Pictures by Kathy Hinde and Jony Easterby

37 https://www.youtube.com/watch?v=XRQ8jv_MoKM

3.5 Sound Kites

I found this study project online at the Physical Computing course of the ITP[38] program at the New York University TISCH. It was made by the interaction design student Ju Yi. According to online documentation, the prototype of this installation titled as Sound Kites was presented as a demo in a room where user walks and kites are hanged from the ceiling with strings. Then user is invited to pull some of those suspended strings to control rich and tonal sounds.The technology implemented is based on stretch sensors connected to pull down resistors, then read by an Arduino UNO that interfaces with a sound engine is implemented in Processing using a sound library. At Ju Yi's page[39] it is mentioned that the project was concluded on winter 2013.

Fig. 3.5.1 Sound Kites installation. Picture by ITP NYU

On one side, sound kites offers a simplified implementation using tension, to focus only in one aspect from the interaction of the kites, also the sonic outcome is clear. On the other hand the prototype is not really used as a real kite, instead it is presented more as a room installation with a remarkable attention on the subtle control of sound. The interface in exchange is not a kite but

38 http://itp.nyu.edu/shows/winter2013/sound-kites/
39 http://www.yuji.io/works/sound-kites/

a metaphor of it that could resemble more a cloud or umbrella hanged from the ceiling. Some of the affordances from Pulsar Kite are also missing here: 6 degrees of freedom provided by accelerometer, outdoor use. However I consider that this same implementation could work more as an installation inside a room. The main difference between these two interfaces, although conceptually related, is that the setup for one is exclusively for outdoors and the other for indoor, this scenario makes a radical change in the experience of listening and experiencing the environment that plays a role as an agent that modifies the overall interaction.

3.6 Fly, lie in thoughts

This is a sound installation by the dutch artist, Marije Baalman[40] from 2012, the original title is "Vliegen, liggen, in gedachten", which consist of an interactive composition made for a kite. The setup of the installation works for one person at a time, to lie down and look at the kite, while hearing sound of its line, transformed by the movement of the kite in the air and the flow of the wind around the kite. Mounted on the kite are sensors to measure the flow of the wind, the pressure on the cloth, the turbulence of the tail, and the acceleration of the movement. The data is transmitted wirelessly to a computer – powered by solar panels – on the ground.

In comparison to Pulsar Kite, this installation is not interested on users control, as the kite is anchored to the ground. However it shares the interest on listening to a meditative soundscape produced from organic oscillations from wind burst events. Besides, it is worth noticing that the technical implementation is powered only by solar cells, whereas Pulsar Kite depends on batteries to work.

40 https://www.marijebaalman.eu/?p=249

Fig. 3.6.1 Vliegen, liggen, in gedachten by Marije Baalman, 2012.

3.7 Throwing Flying Objects

(T.F.O.) is a project by Rinat Mustafin (Universidad de Granada, Spain) and Jan Wehner, Wolfgang Sattler, Kristian Gohlke (Bauhaus-Universität Weimar, Germany). I found it as an academic paper presented at TEI 2012 (Tangible and Embedded Interaction) conference. It describes the prototype of a game based on an augmented Frisbee-Disc that works as an interaction device to explore a flying tangible user interface that boosts the pleasure of gaming.

The dynamic proposed on this project is based on at least two users that play the basic game of throwing and catching a frisbee disc attached with motion sensors, then a responsive audio stream is generated on a separate computer receiving a wireless signal. The sound design, presented in the demo as a evolving music composition, is oriented to add a semantic layer that can be used to create new game concepts coming from the basic interaction described before. Moreover the game flow is closely connected the resulting sound composition, which keeps the attention of the players to be in engaged with the game.

Fig. 3.7.1 TFO detail from the disc. Picture by Mustafin et.al.

As a prototype, T.F.O. considers that there is a number of imaginable possibilities of interaction that depend on the way the disc is thrown. Consequently, their system captures motion parameters such as timing of throwing events, spin rate, wobble and impingement force in order to classify different styles and possible gaming frameworks. These data assets offer a potential to expand sonic interaction outcomes. Similarly, different styles of flying kites could provide an scalable number of possible games which can be supported by using sound design to underline meaningful events.

T.F.O used an RFID- enabled flying-disc as the shared object. Their findings suggest that shared artifacts can significantly stimulate social interaction in augmented physical games. Finally, T.F.O. Proposes based on research made by Houri et al.[41] that the use of a flying-disc enhanced with auditory feedback can work as a tool for motor skill learning. This might lead to think that a kite used to provide auditory feedback can be a tool for helping users to assist on their learning process. As a final note, TOF, in comparison to Pulsar Kite does not aims to be an artistic project but to merely design a sonic augmented game.

41 Houri, N., Arita, H., Sakaguchi, Y., Audiolizing Body Movement: Its Concept and Application to Motor Skill Learning, Proc. ACM Augmented Human International Conf. 2011.

3.8 Chapter Insights

The focus of this chapter was on describing a series of sonic and ludic interactive works. Some of the projects, some of them artistic and other are design oriented, they relate to Pulsar Kite at the basis of considering a field of automated systems for contemplation and play with a poetic outcome.

As noticed with aeolian harps, these artifacts were used to support scientific evidence on mechanics, sound and physics, while people learned from its lively and meaningful experiences that provoked the public amusement. The role of technology to engage with amusement is still valid nowadays regarding the expectation that society surrenders to new media technologies. The relevance of these works is outside an objective functionality or plain use of them, in contrast their value as instruments is to diversify mind and be playful.

Other relation is proposed between traditional music automata and computer systems for interactive music. The essence of automated systems is independent of the technology implemented, as it seeks to create new materials based on a system that combines a collection of assets or materials which respond dynamically to an input. Computer based music during the past decades has taken advantage of generative processes based on combining data structures from existing informational assets in order to produce new forms of contents. From here it can be inferred that other disciplines, besides sound, can be benefited of applying automatic systems to assist on a creative tasks.

Chapter 4.
Production Overview

4.1 Chapter Introduction

The following table shows a time line of production milestones reached on each of the artists in residency where Pulsar Kite was hosted. Likewise is possible to observe a resume of goals achieved on each of this stages. Moreover this chapter unfolds around on failures and experiences obtained from the process of producing Pulsar Kite.

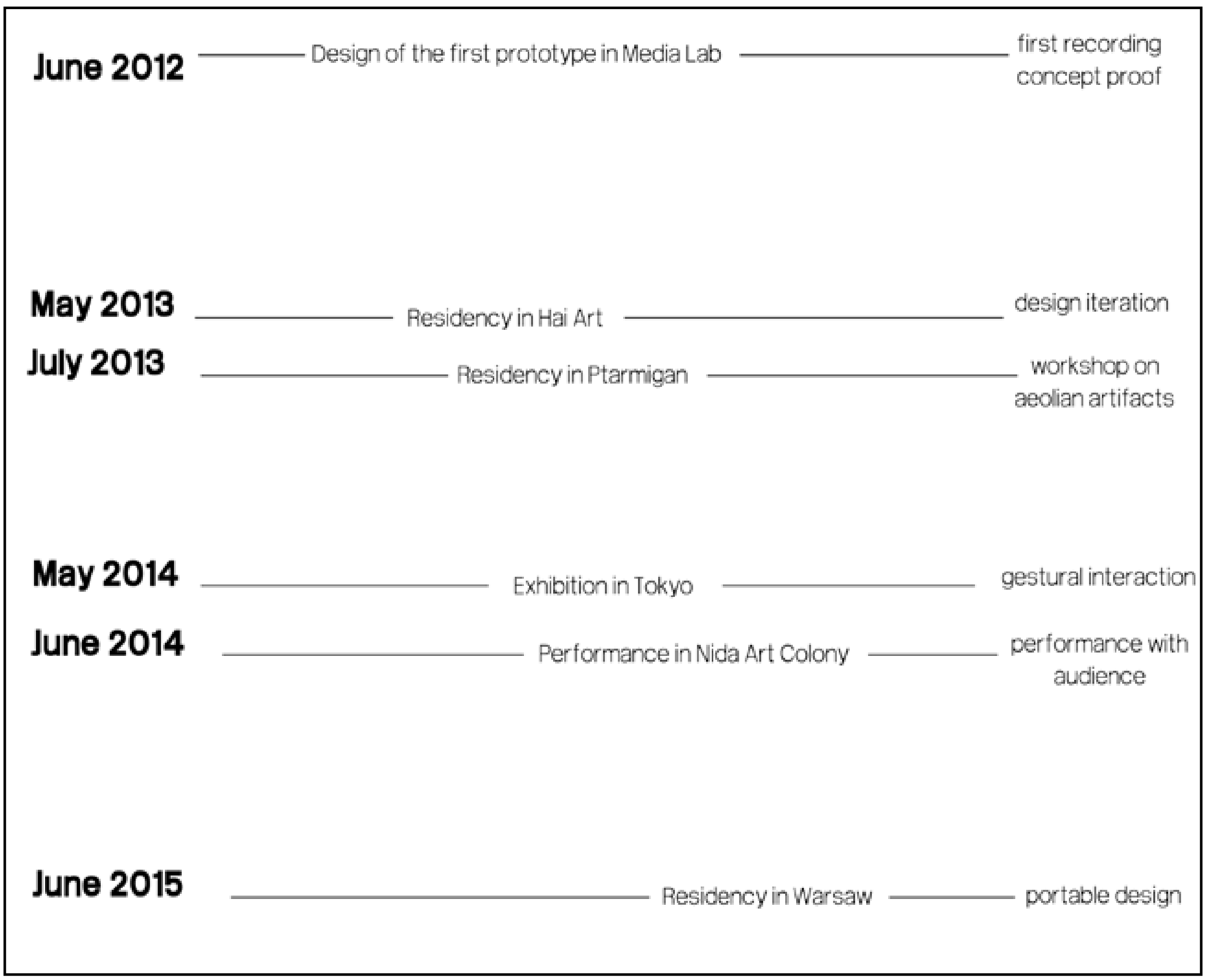


Fig. 4.1.1 Production schedule / goals obtained

4.2 Designing Interaction with electronics

Description

Pulsar Kite started as a school project in Media Lab, during the course - workshop: Designing Interaction with Electronics, conducted by Michihito Mizutani. Back then the course required to design a project to design interaction upon an existing object used in daily life, by using electronic sensors and actuators. During the same course I collaborated with Adnan Muhammed Mirza from Media Lab's New Media program. We prepared a recording setup while testing the prototype. Adnan craft expertise on kite making and flying were crucial for the project, while I provided skills on prototyping with Arduino and Pure Data for programming the sonic interaction.

Fig. 4.2.1 Adnan crafting / flying a handmade kite

Opportunities and challenges

The first part of the discussion to plan the project addressed what elements could be improved by using electronics. Hence, we proposed initially to obtain both sonic and visual feedback from interacting with a kite: it was thought to produce a visual feedback from kite's motion: as an example an array of light emitting diodes to describe a relation between motion and light, mostly experienced during night. Nevertheless, kite's motion provides already a visual feedback regardless of additional light. Then we decided that user's experience should be focused on exploring a set of possible tests to produce music and sound from interacting with kites.

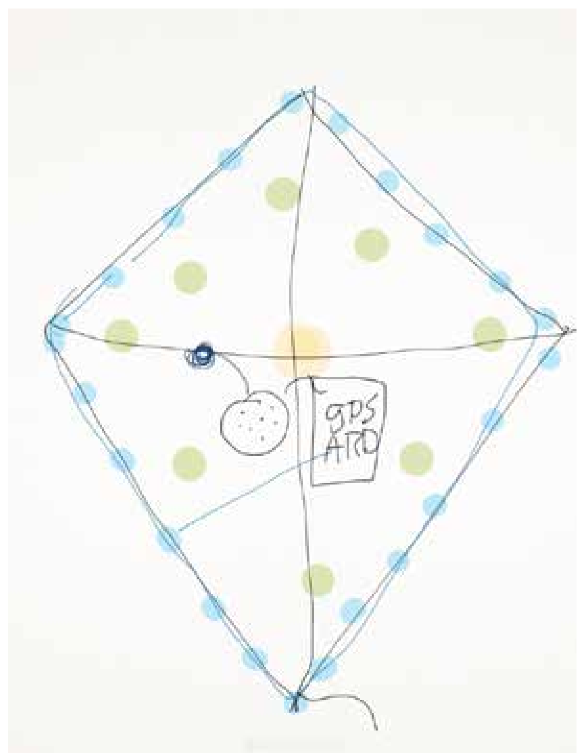


Fig. 4.2.2 Drawing Mockup of kite with leds

A sonic interaction focused on augment tangible objects is relevant on instrument making, specially on digital lutherie (Jordá, 2005) , new digital instruments, and augment physical games experience. Hence, we opted to go for an experimental approach in order to make audible a real time interaction with the kite; in other words, the interaction is based on a mutual relation between physical motion and a corresponding outcome of a set of electroacoustic signals. While playing with the kite there is a set of physical phenomena that can be translated into sound: e.g. the cord tension and wind force. Before going any further, we considered the following tasks to mockup a design for sonic interaction with Pulsar Kite.

Initial tasks to prototype

1. A real time manipulation of sound parameters should be possible by user's manual control of the kite.
2. To obtain as many possible sets of data from kite's motion states.
3. A number of electroacoustic signals could be produced from the sets of data obtained.
4. While prototyping with digital tools, the sonic experience could be mostly as "synthetic", however it is desirable that the sound design recreates "real world" acoustic qualities.
5. Apart from the kite, there is an existing sonic environment where the kite is played, which can provide sources that can be sampled to be used as materials for further sound processing.
6. This samples could be incorporated into the sonic outcome to bring a closer relation between what is sonically modified and the surroundings.
7. If possible, it would be interesting to blend in between sound samples and a synthesized signal.

After looking at the previous list of tasks, it is important to underline that many of the expected functionalities resemble to the way of manipulating an electronic sound instrument, more specifically a modular synthesizer[42], but in this case instead of having knobs or buttons to modify sound parameters, the changes in control are obtained from using the data that comes from kite's motion. On top of that, currently many synthesizers use all sort of custom controllers, such as joysticks, pressure pads and more recently, any kind of electronic sensors and data driven interfaces.

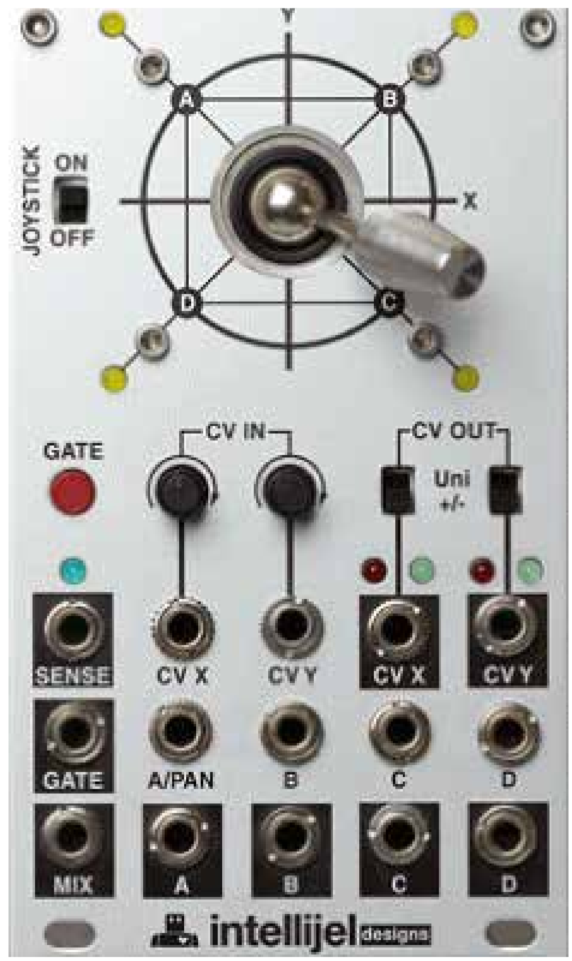


Fig. 4.2.3 Doepfer Modular synthesizer controlled by a gamepad or joystick

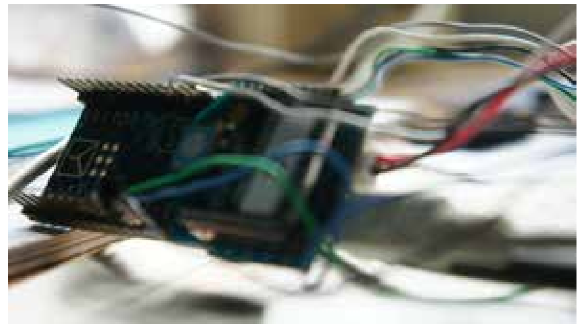
42 A modular synthesizer is composed of separate parts such as generators, processors and logic/timing modules.

Implementation

The design or handcraft is out of the scope of this thesis, however there are some general considerations found in the seminal book “Kite craft and kite tournament”, by Charles M. Miller.

“A kite usually made of a framework of wood, is lashed together with cord, strung with cord according to design, and finally is covered with paper; but in each case some other material might be substituted. The framework must be kept light and strong. It is usually made of wood, the pieces varying in number from two in the plain tailless, to sixteen in a good box-kite, and to a great many in a large tetrahedral kite. Sticks should be uniform in weight and bending qualities.” (Miller, 1914)

The motion of the kite was obtained using an electronic sensor that could measure orientation and acceleration, namely, an accelerometer. This sensor provides separate raw values which can be computed further as orientation and speed values from the kite. The sensor was placed in the center of the kite to avoid clutter and have and balance within a light weight setup[43]. Moreover, Michihito Mizutani hinted at Xbee[44] radios: as they offer wireless connection up to 90 meters, and can provide an scalable network of nodes for receivers and transmitters. Based on this technology principle, a future development of Pulsar Kite could incorporate simultaneous users controlling a same sound composition.



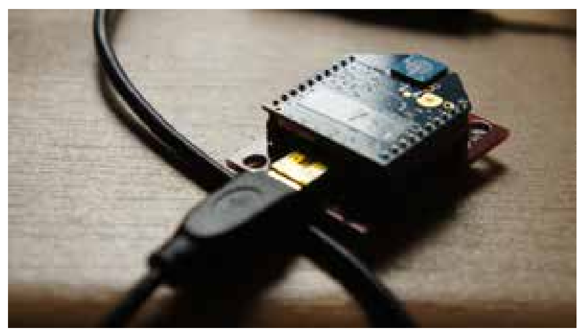


Fig. 4.2.4 Accelerometer attached to the kite. Arduino FIO + Xbee

Considering that we have three values of angle from each axis (X,Y,Z). Acceleration formula is obtained by the product of each value squared. Where “A” is the corresponding angle value.

$$\text{â ˆ}Ay^2 + Ax^2 + Az^2$$

43 An Arduino Fio offered a compact sized and Xbee compatibility.

44 Xbee by Digi International, is a brand of radio modules widely used in Arduino projects to receive and send information wirelessly. They are portable, low powered and accessible to learn how to use.

Orientation is obtained from pitch and roll formulas[45].

Roll = atan2(Y, Z) * 180/M_π;

Pitch = atan2(-X, sqrt(Y*Y + Z*Z)) * 180/M_π;

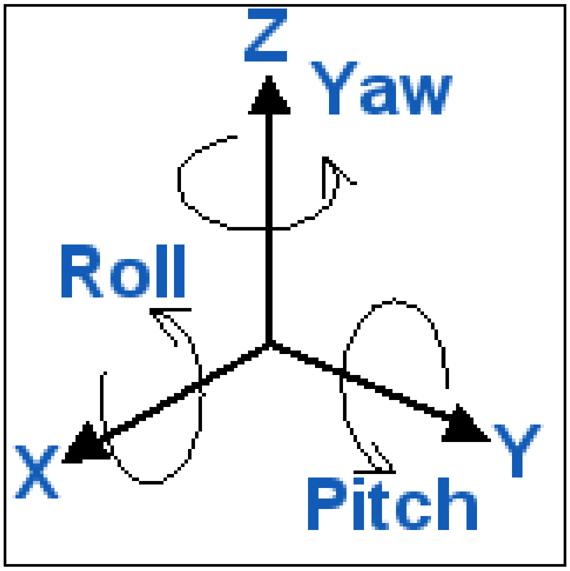


Fig. 4.2.6 Pitch and Roll on a X,Y,Z Axis

Based on a system that received sensor data to be computed into orientation and acceleration values to be used in the following functionalities that perform during the interaction.

1) Data will modulate an incoming sound signal received from the environment.
2) Data will modify discreetly parameters from an existing digital synthesis patch.

On the first function a sonic outcome worked to take advantage of real time acoustic events. The process was achieved using a sound synthesis technique known as Granular Synthesis[46]. Thus, the sounds produced during the physical interaction were processed to create sound textures sourced from sounds of the wind or the kite's material flapping . The second function was implemented using a chaotic and multi parametric synthesizer designed by Martin Brinkmann[47], the use of the latter one served as a proof of concept to compare at least two different sound modules, as the sound presets working on the same instrument/controller.

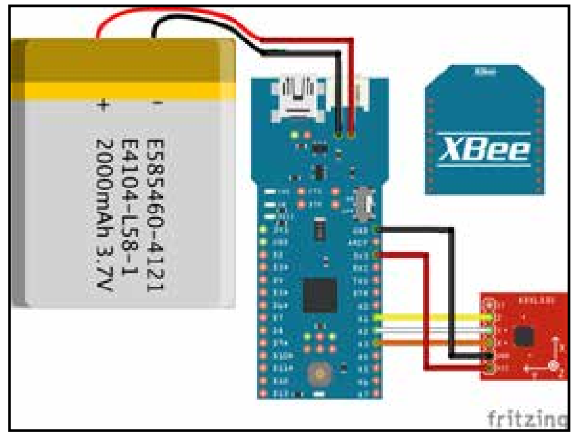


Fig. 4.2.7 Schematic for physical computing setup

Recording

The setup for the first recording test relied on having a laptop running Pure Data to record the resulting sound process and to receive and process the sensor data. Meanwhile, monitoring the sound was done using headphones to avoid a signal feedback between loudspeakers and the microphone used to pickup sounds from the environment. A portable sound card was used to obtain input signal from a microphone that later was processed witht the granular synthesizer. The test was documented in a video that is available to watch in Vimeo[48]. The video recording required to make a rough synchronization by starting both sound and video simultaneously on both computer and video camera. The video consists of two different tests where Adnan Mirza flies a handmade kite fabricated from trash plastic bags and bamboo sticks.

45 Source: http://www.freescale.com/files/sensors/doc/app_note/AN3461.pdf

46 Granular and Pulsar Synthesis methods are described in detail at the end of the third chapter.

47 http://www.martin-brinkmann.de/

48 https://vimeo.com/47652219

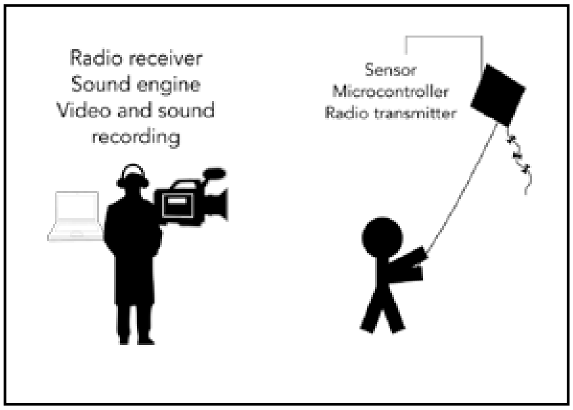


Fig. 4.2.8 Diagram of recording setup from the first recording.
Video 1. Pulsar Kite – Arabianranta
https://vimeo.com/47652219

Insights

As it is possible to see from the video recording on this test there is two sonic setups applied to the kite interaction: one is made with the multi parametric synthesizer, which contrasts with the subtle sonic overall quality provided by the live granulation. However, for this video and sound recording the user did not have sonic feedback from the resulting interaction. The user was aware of interaction only after watching the documentation, this problem should have been sorted out and improved user's experience, for example by using portable headphones. This issue also indicated the need to implement a portable system. Moreover, the system should have collected data in relation to a clock in order to ease synchronization between sound and video. Thus, four different layers of information needs to be correlated: time against motion data and sound with video recordings.

It was noticed the need of having a protection case to mount electronics in the kite could prevent impacts and keep the connections safe. After watching the resulting audiovisual documentation, it was regarded to have different sound modules that could work by using the same interface, this could enhance an experience of changing sound modalities to increase users engagement by interacting with different presets of synthesizers. Finally it was observed vaguely emergent gestures while Adnan was playing with the kite. A further study on gestures could open the possibility to increase engagement, as the user might tend to perform towards goal oriented functionalities obtained by achieving certain moves.

Fig. 4.2.9 Adnan Mirza testing Pulsar Kite in Arabianranta, Helsinki.

Video 2. Pulsar Kite – Kalasataman aukio
https://vimeo.com/48358752

4.3 Sound Art Residency in Hai Art

Description

Hai Art is a cultural organization in Hailuoto, an island located in North Ostrobothnia region in Finland. Hai Art emphasis is in sound art practices combined to engage with local community. Hailuoto is a natural reserve island in Finland surrounded with remarkable and unique settings with strong winds throughout the year. In addition, Antye Greie Ripatti[49] (aka AGF) leads Hai Art, with a a perennial experience in sound art and music as producer, artist and poet. During the time of the residency we worked on two main projects: to design a sound application for Hailuoto, and to produce a series of recordings with Pulsar Kite in the settings of the island.

Fig. 4.3.1 Hailuoto landscape view

In the context of a residency in sound art, it was appropriate to elaborate on the aesthetic experience of playing with Pulsar Kite. The value of using a media interface that deals with sound recordings and music creation in correspondence to surrounding natural conditions. In other words, the experience should emphasize site specific sonic properties along with wind forces. The result of this experience aims to layout a composition based on randomness and indeterminacy. The concept of playing with an "instrument" that responds according to wind conditions reflects on the notion of indeterminacy in music composition. This ideal was extensively pursued by the Fluxus group artists such as John Cage, Max Neuhaus and David Tudor[50].

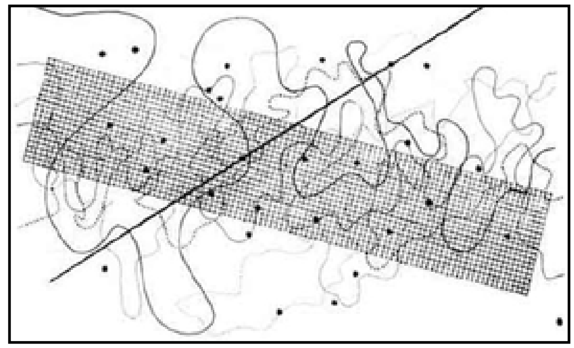


Fig. 4.3.2 Graphical Score for Fontana Mix by John Cage, 1967.

The goals of Hair Art residency can summarized as following:

1) Record Pulsar Kite within a setup that can provide feedback about the sonic interaction.to
2) Implement a new setup that works around the professionally made kite
3) Obtain insights about the experience from other sound artists who work in Hai Art.

Challenges and opportunities

Moreover, the residency in Hai Art offered the chance to reflect on the place of Pulsar Kite in relation to other artworks in the field of sonic experimentation and acoustic ecologies. As follows Hai Art has a program on sound artists visiting the residency for short term developments:

49 http://www.antyegreie.com/

50 Mainly the role of the composer is put aside, to give preference to an autonomos system, where the music result is handled by open and external conditions. An example of indeterminacy in music is the piece "Fontana Mix" by John Cage.

this projects demands the production of temporary sound installations, such as the ubiquitous interactive music work "Sonic Bikes" by Kaffe Matthews (2013)[51]. It is also worth mentioning the permanent acoustic architecture of Hailuoto Organum by Lukas Kûhne (2014)[52]. Many of the recent sound art works produced in Hai Art's residencies, including Pulsar Kite, are available in the CD compilation called "Sonic Island"[53]. Personally I had the chance to experience "Sonic Bikes" in Hailuoto which provided a sensible appreciation on an interactive music piece made with carefully crafted quality and playful usability. Furthermore being hosted in the artist in residence in Hai Art, enabled a long term collaboration that continued through the SoCCoS network, which continued as a residency in Warsaw also included at the end of this chapter.

Fig. 4.3.3 Sonic Bikes by Kaffe Mathews and Sonic Island album cover.

Implementation

After Designing Interaction with Electronics assignment was completed, Adnan moved out from the project in order to attend other studies, meanwhile I was interested on continuing the development of the project, thus I decided to put aside the handcraft value of kite making. As a continuation of the project a professionally made kite was acquired, in order to rely on a well designed aircraft tool. The new professionally made kite provides the following affordances:

- Controllable by two handles
- Longer cords (up to 20 meters)
- It can reach faster speeds and precise control

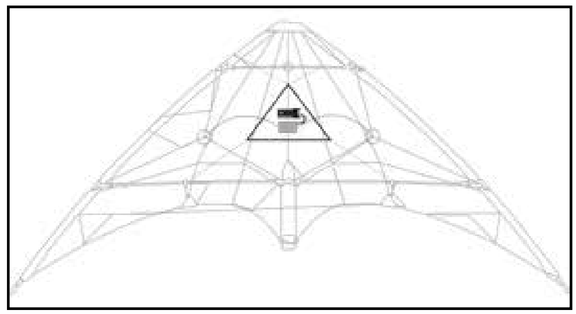


Fig. 4.3.4 Illustration of the professional two handed kite used.

Although it was possible to obtain a faster speed there was also a higher risk of damaging the electronics attached to the kite. Prior the starting to the residency, I designed a protective case made from casting a mold in silicon. The mold had space for containing the micro controller, motion sensor and battery. The design of this case was made with Blender (a popular open source 3D software).

While working on developing sound applications, it was considered to to take advantage of a smart phone sound engine for iOS. Firstly the setup would benefit from mobile portability mobile affordances, while keeping the same functionalities carried on the previous recording. The way of prototyping this app was made through using Open Frameworks in combination with a library that reads Pure Data patches and obtains serial read from an external

51 http://www.kaffematthews.net/

52 http://www.lukaskuehne.com/

53 It is possible to listen this compilation online at: https://haiart.bandcamp.com/releases

connection through the 30 pin port (TTL Serial Cable) available on iOS devices.

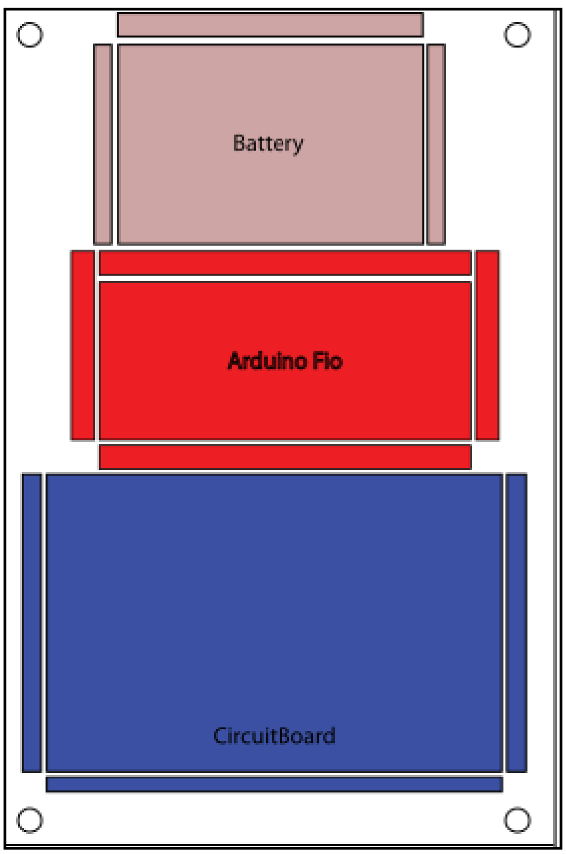


Fig. 4.3.5 Protective case designed with Digital Fabrication tools

Fig. 4.3.6 Prototyping the sound engine with iOS

Lastly, in response to provide sonic feedback for user and or possible listeners this time a portable speaker was included in the recording setup. This part of the new implementation was essential to experience in real time the sonic interaction of the project.

Recording

In order to test the updated setup, I did carry a number of recordings in different parts of the island. After a scouting for appropriate sites for flying a kite, a couple of recordings were done in an area of Hailuoto known as Pöllannokka[54] but also some tests were done in the settlement of Sunikari[55]. Kairit Sõlg and Antye Greie Ripatti kindly assisted during the video documentation. In this case there was no need to synchronize the processed audio against video, since the audio is recorded from camera and the sound is produced by the speakers.

Although, the portable sound engine was not completed to be used for recording in Hailuoto, the system ran from a laptop computer . The tool I tried to read sensor's information on iOS devices was a Red Park cable[56] , the main issue was that

54 https://vimeo.com/67712409

55 https://vimeo.com/137813480

56 http://redpark.com/ttl-serial-cable-c2-ttl/

there was no way for debugging or have certainty about parsing serial information. However it was possible to implement the granular synthesizer patch on iOS via libpd[57].

Fig. 4.3.8 Stills from the video recording in Pöllannokka
Video 3. Pulsar Kite – Pöllannokka
https://vimeo.com/67712409

Insights

Despite the technical failure on implementing a portable sound generator with iOS, it underlined the need improve towards a compact and dynamic setup that could accommodate in different locations, specially on remote conditions. While using a two handled - professional kite it was possible to obtain a better control of the kite. However, to achieve precise moves it is required to master skills through a learning process in the old art of kite flying (Which includes also to sense wind's force and direction). The experience produced along the learning process of using a sound instrument seems comparable the way a musician needs to train in order to master any traditional music instrument. Moreover this experience suggested the possibility to train the interaction system to recognize gestures, that is to say to identify classes of movements, and user expressions in order to trigger or shape sound accordingly. Finally, it was clear that the use of a portable speaker was a positive addition as it was used to assist the user to monitor the interaction between motion and sound process.

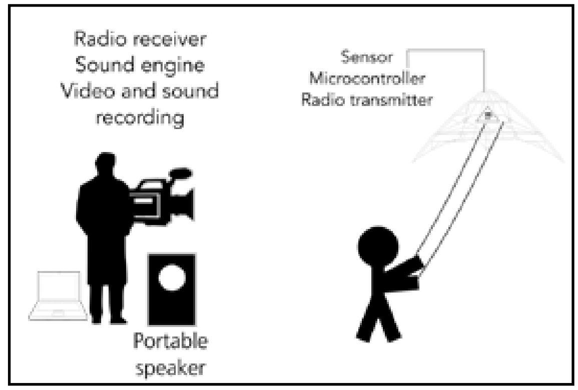


Fig. 4.3.9 Diagram recording setup in Hailuoto

57 https://github.com/libpd

Ptarmigan's Residency - Aeolian Artifacts

Description

Ptarmigan is a project space which operated in Tallinn since April 2011. Ptarmigan has provided a space for unusual projects of a participatory nature, focusing on critical, creative aesthetics and open-form interactions. The invited projects have included art, sound, film, video, performance and discussion. Lastly, Ptarmigan's strive is to create unique environments, support collaborative practices and focus specifically on international mobility and experimental educational forms.

Between June and August 2013, I was hosted as a resident in Ptarmigan to develop Pulsar Kite into a workshop model where participants could get familiar with some of the interaction design process and technology used on the project. Furthermore, the idea was to allow other artists to play with the concept of Pulsar Kite, by opening its source to a broader sense where workshop participants could create unique artifacts to yield wind forces to generate an artwork.

This way, Ptarmigan's goals summary is the following:

1) Develop Pulsar Kite into a short and undemanding workshop for participants
2) Present the project with other artists and receive feedback
3) Expand Pulsar Kite's concept into sound installations powered by the wind

Opportunities and challenges

Ptarmigan's residency provided a chance to meet other art organizations in Estonia, such as Polymer in Tallinn and Moks[58] in Põlva (South Estonia). In the first one, there was a chance to play a concert (as part of Polymer's festival). In the latter one, I brought Pulsar Kite to be played into a workshop called Sonic Interventions[59]. This workshop was lead by Mads Bech Paluszewski[60] and arranged by John Grzinich[61].

Fig. 4.4.1 Aeolian Artifacts Workshop. Ptarmigan, Tallinn. July 2013

Fig. 4.4.2 Pulsar Kite being played in Sonic Interventions.

58 http://moks.ee

59 http://juanduarteregino.com/Audiovisual-Performance/Sonic-Interventionism

60 http://obernkarbi.dk/about/

61 http://maaheli.ee/main/

The theme of Aeolian Artifacts came from the study I was doing on autonomous musical instruments, such as the aeolian harp by Athanasius Kircher[62]. Hence, to provide a context on the history of experiments with sound , Aeolian Artifacts was the topic proposed to widen Pulsar Kite principles into different playful applications. The workshop participants were asked to create sculptures, instruments or installations meant to be used produce interaction from wind force.

During a three days workshop, where I lead participants to create a simple experiment with motion sensors and Arduino's own sound generator to be attached to an artifact that uses wind force. The amount of time allocated to the workshop turned out to be the major difficulty, since it was challenging to condense Pulsar Kite (which implies a complex process) into a self contained practice where participants could develop an own instrument to be used as temporary installations.

Developments

The time and space offered in Ptarmigan allowed me to test simpler ways to minimize the technical setup and reduce the expertise required in order to arrange the project into a workshop mode. This task suggested to have a model of simple interaction to ease the learning of workshop participants of Aeolian Artifacts. Thus, in regard of a short term workshop (of three days), the implementation was centered on a single unit of sensor input, mapping, and sound engine based solely on Arduino. This model could be flexible to work over different types of interaction, besides using kites, such as installations that were powered by wind. The reason to make it flexible is due that I have not an expertise on handcraft kite making to teach, so participants could bring a ready made kite, or build other type of wind powered installation.

62 The topic of autonomous musical instruments, as the aeolian harp is elaborated on the fourth chapter.

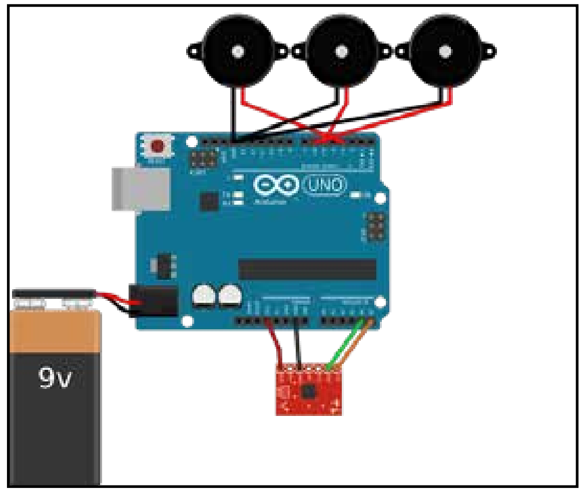


Fig. 4.4.3 Basic setup for motion to sound kit. (Pictures and Fritzing schematic)

The outcome of the workshop produced three projects to be displayed on a public space in Tallinn. The projects made were a lamp that reacted to motion, a sort of wind chime, and a wind follower sculpture. The venue chosen to present the works was the public square venue known as Linahall, located next to the Baltic sea oriented towards Helsinki. Although this spot generally has strong wind currents along the year, unfortunately on the day of presentations there was almost no wind to provide power to the installations.

Fig. 4.4.4 Resulting projects from the workshop I

Recording

There is two video documents produced from this residency, the first one, in which I used Pulsar Kite to play as an instrument, was made during Sonic Interventions[63] workshop in MOKS. This video presents a bundle of works aimed to use any sound source to be played by high powered actuators attached to metal structures found in discarded buildings or scraps of found metal. The second documentation comes from a video recording during the final presentation of projects raised in Aeolian Artifacts[64] workshop.

Video 4. Sonic Interventionism
https://vimeo.com/74054808

Insights

The structure of contents should be simplified for participants to assimilate, specially when they do not have any prior experience on programming or electronics. Also, some preparations should be worth to consider in future workshops, that is, to have ready beforehand materials to handout, such as manuals and schematics that includes technical information about materials, and procedures to build the kit.

Besides, it might have been allocated more time on discussing with participants on how to develop a concept for Aeolian Artifacts also to solve practicalities involved with their projects. Even though this workshop was meant to experiment openly with instruments powered by wind. It should be more concise and concentrate on producing a concrete list of possible projects to carry out, thus it might help to bring a working prototype.

As mentioned before, the scheduled date for presenting works did not have enough wind as expected. Hence, presentation in other residencies, performances or alike could be defined closely when are the most suitable conditions for wind to happen. This experience underlines to imagine two possible scenarios for Aeolian Artifacts and Pulsar Kite, one is the public performance or intervention and the other one is the private at users own time and interest. Nevertheless, the workshop was a success as it got the interest from participants who by completing the assignments learned basics around physical computing and interaction design.

Fig. 4.4.5 Resulting projects from the workshop II
Video 5. Aeolian Artifacts
https://vimeo.com/73602976

63 https://vimeo.com/74054808

64 https://vimeo.com/73602976

4.5 Leija – Sounds from Finland

Description

Later on in 2014, and coming back to the Media Lab Helsinki, at the Production Clinic course coordinated by Pipsa Asiala and Shinji Kanki[65]. This is a sound installation which emerged from a study project under the topic: "Sounds from Finland"[66]. This exhibition took place between the 1st and 6th of May of 2014 at the Spiral Garden Gallery[67] in the city of Tokyo, Japan. The selected projects for exhibition were Luonto (nature), Kivikasa (path), Polku (sauna stoves), and Leija[68] (kite).

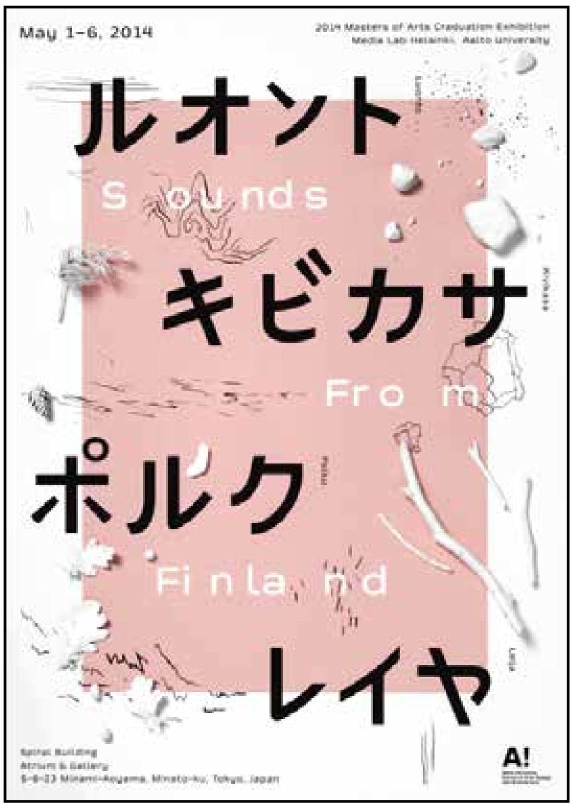


Fig. 4.5.1 Poster for Sounds from Finland exhibition, by Kiia Bellinson[69]

65 http://silakka.fi/

66 Online documentation for the exhibition https://medialab.aalto.fi/2014/03/06/sounds-from-finland-in-tokyo-japan-2/

67 http://www.spiral.co.jp/en/

68 http://juanduarteregino.com/Leija

69 http://kiia.fi/

The exhibition worked as an opportunity to present projects with a trajectory that leaded to a graduation show. Leija, which means kite in Finnish language, was the project that I developed for this exhibition, coming from the background experience collected with Pulsar Kite. The relevance of this installation was to further explore the sonic interaction with kites, regardless of actual wind conditions. As an offline mode to test user's engagement between kite motion and sound, following this procedure it would be feasible to prototype sonic gestures.

Accordingly, the goals I set to produce Leija were the following:

1) the installation needs to fit in the context of a gallery exhibition
2) develop sonic gestures that connects motion and sound within the kite. mounted
3) recreate the experience of flying the kite within a set of artificial simulation of natural forces
4) design a new musical instrument that merges Pulsar Kite concept with Finnish and Japanese traditions.

The purpose of Leija is to enquire into the motion interaction and gestures made by user while controlling the kite. In a controlled virtual environment, this relation can be explored separately and develop in detail. This way, Leija focuses on user control dimension regardless of the full setup with a real kite in order to focus on the gestural controller which enables a series of sonic functionalities.

Coming from a experience where wind unpredictability might withhold the potential outcome, Leija works as a virtual version of Pulsar Kite for an indoor exhibition format. Then users can experience a simulation of flying a kite while the system recreates natural forces and provides visual, haptic and sonic feedback depending on the interaction between autonomous agents and user's manual control.

Fig. 4.5.2 Leija installation. Picture by Johanna Rotko[70]

Challenges and opportunities

The context of bringing Leija to Japan, suggested an approach to emphasize cultural roots within the kite flying practice. As a consequence It is notable in Japan the traditional Hamamatsu Festival[71], where more than hundred kites are flown every 5^{th} of May as a ceremony to pray for boy's health and bright future. The celebration turns into a kite tournament where competitors battle to cut the ropes of the rivals by using only string friction. Besides, there is also the Giant Kite Festival in Sagami City, where large groups of men build and struggle to raise $15m^2$ sized kites, as a ritual of mutual collaboration and symbolic entanglement.

Fig. 4.5.3 Sagami Giant Kite Festival. Commons Wikimedia

Sounds from Finland exhibition called for works related to Finnish culture. From my own perspective, it was interesting to underline a possible dialogue between the nature and soundscapes owned by Japan and Finland. This undertaking was tackled in the course of two stages, firstly through bringing soundscapes and pictures taken during my residency in Hailuoto, Finland: the images and soundscapes were used as materials to compose Leija 's interaction.

Secondly, through creating a prototype of an experimental instrument, that could blend qualities of the Finnish Kantele and the Japanese Koto. Both are traditional stringed and horizontal instruments , widely present in the folk music of their respective cultures. Then its proposed a resulting hybrid of a Kantele + koto namely here as the "Koto-Kantele". This new instrument aims to play the role of a Musical Automata[72] that embodies the randomness of wind forces.

70 http://www.johannarotko.com/

71 http://www.jnto.go.jp/eng/location/spot/festival/hamamatsufes.html

72 More on Musical Automatas on the third chapter.

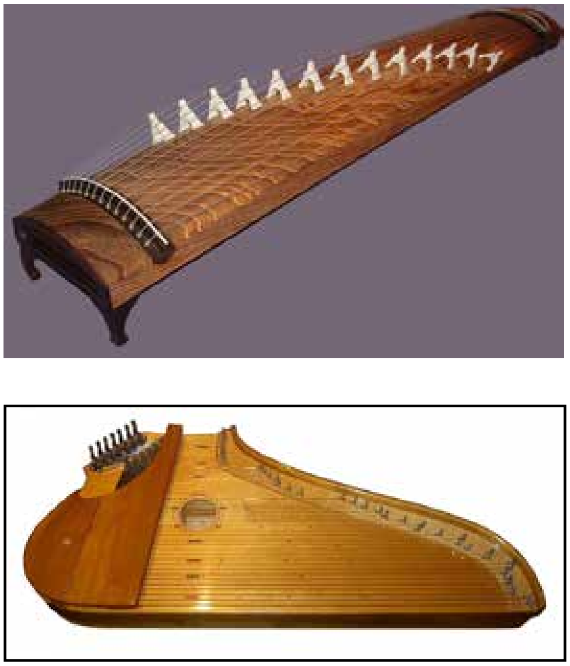


Fig. 4.5.4 Finnish Kantele (lower) and Japanese Koto (top)

Developments

During Production Clinic course we had access to Lume Studio and work at their facilities to develop our projects, until the they were ready to be shipped to Tokyo, couple of weeks before our arrival to setup the exhibition. The time span for production was divided between the process of building the acoustic instrument and programming the media interaction. To introduce the production phases I will start describing the interaction side (involving sensors, user interface, visuals and sound) and then will unfold around the Koto-Kantele.

The user interface consisted of two Play Station Move[73] motion controllers that were used to control a virtual kite. By manipulating these controllers it was possible to produce the following types of gestures.

(i) When users pulls the controllers up, they trigger to raise up the kite.
(ii) When users pulls the controllers down, they trigger a landing to the ground function.
(iii) While the kite is flying, user can orientate the flight trajectory by pointing controllers to certain direction.
(iv) While kite is flying, and users shake the controls, kite speeds up and produce spins on the x -axis.
(v) These gestural events are augmented when a wind current is generated in the system.
(vi) The buttons on the controllers allowed to swap in between different sample recordings.

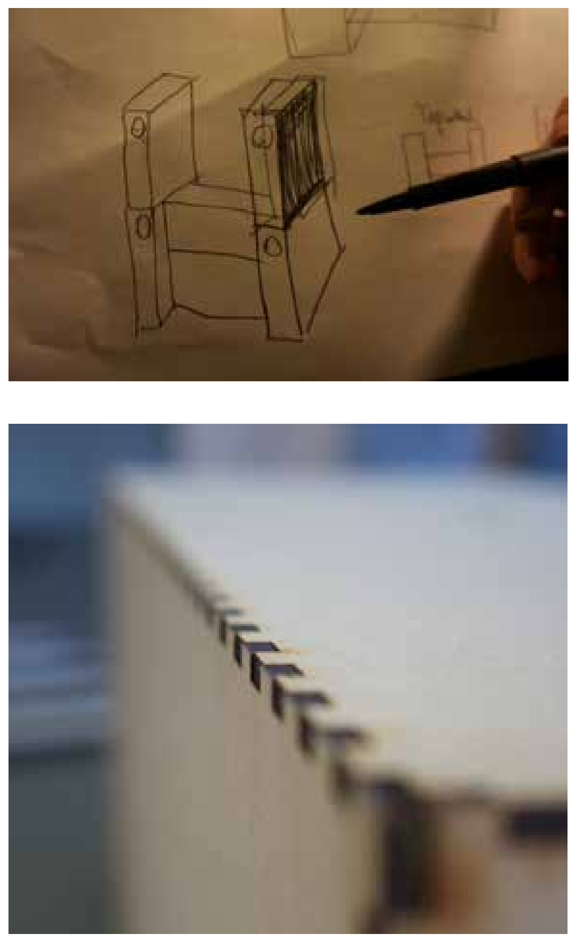


Fig. 4.5.5 Making of Leija in Lume Studio

There was also a haptic feedback coming from

73 It is a motion-sensing game controller produced by Sony, it is based around a handheld motion controller wand: it uses inertial sensors in the wand to detect its motion, and the wand's position is tracked using a webcam.

the controllers, when gestures were captured successfully, the controllers provided vibration depending on the level of force produced by the gestures. On top of that, the controllers emitted a coded colored light which was used in the system to track motion from each handheld controller separately, the motion capture was done with a webcam and the computer vision library in GEM-PD.

Fig. 4.5.6 Motion controllers for Leija

The visual display consisted of a three dimensional environment programmed in Pure Data, also using the GEM library. Hence, it was possible to control camera positions in order to follow the kite. Besides, some pictures of landscapes taken in Hailuoto were projected on this virtual environment surface to portray a realistic outdoor environment where the kite was flown. Finally, a particle system displayed visually the speed of wind forces to indicate to user when it was more likely to reach a higher speeds while controlling the kite.

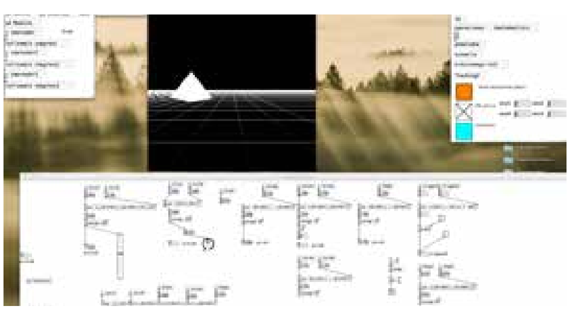


Fig. 4.5.7 Visual environment made with Pure Data GEM

The sonic outcome from interaction was made with a granular synthesizer that processed prerecorded field recordings from Hailuoto. Following the idea of Pulsar Kite to become into a more portable system, the main auditory display was setup with a pair of headphones to provide immediate response from interacting with the motion controllers. Also, headphones were chosen because they isolate the sound of the installation from the surrounding noise in the gallery space, which would be disturbing if we had chosen loud-speakers. Conclusively, the sounds heard from the headphones were spatialized with the HOA Library for Ambisonics[74], the role of 3d sound spatialization was to achieve immersion with the virtual environment.

On the side of the Koto-Kantele, the prototype was designed digitally using a Laser cutter to build MDF boxes. Kairit Sõlg supervised the design and overall functionality to accommodate the boxes within the space available for exhibition. This setup of wooden boxes worked to hold guitar strings stretched by guitar tuners and played by Direct Current Motors that received signal from an Arduino that was triggered accordingly to the overall system of Leija. As mentioned previously, the "Koto-Kantele" played the role of make audible the wind currents produced randomly in the simulation system.

Recordings

An overall recording of the whole exhibition is available[75] along with other spare video and sound documentation[76] from the making of Leija.

Video. 6 Sounds from Finland Exhibition.
https://vimeo.com/96554498

74 http://www.mshparisnord.fr/hoalibrary/en/downloads/puredata/

75 https://vimeo.com/96554498

76 http://juanduarteregino.com/Leija

Video. 7 Leija recordings.
https://www.youtube.com/watch?t=2&v=pL5zuukOuCA

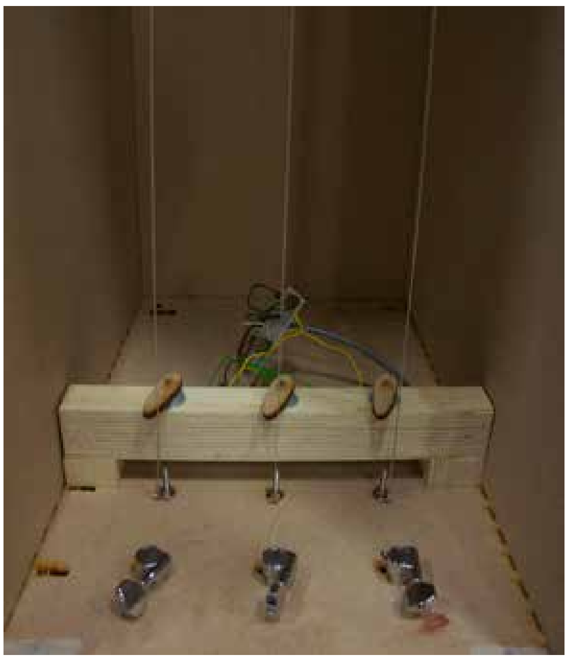


Fig. 4.5.9 Detail of motors playing inside the "Koto-Kantele"

Insights

The "koto-kantele" instrument has potential to develop separately from Pulsar Kite, so it can be further developed as an auditory display for interactive sonification. The following direction to take on this project is currently explored by the composer and researcher Andrea Valle[77], where he combines the use of algorithms programmed in Supercollider to play motors that stroke cords from a laud an other acoustic instruments.

77 https://vanderaalle.wordpress.com/

It is worth noticing that the interaction that the system was boldly running on Pure Data. However it would be desirable in future to test other low level platforms with a lower latency performance. The system in Pure Data comprised tasks of reading multiple sensors input, and activating and deactivating motors, also the sound engine and visual generation were part of the same combination. In general the system demonstrated to be both stable and powerful tool to run the installation continuously. Nevertheless, some issues related to power shortage on the controller's battery and portable headphones lead to few crashes on the system.

Also, Shinji Kanki (May 2014, through email communication) suggested that the sonic outcome could be more in balance between organic and synthetic sounds, in which I agree since the synthetic processing sometimes masked the source materiality from original samples. This could be sorted out by having a less radical granularity and larger threshold of unprocessed soundscape from interaction. Pipsa Asiala (through personal communication after the exhibition concluded) regarded the installation as satisfactory for the audience, specially for children, who were eager to try a sound installation with an intuitive interface.

To conclude, Leija brought the experience to try a different approach on Pulsar Kite's concept. In this case as an off reality model permitted to focus efforts on creating sonic gestures based on motion interaction. Moreover, Leija helped to diversify the feedback sources, including the haptic feedback from controllers when a gesture was achieved, and the outcome produced from the koto-kantele which connects with the use of strings to produce an additional layer of sonic events. Finally, the exhibition was a unique opportunity to showcase Pulsar Kite to a large number of visitors during the five days of exhibition time who were eager to try all of the installations of Sounds from Finland.


-26.6
-0.001
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4.6 Techno ecologies - Nida Art Colony

Description

Some weeks after returning from Tokyo, I was invited to present Pulsar Kite at the Inter-format Symposium "On Flux of Sand and Aquatic Ecosystems, hosted in Nida Art Colony"[78] between May 22nd until 25th 2014. "An event which is a merge between academic conference, art festival and cosy performative meeting of interdisciplinary professionals"[79]. The meeting reunited experts around the topics of sea ecosystems, man and sand made landscape, and food, energy and sustainability. In this scenario Pulsar kite was presented as one of the series of artistic performances to happen at the sea side of the Curonian Spit region in Nida, Lithuania.

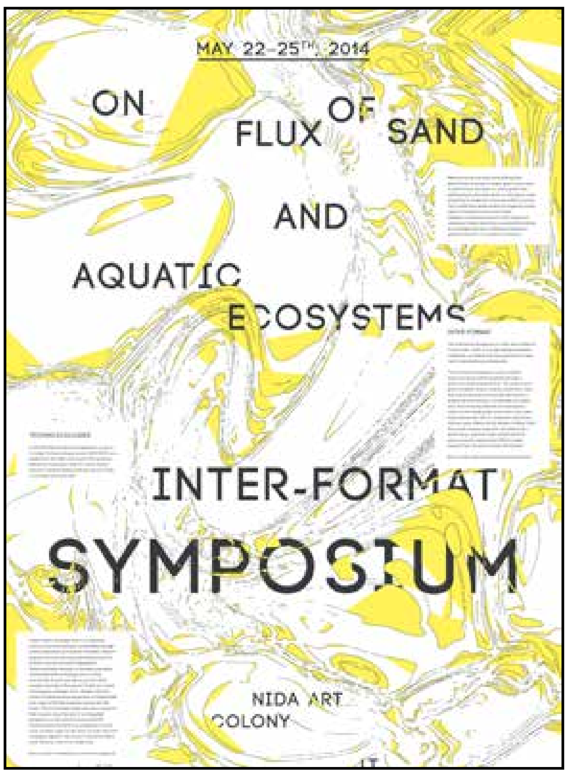


Fig. 4.6.1 Poster On -flux of sand and aquatic ecosystems. Nida Art Colony

78 http://nidacolony.lt/

79 http://nidacolony.lt/en/projects/symposium/inter-format-symposium-2014

Challenges and opportunities

The Symposium brought an interesting topic to discuss "Techno ecologies"[80]. This new perspective intertwines art science and technology, allowing a multidisciplinary approach to understand complex relations between human presence/activity (namely as the Anthropocene) and its environment affection. Techno ecologies was also the anchor theme for a conference[81] in 2013, arranged by RIXC[82]: a media art organization based in Riga, Latvia. Although seem disconnected from the New Media Art regular activities, there is an increasing scene of formerly media practitioners (performance, audiovisual and technologists) who are turning towards experimentation with real life systems. In Finland, organizations as the Finnish Society of Bio Arty[83] and Aalto Biofilia[84] that operate in this emerging field.

Developments

Due to the large number of presentations, talks, workshops, performances and screenings in the program of the Symposium in Nida. Pulsar Kite was presented as a sound performance at the public beach. The setup was the same as the arranged for the recordings done in Hailuoto, although in this case there was a large sound system facing to the beach, and presented as an improvisation concert with a large audience expecting to see.

80 Techno-Ecologies builds upon the concerns of Felix Guattari about the lack of an integrated perspective on the dramatic techno-scientific transformations the Earth has undergone in recent times. Guattari urges to take three crucially important ecological registers into account the environment, social relations, and human subjectivity.
http://nidacolony.lt/

81 http://renew.rixc.lv/

82 http://rixc.org/

83 http://bioartsociety.fi/

84 http://biofilia.aalto.fi/en/about/

Recording

There is an audiovisual documentary[85] created by the curator and cultural producer in Nida, Akvile Anglickaite. The video summarizes the activities of the Inter-format Symposium: "On Flux of Sand and Aquatic Ecosystems". My participation in this video starts around the minute 7,01.

Insights

The presentation got some feedback mainly from the audience who did not got clearly the sonic interaction and sound related, as it might seem to be obscure and unrelated to kites motion. This could be explained as one factor of Interactive Sonification, where, the person who manipulates a sound object has a more clear estimation on what effects will produce the instrument manipulation. Also too much sound processing is counter intuitive for user engagement.

A couple of negative factors appeared: the wind conditions were not the best at the appointment for performance. This could have sorted out, by leaving open the performance's schedule for when wind was more favorable (which happened to be the next day). On top of that, a number of persons in the beach of Nida complained bitterly about intervening their public space with sound, as they were intending to rest quietly. Thus, a man approached directly to turn off the sound from the mixing desk.

If there is a chance to have future presentations on a inter format symposium of this nature: I would consider, besides the performance, to have a talk presentation about the project, to familiarize the potential audience with the interaction system, possible failures, and, if they are interested to arrange a group of collaboration for the performance. This model would enable a more spread experience to engage with other people attending, so its not only about a person performing for an audience but a participatory happening that everyone can join.

Fig. 4.6.2 Pulsar Kite performance in Nida Art Colony

Video. 8 Nida Art Colony
https://vimeo.com/103045308

85 https://vimeo.com/103045308

4.7 SoCCoS Residency in CCA

Description

The possibility to be part of this residency came many months later, and it is considered in this thesis as the last production episode of Pulsar Kite. The residency was held between June to July 2015 at the Center of Contemporary Art (CCA in English, CSW in Polish) – Ujazdowski Castle, in Warsaw Poland. This A-I-R program was part of a larger project called Sound of Culture – Culture of Sound (SoCCoS), organized by a number of european organizations working in the field of sound art and sonic studies. SoCCoS project is shared by Hai Art (Hailuoto - Finland), Binaural/Nodar (São Pedro do Sul - Portugal), DISK Berlin (Germany), A-I-R Laboratory (Warsaw - Poland) and Q-O2 workspace (Brussels - Belgium).

According to SoCCoS webpage: "The project focuses on language, differences in urban and rural environment, and work with local communities. It practices a structuralist approach in relation to sound art residencies, connecting different sound art practices, geo-social contexts and art production typologies. It has a strong focus on research, elaborating on geography, culture, sound, language and site-specificity. It will engage a new generation of artists through micro-residencies".[86]

In this sense Pulsar Kite role in SoCCoS unfold around site specific locations where:

1) It is meaningful to present Pulsar Kites as an exploration of public spaces with rich sonic qualities, and otherwise unexplored.
2) It is possible to involve local artists in the process of design and participatory performance.

Challenges and Opportunities

86 http://soccos.eu/about

A residency of this nature requires from artists to connect with the local community (mostly consisting of other artists) in order to exchange knowledge, being it in the form of workshops, lectures or performances. Thus it was agreed beforehand to bring two main activities: firstly I could have the chance to work on developing further Pulsar Kite, then I could provide open studio meetings where people interested to get acquainted with the design and production process. The second activity would be a workshop on electroacoustic devices[87] for music performance, which took the form of workshop meetings where participants could built a kit for a synthesizer that reacted to light input. Both activities lead to a final public presentation in the form of a sound performance.

Moreover, the coordinators of SoCCoS project in Warsaw, Marianna Dowkowska (Center of Contemporary Art Ujazdowski) and Krzysiek Marciniak (Glissando Magazine) suggested to explore a possible connection between Pulsar Kite and the site known as the Flying Kite or Warsaw's smile. This relation would give a site specific value allocated in one of the most transited areas of the city.[88]. The diamond shaped area known as the Flying Kite it is surrounded with squares, and public parks. Moreover this area provides a varied source of soundscapes to survey, which ranges from isolated green areas and cultural centers to heavy traffic roads and churches.

87 The idea of a workshop on electronic instruments comes greatly inspired from the work I did as an intern with Derek Holzer at his studio Macumbista Atelier, during Autmun 2015 in Berlin, Germany.

88 More on Warsaw Smile by Centrala - Designer's Task Force at http://centrala.net.pl/our-work/smile

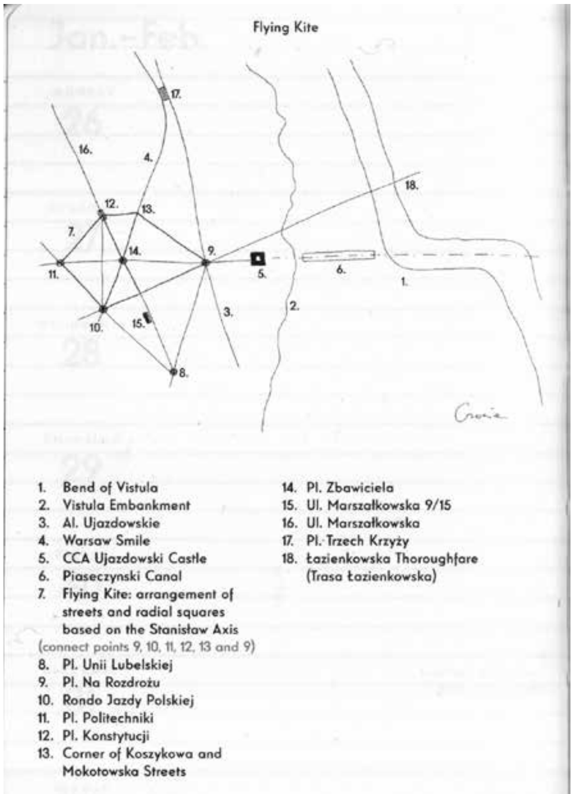


Fig. 4.7.1 Map of the Flying Kite area in Warsaw. Drawing by Malgorzata Kuciewicz

The residency settlement was hosted on a stablished A-I-R platform that facilitated a studio space, an opportunity to collaborate with other artists who were at the same time either coming to exhibit or working there. Also it was remarkable to have granted to a budget for materials to produce the work, and assistance from local volunteers to help on exploring feasible areas to fly kites. Although the timing for residency was restricted to one month, it was possible to connect with a group of participants[89] who took part in the workshop and open studio meetings. These people was attracted through an open call for participants, that was published weeks before the residency started.

The goals of the residency were structured as in the following list:

1) Develop Pulsar Kite into a mobile setup that can be presented as a performance.
2) Involve workshop participants to co design Pulsar Kite's sound interaction.
3) Introduce workshop participants into the electroacoustic instrument making

Developments

In that way, Pulsar Kite was developed into a portable setup that would ease the user's experience to concentrate mostly on functionalities provided by a single interface (in order to free the setup from laptop and to use either portable speakers or headphones). To achieve this, I worked with a Raspberry Pi[90] to enclosure all functionalities into a pocket computer powered with a portable battery. More over, the participants could contribute by producing sonic materials to be played (both interactive compositions or pre recorded samples) also by giving input on the usability of the project. Some minor changes on the setup were also done by eliminating the Arduino Fio from the setup and relying only on Lillypads[91] Xbee receivers to transmit serial data from motion. Also the portable setup based on Raspberry Pi still fails to include a sound input to process external sounds, hopefully this will be sorted out in the next version of improvement.

External participation was arranged via two ways: the first one was held on workshops open to learn how to create basic sound electronic instruments: from simple synthesizers that reacted to light, and signal amplifiers for contact microphones and coil pickups. This learning process expected to approach participants to learn from simple sonic interaction experiments and signal processing. Secondly, participants could attend to a series of open studio meetings where was possible to learn

89 Although the workshops and open studio sessions were advertised in Polish, there is still a number of assumptions that require to be resolved on case by case.

90 A single board computer, credit card sized, based on Linux. Open Source and thus Pure Data friendly. Although with some sound engine issues that can be worked around it eliminates a lot of the complicated setup required before.

91 Lillypad is a brand of electronic components used mainly for wearable electronics, they are Arduino compatible and sewable to textiles and fabric of all kinds. In this case was easily sewed to a piece of textile attached to the kite.

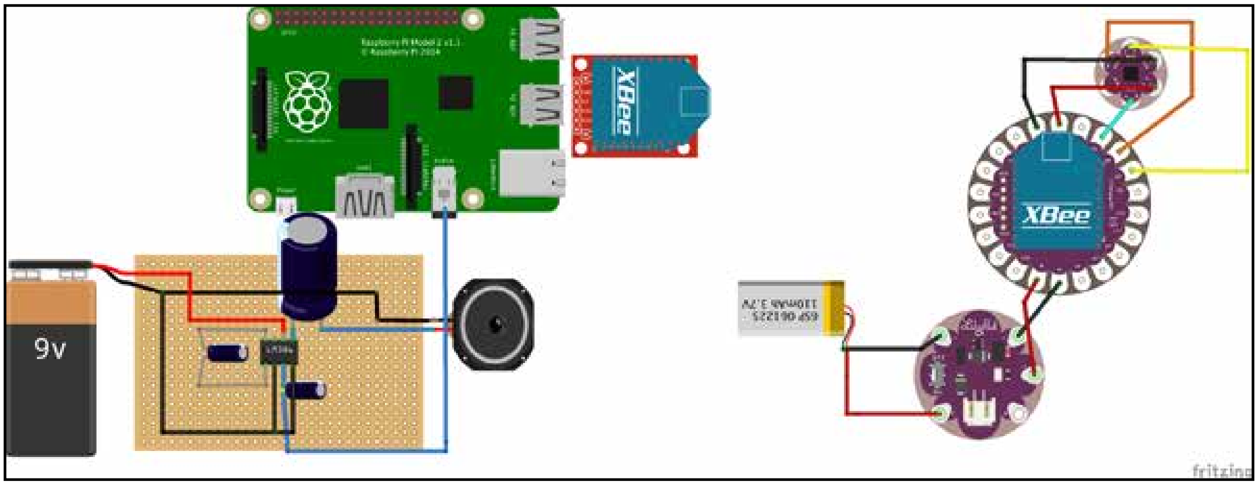
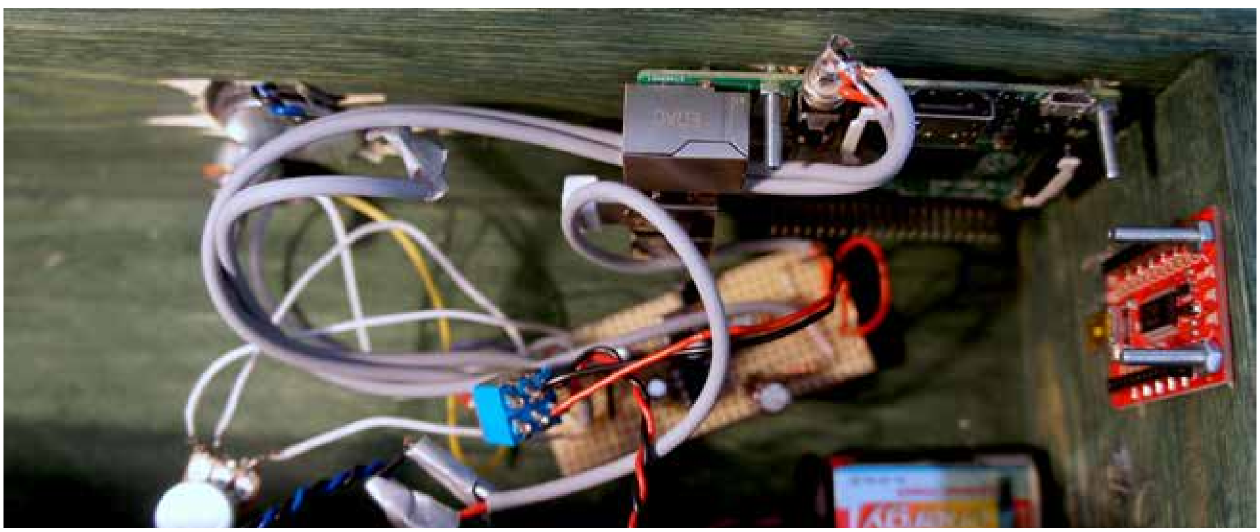


Fig. 4.7.2 Setup for Pulsar Kite produced during Residency in CCA

from the process involved of updating Pulsar Kite. Likewise, the open studio granted to arrange a number of meetings to learn the basics of Pure Data and Arduino to prototype simple physical computing devices, like Pulsar Kite. A newer version should also include the possibility to fine tune sounds by using a physical interface.



Recordings

There is video documentation about a test with the version of Pulsar Kite worked during this residency[92] The video was facilitated by CCA's crew. Also there is a number of pictures and documentation from the workshops and the last performance – concert related to the Electroacoustic workshops found at the blog post on my webpage[93] about this residency.

Fig. 4.7.3 Electroacoustic Atelier concert and Pulsar Kite Intervention.
Photo by Bartosz Górka, Courtesy of Centre for Contemporary Art Ujazdowski Castle, Warsaw.

Video 9. Pulsar Kite – Warsaw
https://vimeo.com/135348555

92 https://vimeo.com/135348555
93 http://juanduarteregino.com/Sound-of-Culture-Culture-of-Sound

Insights

The scope of this residency was more focused on producing visible (and audible) results such as performance and concerts, that came from the workshops and open studios sessions. It was possible to notice that a simplified approach platform (such as having workshops on basics) do empathize more effectively with external participants without any prior experience on sound electronics or physical computing. However, far from realizing a last version of what could be a workshop merely on Pulsar Kite, the activities produced during this residency helped to frame what expectations are worth to participate in: this can be interactive composition, and control and manipulation of electroacoustic signals.

I valued the approach that curators put on experimental music and a broad field of sound art activities, this perspective provided a view to situate my work in relation to Sound Art practice. For instance there was an interesting contrast between my project and the project that Caroline Claus[94] did, which was focused on developing sound mapping from areas in Warsaw, to reuse-reimagine spaces through participatory performances. Thus, although my project during this residency was substantially more practical and focused on crafting sound objects, I consider that mine somehow relates with her project, as both need to create engagement with participants to widen the social experience of artistic practices around sound.

The sound piece I created for Pulsar Kite during my residency, was somewhat related to the fluid logic I proposed on open studio meetings. This process took shape mostly while talking informally about of the project with participants and people who were interested in the project.

94 Caroline Claus was the other artist in residence invited to work at the same time as part of the SoCCoS project in CCA.

More over the relaxed and private environment of the residency provided me with inspiration to work on a interactive music composition, which is at last a very meaningful part for Pulsar Kite.

In regard of the goals defined for this residency, the time and space offered permitted to effectively obtain a working, still perfectible, mobile setup. There was a moderate involvement of participants on designing sound modules for Pulsar Kite's sound interaction, however the electroacoustic instrument making workshop had a better outcome and engagement of participants on a simpler tasks. This can lead to optimize a technique for workshops which can be simple to produce motion to sound experiment based only on simple components.

To conclude, I found both intriguing and motivational to encounter unexpected coincidences between my project, as the area known as the "Flying Kite", and meeting with the sound artist and curator: Czarny Latawiec ("Black Kite" in polish) – aka Daniel Brozek. Finally, the Archipelago Jazdow[95] held an event specially for crafting kites with children. This number of experiences are greatly valued in the human dimension of my project.

Fig. 4.7.4 Workshop on kites for children arranged into the Archipelago Jazdow festival.

95 A summer festival event with activities on Sound Art and performance organized by CCA, at the same time of my residency.

4.8 Chapter conclusions

The progress obtained form the first prototype until the last version has concentrated efforts on obtaining a simpler and reduced setup aimed to make audible sonic interaction. Although, some functionalities are still in process to be finalized, as a solid interface able to switch in between modalities and have mapping controls for sound processing values, also data capture to support video and sound recording. The tasks which are left to do can be implemented during the next artist/research residency, scheduled to happen between February and May 2016 at the Institute of Advanced Media Arts and Science (IAMAS) in Gifu Japan.

The first residency (Hai Art) allowed to put the project into perspective and dialogue with other sound art projects.The second residency, in Ptarmigan, helped to run a workshop related to Pulsar Kite, where it was possible to try out within few days a simple but meaningful experiments. The exhibition in Japan helped to gain insights on gestures placed in between sonic and motion interaction, also to find a balance along the threshold of sound processing. The public performance in Nida Art Colony demonstrated possible risks of having over complicated sound processing and the unpredictability of response in public space. In Warsaw's residency the experienced was focused again on the portability implementation and a simpler approach on sound electronics which can help the further design of a total workshop on Pulsar Kite.

On other aspect, throughout the experiences here described, Pulsar Kite has oscillated between private and public performance, a music experimental instrument or a sound art piece. In both cases it is clear that tangible experiences with a nomadic sound interface can promote social engagement in outdoor activities, physical interaction and the other benefits obtained from surface-less interfaces. Finally the residencies helped to discover the potential of attraction around the project, which has started and will continue in future.

Chapter 5
Workshop Guidelines

As defined at the beginning of the thesis, it is a long term goal to be able to design a workshop on Pulsar Kite. Coming from the experience of Aeolian Artifacts (Tallinn) and Electroacoustic Atelier (Warsaw). The design of a workshop takes some of the insights raised on this two events and its compared with some guidelines found in a research paper related to workshops on media technology aimed for artists, in the context of ISEA a media art festival. In this scenario objects becomes assemblages, practices ecologies, and information is ubiquitous, words like "laboratory" and "workshop" comfortably replace words like "gallery" and "exhibition.

According to Allen et al. (2011) a workshop in media arts is not related to the production of an art work in the classical sense, a workshop enables an understanding of both ecology and entanglement of people, ideas, tools, materials, systems and processes. This could lead to think that a relation between knowledge transmission needs to enable a unique ecosystem where participants, facilitators and instructors exchange meaningful information to support the goals of the workshop, that is to say, the meaning of the workshop is beyond the merely knowledge transmission but its focused on generating creative empowerment value on participants. This can be applied on defining a degree of customization of the interface by personal choices of participants, that is, they should choose what sounds or modalities find more interesting to implement on their sonic kite. The more options available offered on a blank interface, the more potential is on generating innovation and meaningful engagement.

Furthermore, the workshops on Art and Technology offer a chance to involve artists and cultural agents who work actively around performance and installation, theatre, on and off line communications and media. This broader field may cloud artistic or personal objectives- including some of the community engagement agendas from institutional - political organizations that work with art and culture. So far young professionals form the main audience of the workshops that I have arranged: music and sound composers, designers, performance artists are the most apt profile to fit in the interest to carry out a project like Pulsar Kite. However their enthusiasm should be better rewarded by easing their technology expertise deficiencies. Then, visual manuals, and exhaustive documentation with clear schematics needs to be prepared beforehand.

Chapter 6
Thesis Conclusions

On the first chapter it was described an overview of the project along with the main problems and strategies set to unfold around the main research question: how to design a sonic ludic interface from a kite. This question was addressed in parts along the four chapters, in regard of sonic interaction design, ludic interaction and he production achieved so far.

The first chapter provided insights of designing an interactive sound systems based on data sonification and user manipulation. The relation between user, sound object, and environment described in the experience of sonic interaction is closely related to what is aimed to correlate in a closed loop for use engagement and sonic exploration. The similarities suggested between the sonic kite and any other music controller are evident mostly through the strategies later implemented during the production phase. The Digital Lutherie paradigm served as a source of inspiration for modeling usability and sound affordances suggested in Pulsar Kite. The choice of granular synthesis technique responds to an aesthetic criteria, but also connects within the interest of integrate users experience in the cycle environment listening and sonic manipulation.

The second chapter described what affordances has the kite from the perspective of the play element, know as ludism. From here, it was possible to describe scenarios for single or participatory performance. The benefits of a solitary use of the sonic kite is improve own motion skills and reach a deep listening between instrument manipulation and environment. While having a private use of Pulsar Kite it also lowers the responsibility on a single performer. Although, the presence of observers will be regarded in future to improve usability and aim for a participatory modality with multiple users.

The third chapter described examples of ludic sound works, that combine art and technology. The examples include musical automata systems and aeolian artifacts found in a long standing tradition of sound artifacts inventions. It was possible to compare Pulsar Kite approach with other similar projects in media art that share similar goals, or use a similar implementation. Hence, there is not guarantee that Pulsar Kite is the first of its kind, as there are many other projects being benefited from the potential of embedded computing and pervasive technology. Yet, Pulsar Kite's own potential still yet to be really found.

The fourth chapter described what has been produced so far with Pulsar Kite, the technology implemented and the experience obtained during art residencies, performances and recordings. Due to the nomadic nature of the project, the development has worked in early stages from prototyping the concept proof to working around a portable setup that ease the presentation in outside locations.

Currently the setup is consistent to work as a wireless and embedded computing system, and it might allow to grow specially around the user experience to enable an intuitive use, which has not been achieved so far, it also lacks of gestural controls and basic tasks as turning or turning off the whole system. Moreover the production has provided valuable experience to detect failures and potentials that can be further explored. What went wrong is the over complication of sound interaction and processing of sonic materials, it is clear then, that a transparent and simplified modality might lead to a more clear path for iterative design.

The workshop guidelines suggested describe a potential to continue the experimentation that has followed the project along the production stages. These workshops may allow integrate co design and user tests from the principles proposed in this thesis. The future design scenarios will take in account the media art workshops as a platform for socializing the project developments and find out what works and what not, from a pool of both specialized and general audiences, which is important because a sonic kite should be a interface aimed only for sound artists or media technologists, but it should beat the reach of the general population: the folk. Specially those who don't bear an interest to learn the steep curve that suppose many of the traditional music instruments.

To conclude, coming from a starting point where I had a basic knowledge on physical computing and sound synthesis, Pulsar Kite allowed me to improve skills on the field and to develop insights around sound art and performance, and to collaborate with other artists while discussing about the project or helping to build their own sonic kite. What I learned from the project is that by designing a sonic ludic interface from a kite, one can obtain interesting sound experiments, gather social experiences on artists residencies, and obtain valuable experiences from a tangible interface that can connect lively experiences with environment, humans and sound objects. Sound art practice merged with performance art in a ludic manner that can be both beneficial for single and participatory contexts. The interfaces of the future might integrate similar pervasive computing approaches, by augmenting sound objects as a new field with potential to provide new meaning on our daily interactions.

Chapter 7
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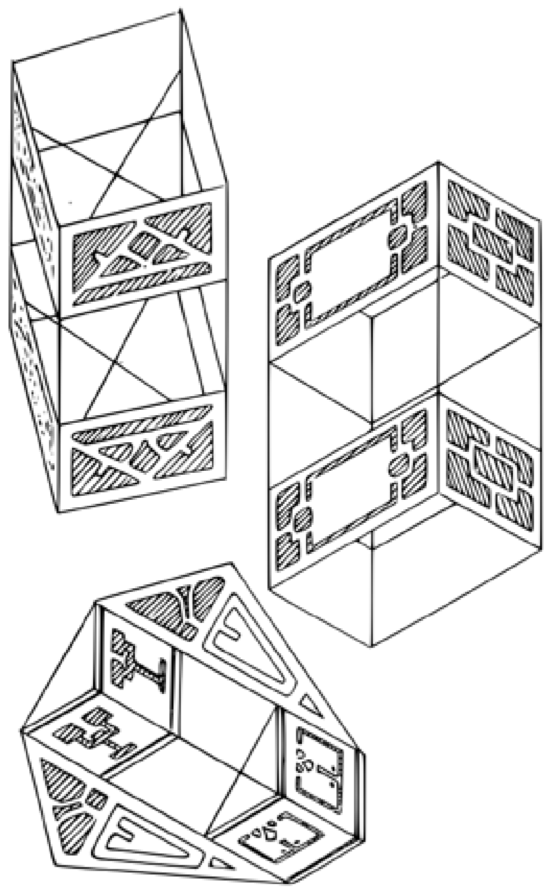

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