Playing the "MO" – Gestural Control and Re-Embodiment of Recorded Sound and Music

Norbert Schnell, Frederic Bevilacqua, Nicolas Rasamimana,
Julien Blois, Fabrice Guedy, Emmanuel Flety
IRCAM – CNRS STMS
Real Time Musical Interactions
1, place Igor Stavinsky
75004 Paris, France
Norbert.Schnell@ircam.fr

ABSTRACT

We are presenting a set of applications that have been realized with the *MO* modular wireless motion capture device and a set of software components integrated into Max/MSP. These applications, created in the context of artistic projects, music pedagogy, and research, allow for the gestural re-embodiment of recorded sound and music. They demonstrate a large variety of different "playing techniques" in musical performance using wireless motion sensor modules in conjunction with gesture analysis and real-time audio processing components.

Keywords

Music, Gesture, Interface, Wireless Sensors, Gesture Recognition, Audio Processing, Design, Interaction

1. INTRODUCTION

The development of motion capture and sensor technology linking body movements and gestural expression to digital technology has created novel opportunities in the performing arts over the last decades. Since the early experiments by artists like Cage, Cunningham, and Rauschenberg in the 1960s [7] – still using analogue technology – numerous artistic and technological projects have explored novel relationships between movements and sounds using wireless real-time motion capture and interactive sound synthesis. Many of these applications explore bodily involvement on the borderlines between music making and music listening as well as on the intersection of multiple disciplines such as the design and performance of musical instruments, dance, and audiovisual installations.

With the *MO* [8] we propose a device that can be easily customised by a set of accessories. This system allows for the adaptation of the device to a large range of scenarios and applications without requiring strong engineering competences. In this sense, we can present the *MO* as filling the gap between complex development platforms such as the *Arduino* and ready-made gaming controllers such as the *Wiimote*.

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The study of the control and embodiment of sound and music by movements in music performance, music listening, and dance as well as extra-musical activities became a vivid field of research over the past years [4]. Research projects have explored applications allowing for the active participation in music listening [1]. The relationship between free gestures and sound have been studied for example from the perspective of *air-playing* or *sound tracing* [5]. Further research has focussed on sound and gestures related to the manipulation of objects [2]. While this research creates the scientific background for many of our applications, the experiments in this domain themselves represent interesting application of the presented technology.

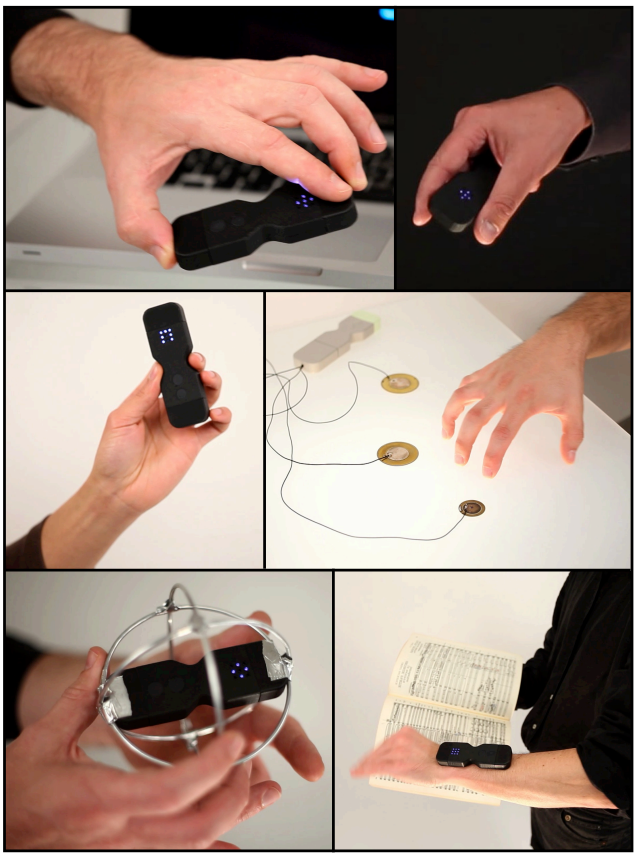

Figure 1: MO modular wireless sensor device used in different playing scenarios.

Many of our developments have been driven by applications in music pedagogy. Methods of music pedagogy such

as the *Eurhythmics* developed by Jaques-Dalcroze [6] can be cited as precursors for many approaches to sound and music embodiment beyond the repertoire of gestures and movements involved in common musical practices (i.e. instrument playing techniques and conducting gestures). Our particular interest in wireless motion capture and interactive audio technology in this context is the possibility to spontaneously create performance scenarios that fit a particular pedagogical goal. In many of our projects, the music students have been involved in the elaboration of collaborative scenarios that focus on particular aspects of music interpretation such as tempo and phrasing as well as more abstract musical aspects such as musical form or harmony. These scenarios often use extra-musical metaphors of playing such as a ball game or a chess match.

Music and audio games are currently emerging as a field of application for many technologies and techniques developed in the domain of digital art. Recently, movement and gesture analysis have become an important aspect in the development of interfaces for gaming platforms and mobile devices. In addition, we observe the appearance of computer games with a strong accent on musical content as well as games dedicated to real-time sound control and music performance. In many aspects, the presented applications are prototyping scenarios, techniques and practices for musical games and playful sound environments for gaming platforms and mobile devices. Other than many platforms, the presented technology supports playing scenarios involving multiple players facing each other in arbitrary spacial setups.

2. APPLICATIONS & SCENARIOS

The presented applications are a summary of different scenarios that we have developed over the past few years. They include musical ball games, virtual orchestra conducting, as well as a wide range of playing techniques based on musical and extra-musical playing metaphors. In these scenarios for one or multiple players, the *MO* wireless sensor module may be hand-held, attached to he body, or used to augment objects such as a ball, a kitchen utility or a table to create new instruments and playing techniques.

3. HARDWARE & SOFTWARE

All presented applications use the *MO* sensor modules with the available accessories including a module with piezo sensors, a baton of LED lights, and a set of passive elements that can be attached to the core module. The presented software components include a set of modules for the analysis and recognition of gestures [3] as well as a set of audio analysis and re-synthesis modules integrated into Max/MSP [9]. The audio processing components developed in the framework of this project are mainly dedicated to the real-time interactive rendering and transformation of recorded sounds. They have been developed for the experimentation with the re-embodiment of recoded sounds and music by gestures and movements. A set of tools for the analysis and annotation of recorded auto content provides automatic extraction of audio descriptors and segmentation as well as graphical visualisation and editing. The real-time modules for the interactive content based rendering and transformation of annotated audio materials include a phase vocoder as well as granular synthesis and concatenative synthesis modules. In addition to the realised applications, the presentation shows how to create new scenarios and playing techniques with the software components developed around the *MO* sensor modules.

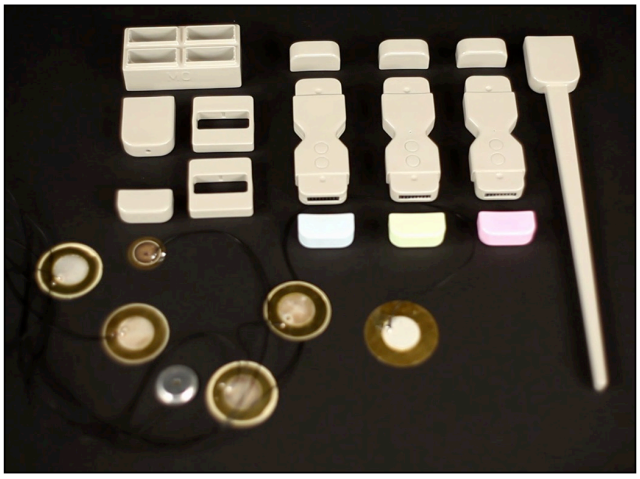

Figure 2: The MO device with different accessories.

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