To — The CIRMMT Executive Committee

From — Joseph Malloch (MA 1)
D. Andrew Stewart (DMA 2)

INTRODUCTION

We are requesting funding for a joint interdisciplinary research project that combines music technology (gestural control, digital synthesis), composition and performance. This project is sponsored by CIRMMT members Marcelo Wanderley and Sean Ferguson. Work would be carried out in the Input Devices and Music Interaction Laboratory (IDMIL), under the supervision of Marcelo Wanderley, and the Digital Composition Studio (DCS) under the supervision of Sean Ferguson. The project would take place during the 2005-06 academic year.

PROJECT DESCRIPTION

We are requesting financial aid from CIRMMT in order to facilitate the creation of a new digital instrument. The following is a list of general steps that we will take toward the realization of this project.

- Research and development pertaining to computer-interface design and modes of feedback
- Preliminary instrument designs
- Experimentation pertaining to sensor mapping, temporal mapping, haptic feedback, performance technique
- Prototype construction and testing
- Building of a mature functional instrument
- Performer training
- Creation of a number of small performance studies
- Composition of an original work for the instrument and public presentation in a DCS concert

ARTISTIC COMPONENT

The artistic goal is to create an expressive digital instrument. Our instrument will respond to the performer's gestures in a way that allows the artist to make intelligent and intuitive decisions during a performance. The instrument will relay appropriate aural and physical feedback to the performer as a result of its manipulation. The level of instrumental response we intend to implement will be highly developed in order to come as close as possible to the same level of feedback one receives when playing a traditional instrument; however, the range of response will be expanded. That is to say, the instrument will be capable of generating feedback atypical of the traditional instrument. As a consequence, a composer writing for this new digital instrument will be given an equally expanded palette of compositional tools. For instance, the way in which one holds the digital instrument along the horizontal plane could significantly alter the voice of the instrument. The composer must rethink the very essence of what elements *express* music. The natural result will be a new type of musical sound and message. Consider how the widespread acceptance of the valve system (circa. 1850) in brass instruments changed the sound of the orchestra, or how 12-tone pitch logic replaced triadic harmony in the first half of the 20th century. Each of these inventions led to a reconsideration of musical expression.

We will develop a notation system for the instrument's voice — with reference to traditional notation systems — in parallel with its development. This will be an essential step toward establishing its artistic merit among performers. It is a necessity, much in the same way early electro-acoustic music demanded graphics (i.e. signs, symbols, cues) to represent complex sonic gestures and textures. The subsequent training of the performer to recognize and interpret the notation, will ultimately determine the instrument's effectiveness in a musical context.

TECHNOLOGICAL COMPONENT

Our experience of traditional acoustic instruments corresponds to a physical view of the universe (a simple example: big instruments make low-pitched sounds, small ones make high-pitched sounds; large and fast performance gestures produce loud sounds, etc.) As this perception forms part of the context of our experience of music performance, and forms the basis of a performer's interaction with their instrument, it is of utmost importance that this be considered carefully by a prospective instrument-builder. In this project, we propose to use our different viewpoints and experiences to take a holistic approach: the gesture vocabulary, sensor placement, mapping, and synthesis, while not bound to exactly replicate the response of purely physical systems, should have an internal consistency and logic that permits a prospective performer to quickly and easily begin to make sense of the interface. The development of specific interaction metaphors [as in [1]] may also be necessary.

The instrument will be developed with both hardware and software components. Commonly available digital and analog sensors will be used to sense performer movement, in an arrangement to be determined through experimentation and the design process. The voltage signals from these sensors will be passed to a computer via an interface such as the Ethersense or Kroonde. Mapping and synthesis will probably be implemented entirely in Max/MSP, with the creation of new external objects if necessary. The precise type of synthesis and the form of its implementation will grow in part from compositional demands during the parallel development of an original piece of music. This will help ensure that the interface will be a useful tool for performance, that it has appropriate expressive potential.

Although the mapping and voice/synthesis will primarily be considered to be part of the instrument rather than part of the composition, the software will be implemented using an intermediate mapping layer in order to facilitate the development of new voices for the interface.

The types of feedback available to the performer (auditory, visual, tactile-kinesthetic, etc.) and their implementation will also be of prime importance in the development of this instrument.

RESPONSIBILITIES AND PERTINENCE OF THE PARTICIPANTS

Joseph Malloch - electronics development, software, mapping, synthesis

Coming from a background in music performance, arranging, composition, and sound design, Joseph Malloch now focuses on studying music technology, with particular interest in new music interfaces, synthesis, and biological issues in music. He is also part of a group which

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[1] D. Wessel, David and M. Wright, "Problems and Prospects for Intimate Musical Control of Computers," NIME 1, Workshop, 2001.

adapted techniques from the field of human computer interaction for the analysis and characterisation of music interfaces (paper submitted to NIME 2005).

His music technology works include software implementations of music controlled by DNA sequences and cellular automata. He has developed live electronics and compositions for interactive music performance, and has experience both building and composing for Digital Musical Instruments. His composition Alignment, for 2 performers playing glove-based DMIs, required the development of new notation methods and the implementation of a video mouth-shape tracking system in Eyesweb. The Celloboard, which he built in 2004, is a prototype sensor-based instrument which uses complex, integral mapping and scanned synthesis implemented in Max/MSP. He is now in the process of developing this interface further.

D. Andrew Stewart - composition, notation, synthesis, electronics development

D. Andrew Stewart has generated a consistent output of electro-acoustic compositions since his early training at Wilfrid Laurier University, with Peter Hatch. In 1998, his interest turned toward interactive systems, strongly influenced by activities at both The Institute of Sonology, The Hague and STEIM Studios, Amsterdam. Since then, Stewart has composed a small body of works that incorporate gestural-controller technology. Following a study period in The Netherlands, Stewart moved to Paris, France, where he was introduced to Emmanuel Fléty's voltage to MIDI converter, the AtoMic Pro. In 2002, after an inspirational meeting with Japanese artist Suguru Goto, he designed his own personal sensor suit, referred to as the SonicJumper, primarily using the AtoMic Pro with a handful of small potentiometer and accelerometer sensors. The suit effectively turned the performer's body into an instrument. A composition for the SonicJumper was created and presented in Amsterdam. Andrew Stewart is currently working on a new work for the Jumper.

COLLABORATION

The process of creating new digital musical instruments is by its nature interdisciplinary, since it involves important issues of both aesthetics and technology. While we have each approached these issues individually, one of us is a composer exploring music technology, and the other is a music technologist interested in composition. We each bring different experience to this project, which will positively influence the end product - an instrument that is robust both technically and aesthetically.

Together, we possess the knowledge and experience necessary to successfully bring this project to fruition. Through our studies at McGill and independent research, we have a comprehensive understanding of previous and ongoing DMI research and design. Through our supervisors, and our positions as McGill students, we have access to lab spaces for electronics and software development, gesture-analysis, and digital composition. We have experience using various types of sensing technologies and products, and not least, we have hands-on experience using these sensors to utilise human movement in musical ways.

We appreciate your consideration of this application for funding.

Joseph Malloch
D. Andrew Stewart