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robotcowboy

A Human-Computer Performance System

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1 Abstract

This article presents the proposal for the human-computer performance thesis project entitled "robotcowboy". robotcowboy consists of a "one-man band" wearable computer audio-visual system composed of a computer monitor helmet / mask, a mobile computer running custom "unit" software, a battery-charging system, and various input and control devices.

2 Introduction

> By its very nature, performance [art] defies precise or easy definition beyond the simple declaration that it is live art by artists.[2]

Performance artists and live musicians share the common bond of producing artistic endeavors in front of an audience. The former uses performance as "a way of bringing to life the many formal and conceptual ideas on which the making of art is based"[2], and the latter as an essential ingredient in the display of their expertise. A painter produces a painting; a sculptor makes a sculpture; and a saxophonist plays his sax. The work of performance artists is more nebulous in that "art" encompasses the whole of human work and, thus, performance artists draw upon multiple media. Live music and theater are the closest forms of media to performance art and many performances closely resemble musical acts or plays.

Fig. 1: The robotcowboy helmet and computer proof-of-concept

Performance art and music have a close relationship which is utilized by one-man bands, DEVO, and Maywa Denki, among others. The one-man band 2, as a performance, is "single musician playing more than one instrument at the same time" and its artistic motivations mirror the essence of art:

> There is something deeper at work in this extraordinary impulse to play it all, alone, at one time, with all the requisite physical agility, and to play it so joyfully. There

Fig. 2: Example of a one-man band[3]

Fig. 3: DEVO

> is a radical independence at work here, an urge to confront and explore human capabilities and possibilities, an urge to realise a unique and playful thought.[3]

DEVO, the band of "de-evolution", is known for experimental performance in music and aesthetic, with costumes, a dedicated manifesto, peculiar language, and a knack for off-beat humor. 3 They produced one of the first music videos and pioneered use of new wireless, satellite, and synchronized projected visual technology in live musical performance. Their onstage antics and audio-visual performances during the 1970's and 80's have become a template for engaging live performance.

The Japanese artistic unit known as Maywa Denki produces "nonsense" electro-mechanical musical instruments and interactive toys. 4 There art objects are referred to as "products" and their shows as "product demonstrations". Their performances showcase many of these devices and also, much to the amusement of the audience, force them to deal with mechanical failures in a theatrical manner.

robotcowboy aims to blend performance art with a live musical production. The custom music software "unit" combined with input devices will allow

Fig. 4: Maywa Denki

a small set of performers to play elaborate songs anywhere. A specific trash art aesthetic and humor will be apparent in the songs as well as manner of production of the devices. Many of the devices will be of a simple, "nonsense" design in which a simple manner of input control is mapped to an audio-visual cue. The entire system aims to produce an audio-visual blending of performance art in which the audience experience breaks the "fourth-wall" into a shared experience of both performer and viewer — the viewer becomes a participant.

3 Background

Laptop computer based music has come to the forefront as high-performance machines become cheaper and cheaper. There is a distinct disadvantage, however, to live performance with computers due to the fact that much of the interaction is not tangible.

> *"Laptop's Are Boring"* - The Scumfrog
>
> "Every live electronic music performance I've seen in the past year and half has been laptop based," said the producer from his New York home.
>
> "There's no entertainment worth in laptop DJing."
>
> "The laptop DJs might be doing rocket science, and creating amazing soundscapes, but it's totally boring for an audience to watch."[1]

Fig. 5: The laptop performance problem

While digital music software and computing platforms offer a great advantage over dedicated hardware, such as effect units, sequencers, and synthesizers, the visual use of these devices is lost. Traditional acoustic instruments such as a piano or guitar draw a direct correlation between the physical action of the performer and the sound produced. A hand pressing a key produces a note, a plucked string results in a sound, the greater the action, the greater the level of sound or difference in timbre.

> "With DJing, what you see on stage, is what you hear coming out of the speakers.
>
> But with laptop DJing, that connection between stage and sound is lost."[1]

An audience watching a laptop performance cannot make the connection between physical action and sound, as the action is very subtle a finger on a track pad, or an off board knob array. The performance, thus lacks interest for the audience as the energy and action done by the performer are lost through the computer interface. 5

Computer interfaces have been driven by the mouse/keyboard paradigm for the last 20 years. Music software, naturally, follows this convention for its interaction, yet music performance demands many and varied types of control. The Musical Instrument Digital Interface (MIDI) is a protocol developed in 1983 to standardize digital musical instrument control and, naturally, has been integrated into personal computer music software. Most software packages however, only allow simple uses of MIDI data, note data from a MIDI keyboard for example, but not control of more complex operations such as the cuing of different songs or tracks. These higher-level operations were developed well after the design of the MIDI specification and their control resides largely in the realm of the typical interface of the programming platform: mouse/keyboard.

As a result of this interaction, performers using live instruments with computer accompaniment are forced to transition between playing their instrument and using the computer to setup the next song. There is a distinct rift between the audiences perceptions of these two actions. The physical action of the live instrument is easy to grasp the effect is tangible. The action on the computer is not abstract and the result is harder to gage. The total result is the effect of the performance is limited as the energy built by the live instrument is drained when the performer is forced to interact directly with the computer.

4 Implementation

The robotcowboy system consists of a "one-man band" wearable computer audio-visual system composed of a computer monitor helmet / mask, a mobile computer running custom "unit" software, a battery-charging system, and various input and control devices. The monitor helmet is a flat panel monitor mounted inside of a cathode-ray tube monitor case retrofitted into a helmet. A camera viewed through video goggles provides vision as line of sight is obscured by the flat-panel and a video on-screen text module will accept serial data from the computer to act as a simple "heads-up display". The device has been prototyped as a proof of concept. 1 The symbolism of the mask to identity and the helmets use as a visual display device will be

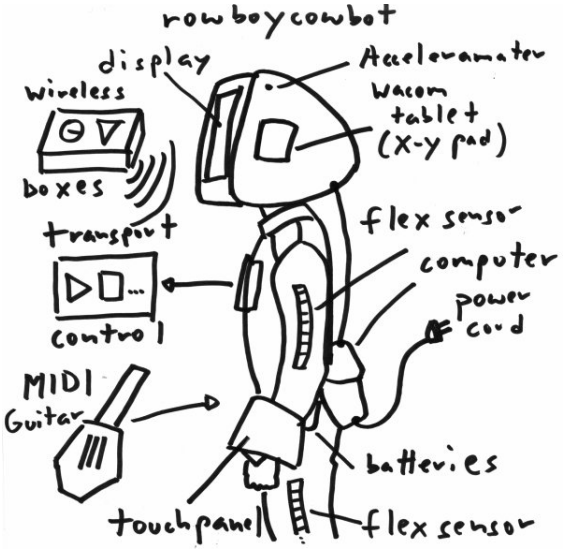

Fig. 6: robotcowboy devices

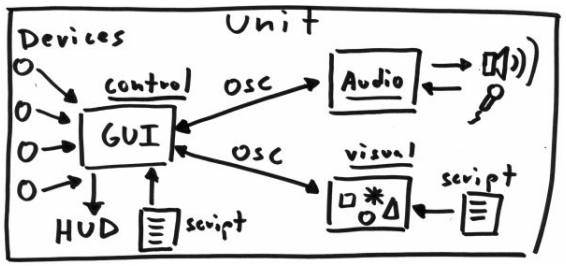

Fig. 7: unit module specification

elaborated on in the forthcoming thesis.

A commercial Xybernaut mobile computer will be the main computing platform as, since it is a finished device, it is already maximized for size, weight, and power consumption. The Linux operating system will be used as it is modular, stable, and free. A touch panel will allow specialized input over the system and electronic voice recognition may be realized. Input devices will communicate over RS-232 serial, USB, and Bluetooth in order to facilitate simplified device management. 6

Custom software, which is initially being called "unit" will be the backbone of the system. unit will consist of 3 modules following the client-server — control, audio, and visual — and all will communicate using the Open Sound Control protocol to allow use on separate networked machines. 7 The control module will act as the graphical user interface (gui), musical sequencer, and serial device handler. The audio module will handle the voice and sample commands sent by the sequencer in the control module. The visual module will provide a sprite-driven representation of musical and control information to construct a link between the music and action. A simple scripting language used by the control and visual modules will allow easy extensibility for new devices and display modes.

Mobility is and autonomy is important and the entire system will be designed to maximize weight and power consumption. A rechargeable battery system will provide power off the grid and an ac-dc charging / power system when on. This part of the system will require extensive testing and development, as it can be the most dangerous to both performer and equipment.

5 Closing

robotcowboy aims to be a human-computer performance system allowing the user to produce a dynamic audio-visual experience for the audience. There is a history of one-man band acts and performance troupes producing music in the course of the exhibitions, why not attempt to combine both using wearable computer technology?

References

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