

# A Theory of Modulated Objects for New Shamanic Controller Design

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## ABSTRACT

This paper describes a theory for modulated objects based on observations of recent musical interface design trends. The theory implies extensions to an object-based approach to controller design. Combining NIME research with ethnographic study of shamanic traditions. The author discusses the creation of new controllers based on the shamanic use of ritual objects.

## Keywords

Music and Video Controllers, New Interface Design, Music Composition, Multimedia, Mythology, Shamanism, Ecoacoustics

## 1. INTRODUCTION

The design principles for the shamanic multimedia computer performance interfaces discussed here draw on a perceived mutability of physical objects in traditional shamanic cultures in combination with recent trends in HCI. The mythology of Alaska reveals a fluidity between the human, animal, natural and spiritual worlds. The shaman negotiates the relationships between these worlds by means of carefully orchestrated rituals. At the center of these rituals, characteristic objects such as masks and other adornment actuate the ceremonial joining between the metaphysical and physical world. The rich possibilities of integrating new technology with principles derived from traditional shamanic practices has been addressed by artists such as Lawrence Paul Yuxweluptun in the *Inherent Rights*, *Vision Rights* installation, and Diana Domingues' *TRANS-E, My body, My blood* installation among others (Domingues 99). These pieces reveal a tradition of merging biological and virtual reality as a means of exploring the relationship between body and spirit.

In a series of compositional multimedia works dealing with Alaskan shamanism, environment and culture, this author has employed new computer music interfaces as a way of evoking the shamanic transmutational state. Using computer controllers and sound synthesis allows for a clear connection between the embodiment of a performer on the physical stage, and a disembodied counterpoint of forms in the virtual stage. Where previous work has looked at the nature of disembodiment and physical acoustic reality through the use of computer controllers and physical modeling synthesis (Burtner 2003, Burtner/Serafin 2001), this work with shamanic controllers crosses from strict acoustics into multimedia, employing dance and theater, video, sculpture and surround sound.

This paper focuses on simple object controllers in particular and how a preoccupation with the physical object as a controller was expanded through the shamanic notion of ritual object.

## 2. A THEORY OF MODULATED OBJECTS

### 2.1 Simple Object Controllers

In the NIME field, a small collection of controllers has evolved based on physical objects like cups, telephones and hats that are not musical instruments but involve human interaction to function. Perry Cook placed sensors and a MIDI connection on a coffee cup and called it the *JavaMug* (Cook 2000). Gary Scavone attached sensors and MIDI enabled a telephone handset calling it the *Phoney* (Scavone 2001). This author imbedded sensors into a wool hat to control vocal signal processing and called it the *Hattie*.

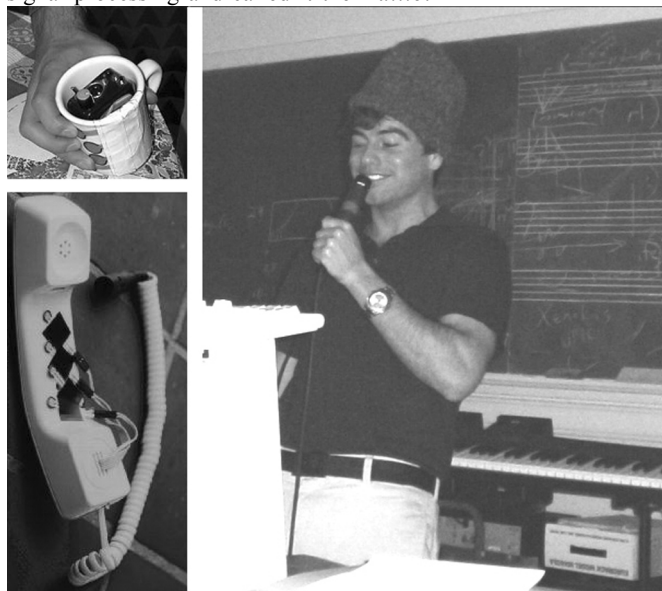


Figure 1. Simple Object Controllers: 1) Perry Cook's *JavaMug* (upper left), 2) Gary Scavone's *Phoney* (lower left), and 3) the author's *Hattie*

These controllers share a preoccupation with the functional extension of a common object. As musical interfaces they effectively juxtapose normalcy with the fantastical. These controllers are effective not because they contain unique expressive properties of sensitivity or are wonderfully rich interfaces. On the contrary, they are designed to be fun, playful, and to make the viewer reconsider common

interactions we have with ubiquitous physical objects. The effectiveness of these controllers resides in the apparent primitivism of the interface and the fact that this simplicity is exposed and developed by the sensing properties of the computer.

## 2.2 Modulated Objects

Unexpectedly perhaps, these simple object controllers offer an important insight into the extendable effectiveness of controllers as artistic communicators. These devices show that the choice of the physical object itself carries significance. The *JavaMug*, *Phoney* and *Hattie* all use similar sensing technology. The difference is rather in the designer's choice of the physical object housing the electronics. The object implies a type of user interaction while projecting a cultural message to the viewer.

A coffee cup, a hat and a phone have very different uses, and for this reason the viewer will contextualize these objects as categorically distinct. However, these controllers employ similar sensor technology. But while the technology is comparable, the object itself is modulated creating a series of different instruments. The simplicity of the interface allows for this kind of object modulation.

In the case of simple object controllers, deciding which object to use and identifying the modes of user interaction are at least as important as designing the electronics.

## 2.3 Extending the Modulated Object

These examples reveal the extension of common physical objects using HCI techniques. The objects are transformed from otherwise functional articles into musical things, with abilities to sequence Miles Davis tunes (*Phoney*) or techno (*JavaMug*), or to scratch a vocal audio signal input (*Hattie*).

Each of these objects does something surprising, distinguishing it from like objects. The relationship established between our understanding of the category of object and the actual properties of this individual object forms an intriguing dialectic. Recent work with controllers discussed here has extended the concept of the modulated object, combining it with ethnographic theory of shamanic ritual.

## 3. SHAMANISM AS A MODEL FOR OBJECT CONTROLLER DEVELOPMENT

### 3.1 The Shamanic Object

The three simple object controllers discussed above can be interpreted according to the theory of "liminality," proposed by anthropologist Victor Turner (Turner 1974), a leading scholar on shamanism and ritual. Liminality refers to an ambiguity arising from everyday tasks being reinterpreted as symbolic activities. The transformation from common activity into ritual activity is paramount to an understanding of shamanism. Ethnographically, rituals are described as "the collectively patterned performance forms through which processes of cultural or sacred signification are integrated into consciousness and social practices." (Tomaselli, 1996, p50). Liminality describes this passing from common reality, into a symbolic understanding that enacts a change in an individual's personal relationship with herself and with society. In the case of the simple object controller, a far less profound but equitant situation occurs when the common object is functionally transformed into a MIDI controller.

This author's study of traditional Alaskan shamanism has led to multimedia work that takes advantage of expressive interfaces to construct virtual reality worlds evoking the transformative rituals of shamanic exploration. The controllers themselves are object controllers that create a real-time interface between the artist and the media, much as the shamanic ritual object allowed the shaman to interface with the spiritual world. Here technology is used as a means of representing the magic observed in the mythology of Alaska.

### 3.2 Ritual Masks and Shaman Staff in *Ukiuq Tulugaq*

*Ukiuq Tulugaq* (*Winter Raven*) is a large scale multimedia work for instrumental ensemble, surround sound electronics, interactive video, dance and theater (Burtner 2001). For the piece, a special set of masks and a shaman staff were constructed to be used by the dancer to control interactive video.

In *Ukiuq Tulugaq*, a dancer portraying the Shaman character personifies the natural forces of sun, ice and wind. A desire to evoke the shamanic relationship between human and nature on the stage inspired the creation of these special masks and a shaman staff. The shaman staff allows the dancer to capture the detailed changing movement of the masks she wears. A computer receives and processes the video signal, projecting it onto a stage screen. Video tracking technology is used as an analogy of the shaman's ability to effect reality by entering a dream-like spirit world.

Figure 2 shows the performance setup for the Shaman Masks and Shaman Staff. An interface written with Isadora, processes the incoming live video and layers it with prerecorded video.

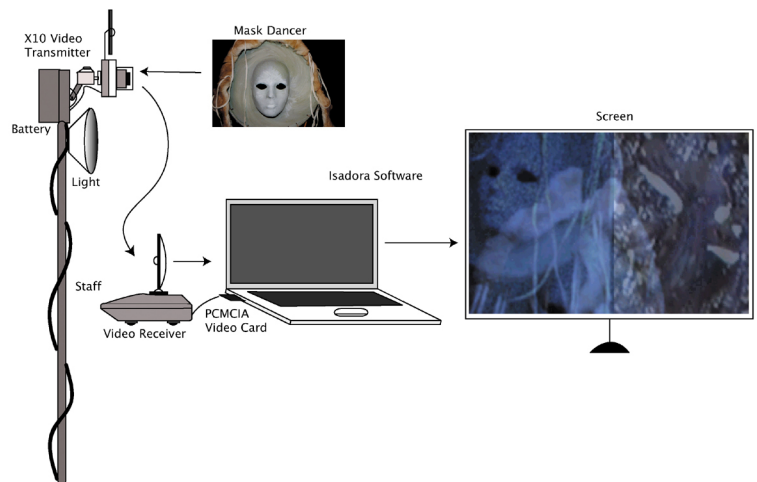


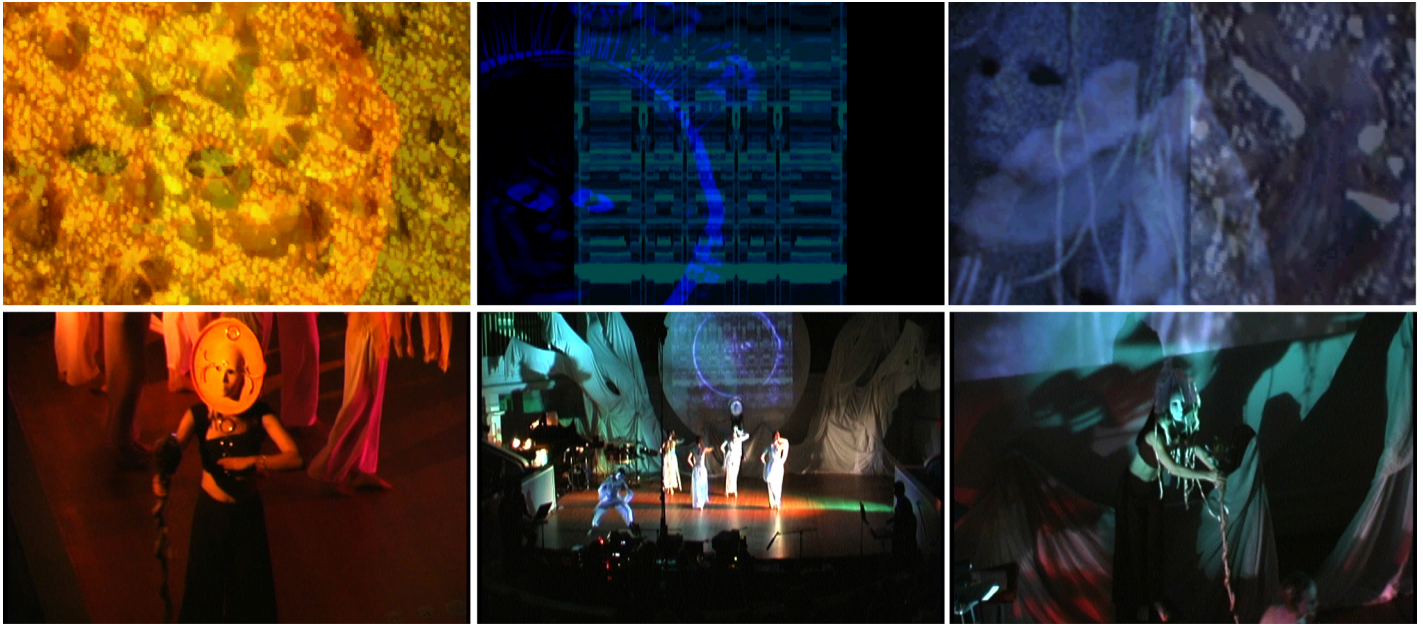
Figure2: diagram of concert setup

Figure 3, shows the processed video result on the top row and the Shaman dancer on stage on the bottom row. From left to right, the columns shown are from the Sun (*Siknik Unipkaa*), Ice (*Siku Unipkaa*) and Wind (*Anugi Unipkaa*) movements. These images are from the March 28, 2003 performance with Aniseh Khan, mask choreography/dance.

### 3.3 Shaman Hands Controller

Hand-based costume objects are commonly used in traditional Alaskan dance forms. From the women's "dance fans" to the giant shaman hands, the accentuation of hand movements contributes to the unique choreographic forms of these

performances. In HCI, controllers that extend the human hands are possibly the most common of new musical interfaces. Michel Waisvisz's *Hands*, Laetitia Sonoma and Bert Bongers's *Lady Glove*, Butch Rován's *SoundGlove*, the Reality Quest N64 NGlove, the P5 3D Virtual Glove, and the 5DT Data Glove



**Figure 3.** Each column above shows the processed video (above) and mask dancer (below). The rows from left to right show: 1) Sun (*Siknik Unipkaa*)Ice (*Siku Unipkaa*) and Wind (*Anugi Unipkaa*)

The Shaman Hands controllers are based on the author's contact with a pair of the giant shaman hands in southwest Alaska. These particular hands, in use approximately 100 years ago (Figure 4) are heavy, dramatically oversized, and visually striking.

The Shaman Hands controllers differ from other hand-based computer interfaces in that they make no attempt to be ergonomic. On the contrary, they are unwieldy objects, heavy and crude as a control interface. These hands are not designed for subtle movements but rather for the stage. They are dramatic when worn by a dancer and viewed from the back row of a concert hall. They imply large-scale theatrics.

Following the traditional principles of ritual object design, special wood was gathered to construct the Shaman Hands. Three fitted slats of a barrel were used for each hand. The slats were attached together with leather joinings and glue. Following the pattern from the photographs, the boards were then cut into the shape of the hands, sanded and the wood treated. This process yielded a thin curved hand shape. Leather arm straps and handles on the back of the hands allow the dancer to strap the hands to her arms. Despite their weight and size, the hands feel surprisingly freeing due to the dramatic exaggeration of arm movements they provide.

Controllers that extend the human hands are possibly the most common of new musical interfaces. Michel Waisvisz's *Hands*, Laetitia Sonoma and Bert Bongers's *Lady Glove*, Butch Rován's *SoundGlove*, the Reality Quest N64 NGlove (Figure 5 left), the P5 3D Virtual Glove (Figure 5 right), and the 5DT Data Glove (Figure 5 center) are just a few of the many "glove" controllers in use.



**Figure 4.** Completed Shaman Hands outside view. The white dots are finger prints as seen on the original hands. The horizontal lines are marks left from the barrel straps that held the original wooden barrels together.

The controller is designed to capture touch, turn and bend information from the performer. Two Memsic 2125 dual axis accelerometer chips, mounted on small circuit boards, are embedded in the hand. The accelerometers measure movement in two dimensions independently for each hand. Earlier work in tilt sensing used an Analog Devices ADXL 202-series accelerometer employing a mass and spring technique to sense tilt. (Burner 2002). By contrast, the Memsic 2125 senses tilt by heating a pocket of air that passes by thermopiles and is detected as it moves inside the

sensor (Williams 2002). The Memsic 2125 requires fewer inputs to the microprocessor, and gives off temperature as an additional control variable.

Bend sensors attached to the wrists of the hands measure the elbow joint movement of the dancer. The bend sensors are connected through an RC circuit design to convert analog voltages to digital signals from each pin. The Shaman Hands software runs on a Parallax BISSX microprocessor converting the signal to a MIDI message.



Figure 5 illustrates several distinct motions that are idiomatically captured by the Shaman Hands

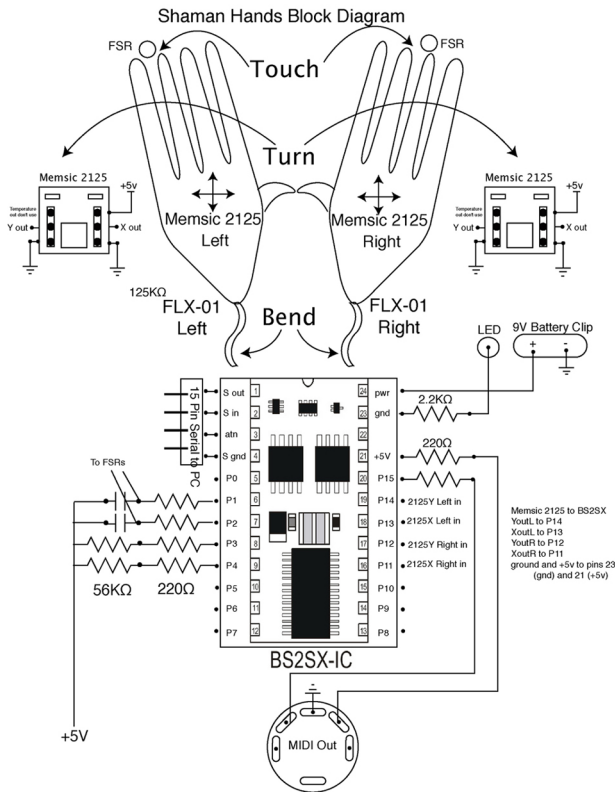


Figure 6. Shaman Hands block diagram showing sensor and microprocessor circuit diagram

#### 4. CONCLUSION

The Shaman Hands, and the Shaman Masks and Staff are highly idiosyncratic object controllers. Rather than general purpose controllers such as musical instruments or gestural devices, these instruments are designed for specific performances. In this sense they bear a resemblance to the simple object controllers such as the JavaMug, Phoney and Hattie discussed at the beginning of this paper. In shamanic controllers the object itself is extended to evoke traditional ritual practices using magical objects. By creating such a connection an attempt is made to evoke the mythological power of the shaman onto the concert stage for theatrical multimedia performance. The interrelation between reality and virtual reality are explored by the shaman character through such ritual object controllers as a means of evoking the power shaman conveyed in their own cultures.

The theory of modulated objects proposed here forms a basis for applying the ethnographic concept of liminality to musical controllers. In technological media it is the connection between physical gesture and signal processing that creates the dialectic state of common activity becoming ritual activity. The liminal ambiguity arises between the real and the virtual in the dramatic concert setting.

#### 5. REFERENCES

- [1] Burtner, M. *Ukiuq Tulugaq*. Doctorate Thesis, Stanford University, Stanford, CA. 2001.
- [2] Burtner, M. and S. Serafin. *The Exbow Metasax*. Journal of New Music Research. Swetz and Zeitlinger, Netherlands. 2001
- [3] Burtner, M. *Composing for the (dis)Embodied Ensemble: Notational Systems in (dis)Appearances*. Proceedings of the 2003 Conference on New Interfaces for Musical Expression (NIME-03), Montreal, Canada. 2003.
- [4] Cook, Perry. *Principles for Designing Computer Music Controllers, ACM CHI Workshop in New Interfaces for Musical Expression (NIME)*, Seattle, April 2001.
- [5] Domingues, Diana. *Interactivity and Ritual: body dialogues with artificial systems*. Proceedings of ACM SIGGRAPH. Los Angeles, 1999.
- [6] Sam Fox Museum Special Collection. *Wooden Shaman Hands*. Dillingham, Alaska. 2003
- [7] Scavone, Gary. *The Phoney Controller (aka "The Air Phone")* <http://www-ccrma.stanford.edu/~gary/AirPhone.html>.
- [8] Turner, Victor. *The Ritual Process: Structure and Anti-structure*. Chicago: Aldine Publishing Co. 1969.
- [9] Turner, Victor. *Dramas, Fields and Metaphors: Symbolic Action in Human Society*. Ithaca, NY: Cornell University Press. 1974.
- [10] Turner, Victor. *From Ritual to Theater: The Human Seriousness of Play*. New York: PAJ Publications. 1982.
- [11] Kaplan, Susan A. *Inua: Spirit World of the Bering Sea Eskimo*. Ed. Fitzhugh, William W; Smithsonian Institution Press: Washington DC, 1982.
- [12] Williams, Jon. *All About Angles Nuts and Volts*. <http://www.nutsvolts.com/> Parallax Inc. 2000