Tactophonics : Your Favourite Thing Wants to Sing

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ABSTRACT

Description of a project, inspired by the theory of affordance, exploring the issues of visceral expression and audience engagement in the realm of computer performance. Describes interaction design research techniques in novel application, used to engage and gain insight into the culture and mindset of the improvising musician. This research leads to the design and implementation of a prototype system that allows musicians to play an object of their choice as a musical instrument.

Keywords

Interaction Design, Improvisation, Performance, Cultural Probes, Design Research, Affordance

1. BACKGROUND AND PROBLEM SPACE

The issues posed by the use of computers in musical performance are complex, well-documented [3][12][8] and can be broadly broken into two main problem areas; that of the musician's ability to express themselves intuitively, and the issue of engaging performance from the audience's point of view. Both of these can be seen to stem from the lack of correlation between the musician's actions and the sound that is produced - traditional musical objects that react predictably to physical interactions provide more intuitive expression; compelling performances are often those where the audience can ground what they hear in their own experience of the physical world.

1.1 Common Ground: Affordance and Embodied Knowledge

The concept of affordances was proposed by James J. Gibson in 1966, surmised as 'what [things] furnish, for good or ill, that is, what they afford the observer' [6]. In other words, affordances are the possibilities for interaction that an object offers to an animal, taking into account the animal's physical form and capabilities. To use a classic example, a door handle affords grasping and turning; this is perfectly sensible and allows us to accomplish the aim of opening the door. However, the handle also affords

myriad, perhaps infinite, other possibilities for interaction (such as, say, poking it with a pointed stick) that would not result in the accomplishment of anything much.

Don Norman adopted the concept of affordance for his book 'The Psychology of Everyday Things.' Norman's version of affordance differed in one important aspect from Gibson's; Norman wrote about what he terms 'perceived affordance', which, in addition to the actor's physical capabilities, is also dependent on the actor's goals, values, beliefs and past experience [10]. This makes it unlikely that an actor would poke the door handle with a pointed stick unless their goals, values, beliefs and past experience were very odd indeed.

We can apply the concept of affordances to musical instruments; a drum affords striking, producing an appropriate sound (depending on the physical variables of the strike) as a result. The player accomplishes their goal of making that sound. Most people observing that player, as a result of their common experience of the physical world, could predict that this would result in a sound being produced; exactly what sound may not be predictable until the observer has more experience of that particular object.

However, by assessing the shape, construction and materiality of the instrument, and the actions of the player, the observer could make an informed decision about how it is likely to sound, even if the observer is musically untrained. The performer's specialized experience of the physical world allows them to act on the instrument in a way that will produce the sounds they desire, and the audience's generalexperience of the physical world, their embodied knowledge and conceptual models [10] built over a lifetime's experience, means that they can draw a meaningful correlation between what they see and the sounds that are produced.

1.2 The Musical Object

In addition to striking, like the door handle the drum also affords numerous other possibilities. However, in the case of the drum (and, indeed, most other musical instruments) a large number of these interactions will produce sound. In addition, even those actions/interactions that do not produce any sound can still be expressive or communicative in a performance context. Thus, in terms of perceived affordance, poking a guitar with a pointed stick may very well fit in with the players' goals, values, beliefs and past experience, if that action were to produce an appropriate sound or communicate the players' intent to observers.
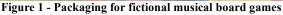
The perceived affordances of the computer as a physical object are much more limited; only very specific, controlled interactions are likely to produce a meaningful sonic result. As a result, more spontaneous, visceral interactions on the performer's part are

discouraged. The conceptual models involved in 'playing' the computer are much less intuitive than any physical instrument, from the point of view of both audience and performer - the physical world is the main overwhelming feature of our lives, our native sense, and as such we can often act intuitively without thought or conscious intent within it. We are also naturally sympathetic to one another's actions within it, intuitively understanding the results of actions, or the motivating factors behind them, from our own experience.

1.3 Project Aims

The basis of this project is the novel application of research techniques from Interaction Design to engage and gather information from relevant practitioners. Hopefully, this new approach to early research for NIME will offer fresh insights into the culture, mindset and requirements of the performer. This research will be used to inform the design of a new interface that explores the expansion of affordance and interaction possibilities in computer music beyond the prescriptiveness of most standard interfaces.

2. DESIGN RESEARCH

2.1 Engaging Users Visually and Critically

Figure 1 - Packaging for fictional musical board games

In the early stages of research, playful concepts and commentaries (such as instruments, performances or 'musical board games') were visualized and used as material to stimulate discussion with musicians. The aesthetic quality of this material was of utmost importance; it was intended that it illustrate engagingly the issues involved, and to communicate these issues to musicians who were not necessarily directly concerned with electronic performance. To take one example, the packaging for 'Sexytime Sounds' (fig 2) illustrates a game whereby two performers engage in the ultimate tactile performance by 'playing' each other inside a tent. Their vital signs are converted to sound as they react to each other's touches, while shadows that are cast on the wall of the tent provide the audience with a 'highly engaging' spectacle. This material serves the dual purpose of communicating the issues involved, whilst acting provocatively to encourage critical reflection and debate. The material, to use the old maxim, *shows* rather than tells.

During the conversations fuelled by this material, the question 'if you could play any object as a musical instrument, what would it be?' proved to provide particularly rich insights. The answers were varied and demonstrated a range of motivating factors; some were concerned with the potential for a compelling performance, some with the emotional connection that they had with the object itself, while others were concerned with the physical rapport that they had (or could build) with it. More often than not, however, a complex mix of these motivating factors was apparent. An interview with the artist and musician Steve Roden (who performs using found objects as sound sources) concerning his choice of objects underlined this – '*it's rare that I'll choose an object simply because of the way that it sounds without any deeper connection to it... often [a relationship] comes about through*

handling, certainly, or through some sort of intimate investigation.' [Roden, Private Communication]

2.2 Cultural Probes

Figure 2 - A page from the question booklet

A way of recording more fully these rich insights was devised: using the technique of cultural probes (after Gaver, Dunne and Pacenti [5]), and providing musicians with a means to record their own responses and reasoning. A booklet was designed, printed and bound, again paying special attention to its aesthetic value. The booklet proposed the question 'If you could play any object as a musical instrument, what would it be?' explaining and illustrating the factors that the respondent might want to consider (emotional, physical and performative), before ending with two perforated sheets of questions for the respondent to fill out, detach and return in a provided envelope.

The materiality of the booklet was carefully considered: thick, coarse off-white paper bound with erratically hand-sewn red thread and wrapped in brown paper. By creating an artifact that was somehow perceived as 'precious' and personal, hopefully respondents would treat it seriously and be more likely to respond thoughtfully and creatively than to a standard 'non-designed' questionnaire.

Stickers were also provided, following the visual language employed in the booklets. Respondents were asked to stick them to an object and fill out two sections: "I would like to play this object as an instrument because:" and "it would sound like:" They then took a photograph of the sticker attached to their object, hopefully capturing in their visual treatment something of the qualities that have drawn them towards that particular item.

2.2.1 Responses to Cultural Probes

Figure 3 - One response to the question booklet

The inventiveness and diversity of the replies was beyond expectation – musicians variously chose to: lay a table with cutlery, crockery and food, which they would then play over the course of a performance, finishing in a messy finale (figure 3); play their own belly with a variety of implements whilst eating a variety of foods (figure 4); play their duvet in a sleepy performance; play Corbusier's chapel in Ronchamp, France. A professional dancer chose to create music from the ritual of making bread by playing the mixing bowl and kneading surface.

Figure 4 - A sticker response

With the diversity and quality of these responses in mind, the prospect of designing an object with a rigidly set form seems overly didactic in this context – indeed, why not let musicians choose their own instrument?

3. TACTOPHONICS
3.1 Concept

The user of Tactophonics may select almost any object to play as a musical instrument. They attach a contact microphone to the object, which is fed into a computer. As they interact with the object, the feed from the microphone is analysed in real-time using FFT, the data from which is then used to control the generation of new sound via granular synthesis and the selection, triggering and resynthesis of stored samples. The analysis of this data is continuous and the sound generated is, of course, strongly correlated with the variables that are analyzed. The player can interact in any way they see fit with their object and expect a predictable sonic response.

3.2 Prototype Product

Tactophonics as a product is envisaged as a kit comprising contact microphone, adhesive discs, software and an instruction book. For a system so concerned with tactility, it is only fitting that the Tactophonics product, as purchased, should invite touch; cardboard, polished hardboard and subtly textured paper were employed in the prototype kit and packaging. It is also important that the kit mediates users' engagement with the system and the issues involved in its use.

3.2.1 Instruction Manual
The instruction manual is designed, like the earlier research material, to encourage users to engage with the issues involved

through accessible means (again, *show* don't tell). The cultural probes' method of describing performative, emotional and physical connections with objects worked well in seeding the right questions in respondents' minds, leading to interesting and insightful responses. Following this format, the instruction book encourages potential players to engage with the same issues, but in a decidedly more practical manner.
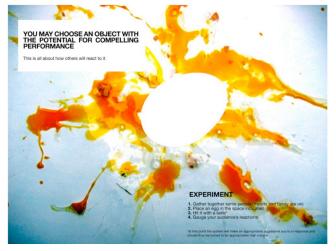

Figure 5 - A page from the instruction book inviting users to smash an egg on it and note their audience's response

The instruction manual comes bound in heavy polished hardboard equipped with an integrated contact microphone – the instruction book is in effect a Tactophone. The player is introduced to the system, before being asked to load the demonstration software and plug the instruction book in to their computer's audio input. From there, they are variously encouraged to hug it, hit it, write on it, tear it and smash an egg on it (figure 5), taking note of the sonic, physical, emotional and performative aspects of each action. Finally, they unplug the book, replacing it with their own choice of object.

3.3 Working Prototypes and Performance

Figure 6 - David Black plays Tactophone #1: The Television

Working with the musician David Black (drummer with improv groups The Electric Dr. M and Distortion Trio), Tactophone #1: The Television was developed. David chose the Television after considering the emotional, physical and performative aspects of the object, opting to 'play' it with a baseball bat.

'You turn on a TV and it controls your mind. It controls you visually and aurally. It's good to get your own back, and very satisfying to do and watch...' [Black, Private Communication]

The performance of Tactophone #1 took place in front of a small audience. Afterwards, the reactions of the musician and audience were sought. The audience consensus is summed up by one response: 'there's definitely a stronger link between the musician and the sound that he's producing than the majority of electronic music. I mean, it's just the performance.' The musician's opinion by the simple yet gratifying 'It was more like a musical instrument...'

A further working prototype was created for public exhibition in the form of the author's own choice of object – Tactophone #2: The Branch.

Figure 7 - A visitor plays Tactophone #2: The Branch

4. FUTURE DEVELOPMENT

The authors are currently working on a project exploring new modes of interaction with speech synthesis: Six Speaking Chairs [11]. The focus of this research is on ways to give more expressive control to the users of synthesized speech. One direction of this involves the application of the Tactophonics concept and technology, preserving Tactophonics' freedom of interaction with the object, but this time with the interactions controlling such variables as voice quality and intonation. Eventually, we see this being applied to communication devices for disabled people, in a field where the need for interfaces for real-time expression beyond Text-To-Speech has been regrettably overlooked.

Ultimately, music and speech are both modes of self-expression,

and those that use electronic means for both can potentially use the power of contemporary technology to open up new modes of

expression and performance that are visceral, intuitive, flexible and engaging.

5. ACKNOWLEDGEMENTS

6. REFERENCES

[1] Amant, R. A preliminary discussion of tools and tool use. Technical Report: TR-2002-06 North Carolina State University, Raleigh , NC, USA, 2002

[2] Bailey, D. Improvisation, its nature and practice in music. Prentice Hall, New York, 1992

[3] Cascone, K. Grain, Sequence, System. (three levels of reception in the performance of laptop music). Intelligent Agent Vol.4 No.1. Available at: http://www.intelligentagent.com/archive/Vol4_No1_djvj_cascone.htm, 2002

[4] Chemero, A. An outline of a theory of affordances. Ecological Psychology, Vol. 15, No. 2, 2003

[5] Gaver, Dunne and Pacenti. Cultural Probes. Interactions Volume 6 , Issue 1 (Jan./Feb. 1999)

[6] Gibson, J. J. The Ecological Approach to Visual Perception. Lawrence Erlbaum Associates Inc, US; New edition, 1986

[7] Holmes, T. (2002). Electronic and Experimental Music: Pioneers in Technology & Composition. Routledge, New York, NY, 2002.

[8] Kivy, P. () The Corded Shell: Reflections on Musical Expression. Princeton, New Jersey: Princeton University Press, 1980.

[9] Lanier J. Music, Nature, and Computers: A Showdown (2001). The Book of Music and Nature. Middletown, CT: Wesleyan University Press.

[10] Norman, D. The Psychology of Everyday Things. Basic Books, New York, NY, 1988

[11] Pullin, G. Social Mobiles and Speaking Chairs: Applying Critical Design to Disruption, Discourse and Disability. Proc. EAD 07. Ismea, Turkey, 2007

[12] Stuart, C. The Object of Performance: Aural Performativity in Contemporary Laptop Music. Canberra, Australia: University of Canberra, 2003. Available at: http://hypertext.rmit.edu.au/dac/papers/Stuart.pdf