Software as real-time musical instruments: On designing interfaces for creative expression [paper proposal]

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ABSTRACT

The ixi software project is an ongoing interdisciplinary research that focuses on the creation of screen-based interfaces as digital instruments for real-time expression. The notion of situated cognition is of particular interest as our findings are that an interface always contains compositional ideologies or mental models of musical intentions. Our research involves the study of the determining nature of interfaces when used as tools for creative expression. This paper describes the problems of computer music in terms of HCI and discusses our findings in relation to affordances and constraints in screen-based digital instruments.

Author Keywords

Screen-based musical instruments, embodiment, semiotics, real-time performance, mapping, affordances, HCI.

INTRODUCTION

Creating musical tools and instruments for the computer is a hard but interesting endeavour where the field of Human-Computer Interaction (HCI) is of high importance. In fact, it is a case-study of particular concern for field of HCI due to various reasons:

Space and organisation. Musicians are used to working in studios full of equipment with buttons and sliders, spatially laid out where the logic of the process of music production is designed with careful attention to the ergonomics of the temporal and spatial workflow. The simulation of the professional studio on the computer screen has been problematic and often resulted in frustrating and dis-embodied work processes for musicians used to the physical devices.

Embodied action. Musicians have trained themselves to play their instruments over a long period of time and in this process the instrument has become almost an extension of their body, where finesse in motor control and knowledge of the subtleties of the instrument define a good instrumentalist. Learning an instrument is a highly embodied action where the musician incorporates knowledge of the instrument and combines that with theoretical knowledge about music. When creating digital musical instruments, much of this embodied knowledge is lost as the instrument is virtual and the control of it is either from some software based control structure, devices such as the mouse or "qwerty" keyboard, or MIDI controllers such

as keyboards, wind-instruments or percussion.[1] None of this has been satisfying, resulting in a new research field often called NIME (New Interfaces for Musical Expression)[2] where people try to respond to the limitations in the control of digital instruments.

Time and latency. In few areas of computing is time and latency as important as in music. Latency above 20 milliseconds is noticeable to the musician and can be frustrating when playing a digital instrument, so effective controllers and fast algorithms are very important. In real-time playing, there cannot be any delay when applying effects such as a reverb or a delay and things have to run seamlessly with as little interruption from the technology as possible. Unlike much graphical or video editing software, real-time music instruments cannot wait while the program applies a filter or renders. And to make things even more complex, digital musical instruments or workstations tend to work as parallel streams as opposed to one action performed at a time. Consider the difference in applying a filter in Photoshop and waiting while the algorithm runs to a real-time musical software that could be receiving control data from sensors and generative algorithms, interpreting this data to map it for the sound engine which at the same time might be playing various prerecorded sounds, all at the same time.

Unnatural mappings. An interesting fact with digital instruments is that the control device and the sound source are arbitrarily related, unlike in acoustic instruments. The control mechanism used to play the sound always affects the character and the style of the playing. As an example, we might not hear if a piano in a song is real piano or synthesized piano, but we would definitively realise a synthesized trumpet played on a keyboard. Playing a trumpet with three fingers and the mouth is obviously very different control mechanism from the situation when a synthesised trumpet is played on a keyboard where ten fingers are used and there is no "embouchure".

In this paper I will reflect on various solutions to above mentioned facts and show how this has been addressed in the design of the ixi interfaces. The research element of ixi software addresses the question how affordances and constraints of a certain instrument can open up for different mental models in the musician and therefore new compositional practices. Designing is essentially a semiotic act. Designing a digital instrument or programming environment for music is to structure a system of signs into a coherent whole that incorporates some compositional ideology (or an effort to exclude it). The goal is to provide the users with a system in which they can express themselves and communicate their ideas in a way that suits their work methods and sometimes provide new ways of thinking and working. But what kind of a tool is the computer and what kind of communication are we talking about here? This paper will deal with these issues and illustrate the way semiotics can be a useful tool in the design process of musical instruments, where the mapping is arbitrary and the question regarding virtuosity has taken on an altered meaning.

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[1] The limited 7 bit resolution of MIDI (where the resolution is integers from 0 to 127) has proved frustrating for musicians that are used to much subtler interaction with their instrument.

[2] See http://www.nime.org