iPoi: acceleration as a medium for digital live art

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ABSTRACT
In this paper, we discuss a system for using acceleration as a medium for controlling visual imagery and audio soundscapes. Our system is multi-channel and wirelessly networked which encourages communal engagement through naturalistic interaction. We integrate the ancient Maori art of poi to create a DIY performance of highly mobile digital live art. The novelty of our work lies in the combination of acceleration and wireless multi-channel, robust devices for digital live art.

Keywords
Acceleration, poi, playful arenas, physical computing, Motes, digital live art, HCI, interactive art

INTRODUCTION
Interactive installations, ambient visualizations, multiple large-screen displays and new dance-floor toys [4,5] are penetrating playful arenas [1,6] across the globe, bringing with them legions of experimental systems artisans who create digital live art [7]. These digital live artworks seek to redefine traditional notions of human–computer interaction particularly task-based computing with its focus on usability, functionality and ease of use, and move towards creating positive communal experiences [3]. However, many of these systems lack the mobility and robustness for what we call 'DIY performance' (namely performance that happens spontaneously and is carried out by non-professional performers). We have developed a highly mobile and robust system for creating improvised DIY performance. The system is based on one of the recurring types of DIY performance that can be witnessed in any number of underground clubs and outdoor festivals called *poi*.

What is poi?
Put simply poi are tennis balls attached to lengths of cord (Figure 1), held in each hand, and swung around the body in a series of circular movements to create fluid patterns in the air around the "poier" (Figure 1).

Figure 1: A DIY poier and the visual patterns created by spinning poi (time-lapsed).

They have their roots in indigenous Maori culture (the word 'poi' meaning ball) and were traditionally used by men and women to improve flexibility, strength and coordination for both work and war. Originally constructed with a small rock on the end of a flaxen cord, they provided effective training for other ancient swinging weapons like the mere or patu and could themselves be used in case of attack.

Poi works very simply through momentum and through basic gravitational and centripetal acceleration. Small circular hand movements and wrist rotations are amplified at the end of the cord and thus the momentum, movement and impact is greatly increased. Used as a weapon poi can deliver a swift and powerful blow to the enemy; used as an art form poi becomes a fluid, colourful and hypnotic dance. Wahine (female) Maori dancers are renowned for their dexterity with poi, the complexity of their moves and their ability to manipulate as many as four poi at any one time. Most poi today follow the same principle as the Maori tradition but are available with tails or ribbons, as fire poi or with internal mechanisms that make them light up or glow under ultra-violet light especially for use in underground clubs where the driving 4/4 beat of techno and trance music acts as a perfect partner for the constant, circular flow through space. The recent resurgence in circus arts has meant that more and more people are learning to

use poi. They are a familiar sight at festivals, parties and outdoor gatherings and there is a plethora of websites and discussion groups set up for enthusiasts to swap techniques and communicate new moves they have mastered or even invented for themselves.

Computationally-augmented poi

Our original wired and wireless systems are described in [2]. Both of these systems are robust and provide interesting ways for poi spinners to interact with audio and video on a single channel. However, single channel data transmission can be limiting in that the data flow is only transmitting from one poi ball and therefore only captures data from one poi in motion which is half of the poi pattern being performed. To detect full poi patterns, we required a system that would allow us to collect data from both balls in real time. This meant developing a system that allowed for wireless, multi-channel data transmission.

Our current system consists of a tMote Sky module [8] and an add-on board that we designed. The add-on board contains a low-cost ADXL210AE 50G accelerometer with high resolution and high shock survival. We developed the add-on board after initial user studies found that the 5G accelerometers provided on a tMote Invent (off-the shelf systems) peaked during poi play and the signal became clipped at high acceleration. The high shock survival is important in that poi spinner often knocks the poi balls against each other or against their body at high velocity leading to significant acceleration (over 8G).

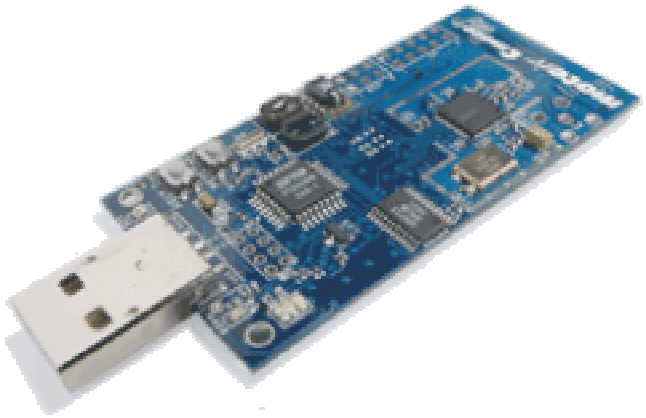

Figure 1: TMote Sky module.

The tMote is placed in a long sock or attached to a long string and swung around the body. Data from the swinging poi is transmitted to a base Mote attached to a PC. The acceleration data is then transmitted to MaxMSP which we use to create visual imagery and audio soundscapes. The audio/visual output changes according to the acceleration data produced when the poier swings poi. The system we developed is dynamically reconfigurable allowing us to connect several poi and computers on the fly to create ad-hoc installations e.g. allowing DJs and VJs to interact with the data from the swinging pois.

Future Work

We have tested our system in various clubs with skilled and non-skilled poiers and had DJs and VJs interact with the poier in realtime. We present our results in [7].

We are further developing our system to include interactive lights and casing made from found objects. Also we are working with visual artists, musicians and performers to create a multi-performer digital live artwork for several upcoming events and underground parties in the UK in 2006.

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