

Interdisciplinary Applications of New Instruments

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Abstract

In this paper we will have a short overview of some of the systems we have been developing as an independent company over the last years. We will focus especially on our latest experiments in developing wireless gestural systems using the camera as an interactive tool to generate 2D and 3D visuals and music.

Keywords

Mixed media instruments. Interdisciplinary applications of new instruments.

INTRODUCTION

Our experience as an independent performing company developing their own interactive systems gives us an empirical if not analytical background, which we can share, and use to raise some simple questions relative to the future of musical instruments. Our approach is a multidisciplinary one, the collaboration between two people coming from two fields of the performing arts (music and visual theatre). Further collaborations with artists from other art fields like dancers, performers or visual artists and musicians have given us the possibility to explore different approaches to the performing arts. In this context, digital data becomes a nexus for the manipulation of the information in order to generate mixed media environments.

MULTIDISCIPLINARY APPROACH OF NEW INSTRUMENT MAKING

Since the digital tools have been available to artists, there has been a constant trend to develop new set-ups, if not new languages, taking as a base the multidisciplinary approach of expression. The MIDI protocol, originally developed by the music industry (i.e. for musicians) has been rapidly accepted as a general-purpose protocol. Multimedia software platform such as Macromedia Director or video oriented Image/ine from Steim have led artists from different fields to collaborate in the making of new set-ups and organisation of the performing art. This meeting between different creative languages might not be a new approach and, for some, this might lead to a contamination of the different art forms, but to us it is a valid field of exploration and we think each language can learn from the other and ideally new languages will emerge. Developing performing tools in this multidisciplinary surround can be considered as a cross between designing instruments for novice and

looking for new paradigms of music composition. Developers who inspired us like A. Mulder J. Paradiso and B. Bongers have made a lot of important research on sensor devices and interface design, and showed us that there are new trends and ways to be explored.

From these works and from the many classifications and use of sensor devices in the realisation of new instruments, we discovered that there could be many ways to follow which lead to getting away from the paradigms of traditional instrument design. Working with people from different backgrounds, we also found out that the dancer (or performer or visual artist) has a different approach to the instrument than a musician.

Except for a few complex systems (like The Hands from Michel Waiswiz and the hyperinstrument approach from various authors), the skill needed to the use of sensor based electronic instruments is low compared to traditional instrument training. A skilled performer will be able to train quickly to use such a system so that the movement and the sound can become two very connected parts of the performance.

As a result of that, we decided to take an approach to the design of instruments for real time performance which is in priority led by the relevance of the technology being used to the concept of the piece. Another important factor is the intertwining artistic languages being used. Factors like ergonomics or physical properties of the sensors are determinant at the time of realisation only.

Examples of interdisciplinary applications in Konic thtr

Here we will describe some of the systems we have been using in different projects.

Background

The meeting between A. Baumann; who feels the need to develop new instruments for the manipulation of new sound data but also feels there is not enough time to develop both instrument and the skill to play it; and Rosa Sanchez; whose main interest lies in 'the body and its extensions' and the need of contemporary society to project information in a multi-sensory space with the help of technology; starts the development of interactive tools for live performances.

Our usual way to develop a project is to start with the concept and form (performance, installation/performance...) and from there, design and develop the interactive interfaces. We normally develop different autonomous systems, rather than one unique instrument, which are activated in the course of the performance, each of them designed to fit, by their design or use, the concept of the piece.

Some systems developed by Konic:

Here we give a short description of the systems we have designed that we feel most relevant to this paper, by the fact that the sound produced is intrinsically linked to other creative languages.

1994 / 1995: SANCTUS Installation/performance.

1994, Institut of Contemporary Art_ICA/London. 1995 PODEWIL, Berlin

Concept: sexual role and gender and technology

Performance: interactions body-sound-image. Creation of gloves allowing to generate and modify sound using the electrical resistance of the skin of three inter-connected performers.

Installation: Inter-connection of various information-generating systems: video installation with surveillance cameras and pre recorded images + sound installation + computer network installation.

Description: the central figure of the installation –Dona Matrix - wears gloves as an integral part of her suit. The contact of the fingers on different part of her body allows her to compose the sound and visuals. At one point in the performance two characters are connected to her, each with a pair of glove which uses the direct electric feedback of the skin to modify the sound Dona Matrix is generating (they cannot play if she does not). Later in the performance the audience is invited to modify the sound and images produced by the performers via keypads.

Dona Matrix is seen as an exposed subject (object?) of discussion. Her movements are very limited, and by her subtle choreography, she is controlling or sequencing the information (live and pre-recorded video, computer graphics, sound, text information entered in the system by the audience). Her eyes are covered, so her only reference is the sound she produces and the way it is being manipulated by the other performers and audience.

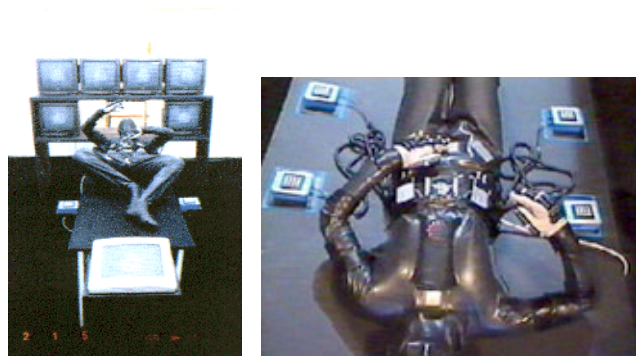


figure1 & 2 : SANCTUS installation & performance Dona Matrix close view of gloves & keypads

1997: IO.Zn Performance-concert for an interactive sound space.

GREC-Barcelona Summer Festival, Barcelona

Concept: the comfort-control culture

Performance: a 70 minutes long performance divided in four parts: comfort, comfort/control, control and memesis. Each part uses a different type of input device to interact with the system. No audience participation.

Description of the comfort/control system: the performer manipulates a touch screen in which she is offered a menu and chooses different parameters to manipulate. The information is sent over MIDI to a second computer. The second computer generates images, which are projected onto a screen on the stage. On that screen photoresistors will give information about the quantity of light which is reaching them. This information in turn will be used to trigger sound. The cause and effects are dissociated; touchscreen -> image processing -> photosensors -> sound; but the relation between image and sound is direct; no image = no sound.



figure 3: IO.Zn performance / concert Comfort-control system

Also in the same project: IO.Zn gloves. A redesigned version of the gloves used in Sanctus. In this case only one performer uses the gloves to manipulate sound and text. The skin as communication ‘interface’.

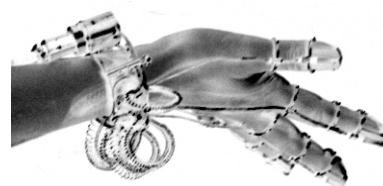


figure 4: IO.Zn MIDI gloves

2000: True installation The Tramway Theatre, Glasgow

Concept: the deconstruction of human anatomy and fetishism, manifestations of urban incommunication? In collaboration with Scottish writer A.L. Kennedy

Description: the characters of the play written by A.L.Kennedy are given shape in interactive pieces. We will describe the pieces corresponding to the husband and lover of dead Lucy.

John is the husband: a pectoral holds the user in a restricted position while parts of the text of the play appear on an LCD screen in front of him/her. By voice commands, the user is invited to navigate in the script and participate with his/her voice, amplified and computer-modified, to the sound track.



figure 5 : True installation & performance
The husband, detail of interaction

Anthony, Lucy's lover, is concretised in a 3D navigation environment. The user by navigating in a 3D visual environment; Lucy's virtual body; is generating a 3D audio environment.

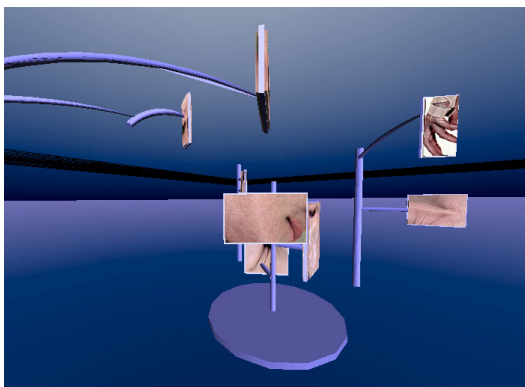


figure 6 : True installation & performance
The lover, view of the 3d navigation environment

RECENT EXPERIMENTS

Over the last year we have been working with the camera as a sensing device. In two different direction, and with two types of technologies.

2D analysis of movement

In our work, we have never tried to make the interactivity process obvious to the audience. It has been a choice from the start to use the systems we built as tools, which we will use for the live performance, and to transmit our message. The overall result is our main goal, that is, to bring the audience to enter a polysensorial space and not be puzzled by the technology.

The conflict of the dissociation between gesture and sound is an inherent part of most of the electronic instruments, and although we carefully choose sounds to fit the actions and simultaneous visuals, we prefer to give preference to the message we want to send rather than give the audience a clear understanding of the use of the instruments.

We have come across part of the audience that feels the need for a more demonstrative use of the technology while the other part does not feel that need. That said, some systems are visually easier to understand than others and it does help for their better acceptance by the audience.

Our most recent approach, which is related to our latest project 'Human Take Away' and deals with the meeting of different cultures and the use of biometrics measurement as a part of illegal immigration control, has been to use the camera as a metaphor for a biometrics device.

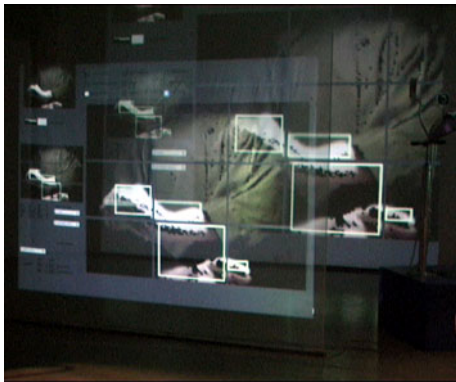
The information given by the position of the object tracked by the camera (in this case the performer's hands position) is then visually output to screen as a part of the mixed media live performance. This gives a direct visual feedback of what is being heard and is useful to the performer but is also very valuable information for the audience. The position of the hands in the image can be used both for sound generation and live or pre-recorded image modification.

The possibility to visualize and modify the data input by the camera as a sensor fits very well with our idea of simulating biometric analysis systems, and at the same time turns out to be an elegant way to show the audience what is taking place.

The system, called the videodactil, was put in practice for the first time during the festival Música a Metrònom: New instruments, new music, new paradigms.



**figure 7 : hta performance / concert
the videodactil, detail of interaction**



**figure 8 : hta performance / concert
the videodactil, projected image**

For this piece, we are using readily available technology, which consists of a webcam and the software combination Max/MSP with NATO + 0.55.

We opted for the NATO library, rather than other available technology (like Eric Singer's Cyclop or David Rockeby's VNS in the Max environment or EyesWeb from Lab. InfoMus on Windows platforms) for the modularity of the software and the possibility it offers to both analyse and manipulate the video information. We used a technique developed in the software BigEye from STEIM and other subsequent software using image analysis which is to define 'hotspots' in the image which will trigger audio and visual events with their respective mapping programmed in MSP and NATO.

Other handheld sensor input allowing the performer to have further control on the system is now being added to the system.

3D analysis of movement

Three-dimensional optical motion capture systems started to appear commercially in the mid eighties. The cost of these systems is slowly decreasing but is still enormous with developments being driven primarily by industries which have the necessary capital such as entertainment, television and advertising.

Only recently there has been a small group of artists with access to this technology. Most of the artistic applications are within the dance field through the meeting of digital artists and choreographers. Some examples include Paul Kaiser and Shelley Eshkar working with Merce Cunningham and Bill T. Jones (USA) and Kirk Woolford with Susan Kozel (UK).

Invited by the Dansa Virtual project to co-direct a workshop-laboratory exploring dance and the generation of synthetic 3D environments we were given access to a STT optical motion captor. This system is able to track up to two people in an approximately 4 by 4 meters space.

We started developing some ideas and prototypes with this set-up, which are part of a work in progress.



**figure 9 : dansa virtual laboratory
two dancers wearing the motion capture sensors**

The system consists of six cameras, tracking up to two sets of 21 light-reflecting sensors placed on the body of the performer(s), and connected to a computer dedicated to track these sensors in the delimited space. The information of the position of these sensors is then sent to a second networked computer, which is running a software called Filmbox, specialised in the generation of visual 3D graphics in real time.

Filmbox was designed as a 3D animation tool for video games and broadcast applications, with the capability to broadcast in real time the movement of a performer, generally applied to an anthropomorphic virtual actor.

One part of the software, the constraint pane, gives the possibility to do some interactivity oriented scripting based on building blocks. Any element of the scene, including the representation of the motion capture sensors, can be related to any other part or behaviour of the scene.

During the workshop we created various prototypes in which we placed virtual sensors (i.e. sensors in the virtual space) which when reached by the virtual actor would trigger sounds or changes in the virtual space.

MIDI messages giving information about the distance between hands and feet and the inclination of the spine were

also sent from within Filmbox to a Macintosh computer running Max/MSP to manipulate sound data.

At this stage, only simple mapping of sound has been implemented and the system certainly gives room for a lot of experimentation. A very straightforward application could be to use the placement of the performer in the space as a source for sound specialisation.

Working with this set-up along with professional dancers gave us a wide perspective of using the whole body as the source of information to generate music, as well as modify the virtual environment.

By defining previously the relation of the dancers with the virtual space, they were able to modify its architecture and generate the music from their movement freed from physical constraints usually brought by the use of sensors.

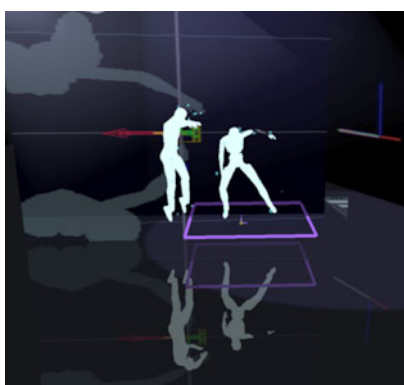


figure 10 : dansa virtual laboratory

an anthropomorphic visual representation of the dancers with markers in the virtual space to define sensible areas

This system has a lot of potential and it is a very good tool for research in this field, but the fact that it was not originally designed for this purpose means that it lacks some basic needs for live performance. The main problem of the system we used is to work with standard cameras rather than infrared ones, which means that there is a lot of 'light pollution' coming from the system. Other similar products, from Vicon, use infrared camera and have been used in similar circumstances by Riverbed and Merce Cunningham for their pieces. Occlusions, as with other camera based systems are the main source of error specially when two performers are simultaneously tracked, but the results are good, with the possibility of the software to do error correction 'on the fly'.

FUTURE PROJECTS AND DREAMS

We have been recently invited to be part of a European project, which will focus on the analysis and synthesis of corporal expression for use in applications in artistic and public environment. One aspect of this project will be to further develop camera tracking for use in performance as well as public spaces. Another aspect will consist of the

realisation of autonomous intelligent agents able to synthesise expressiveness in forms of sounds, visuals and light.

CONCLUSION

As new virtual instruments and ways of organising sound information emerge (a field that we feel is still open to discoveries as a natural evolution of new computing techniques and artificial intelligence) there will be a need for new ways of 'playing' them. New paradigms of music are very likely to emerge when the traditional approach of performing/composing is confronted with different languages and forced to break rules as well as from non-traditionally trained musician. Maybe a recent example of this can be found in the DJ community where a lot of music comes from people who are not necessarily trained as musicians.

New music should evolve in a direction unknown to us and we feel that the multidisciplinary approach can be a valid field for generating new ideas

ABOUT US

Alain Baumann studied clarinet in France and 'electronics for the music industry' with Tim Orr (LCF, South London University). Since 1992 composes and develops interactive systems for Konic thr

Rosa Sanchez studied visual theatre in the Institut del Teatro, Barcelona. She is the artistic director of Konic thr since 1985.

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