Foreword

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Introduction

Technology has, over the past decades, yielded new ways to creatively explore sound and music, to interact with computers and to engage in social interaction. The change from analogue (device-determined) to digital (program-determined) created a major shift in the interaction paradigm, touching all areas of everyday life. Likewise, the analysis of, and critical reflection on, the use of digital music technology has advanced at a similar pace, feeding into developers' methodologies. It is hardly surprising that professionals and users across different fields are excited to explore that which materialises when they bring together their skills. The anthology 'Music, Health, Technology and Design.' collects articles from a set of international research projects but the most from the national interdisciplinary RHYME project where professionals, children, parents and caregivers have collaborated. In this project they have investigated what interactive sound and media technologies, that integrate hearing, sight, touch and physicality, can bestow upon the health and wellbeing of children with severe disabilities and developmental disorders.

When considering the articles as a collection, a number of universal threads can be traced: affordance, transparency, collaboration, appropriation and design needs in terms of system, interaction and relevance. The essence of these threads is discussed in the following.

Affordance

Evaluating RHYME's qualitative research projects, with absolute criteria, is far from easy. As an analysis tool, many of the articles draw on the idea of 'affordance', from Gibson's ecological theory, as a means to map the appropriateness of the interactive objects within their complex settings. In Gibson's theory, rather than regarding perception as a constructive process, affordance emphasises the structure of the environment itself, where users take in already structured perceptual information. In RHYME's context, affordance is used to analyse the significance of the artefacts, their attributes and the abilities of the participants, mapping the health benefits afforded by the integration of technologies and interactive frameworks. Eide broadens this analysis tool to encompass concepts of field and agent, contrasting

what the interactive objects provide against what they do. She proposes that this approach facilitates an easier analysis of the relationships between the physical environment in which the interaction takes place and the participants in the interaction.

Many features of this highly structured environment can be considered as 'natural' and 'familiar'– gravity, light, colour, texture, the coupling of sound with vibration – creating the feeling of safety to a newcomer in the system. Yet as we will see below, affordances are yielded by what may initially appear the less familiar territory of technological interaction. When affordances are mediated through an embodied participation in the world, technologies are characterised by more than functionality alone. To illustrate via an abstraction, we can draw on Bachelard's description of 'felicitous' objects or places. He explains why humans can be emotionally moved by felicitous objects and places, which in turn can be said to reverberate atmospheres in ways that capture human imagination. They attract us because they have become topographies of our intimate being. As such, they 'speak a language' that enters in resonance with felt human aspirations (Bachelard 1964, ix).

Transparency

In our current age, technology is transparent. Mobile, wireless, miniature computers serve our media needs and contextualise us in a network of interactive potential without our needing to know anything about the complexity of their design. The success of ubiquitous technology involves, amongst other things, an integration of hardware, software, content and applicability. 'Wirelessness', miniaturisation and affordability are all important contributors in terms of hardware, bringing with them sensations of movement, change and proximity into a technology rich landscape of experience. In RHYME, success of the CCTs (co-creative tangibles) is likewise by virtue of these elements.

In developing a structure, system and content, serving tangible interaction and responding to societal challenges and individuals' needs, collaboration and design iteration are essential. To give an example, one of the many developments resulting from this approach involved moving the sound source closer to the place of interaction: transparent and technically realisable through the miniaturisation of affordable technology. An individual working alone may easily overlook how this simple semblance to both acoustic instruments and living objects that can enrich the tangible experience.

Appropriation

Collaborative design invariably involves the appropriation of ideas, aesthetics and technologies from other disciplines. Jensenius' paper presents a good example. His work involved designing a set of video-based visualisation techniques for the analysis of music-related body motion. Initially intended for the study of music and dance performances, the tools were appropriated for laboratory experiments on ADHD and clinical studies of CP. What was it that promoted this transfer of technology from music and dance to medicine? Simplicity, accessibility and flexibility are key, and as Jensenius says, "…a lot of the motion-capture solutions… are either too advanced or targeted at specific applications". Unlike expensive, fixed installation motion-capture systems requiring specialised user knowledge, Jensenius' video system utilises a normal laptop computer, cheap video technology and straightforward image processing. No specialised skills are needed to produce a time-based motion information visualisation. This representation, which we can view as the neutral object in Nattiez's semiological tripartition (Nattiez, 1990), is then available for analysis by professionals with specialised medical knowledge. Collaboration is key in appropriation: lacking a priori knowledge, the neutral object does not function without input from the expertise of the clinicians.

System, Interaction and Relevance

As a tangible object, ORFI is described as both instrument and toy, containing bend sensors that generate light, sound and image. The technology is straightforward. The challenge is in implementing an appropriate interactive system and content. Andersson points out that although direct response gives clear feedback, such methods are less good for users with strong disabilities: if you are unable to accurately press a button, then you will be unable to interact with the system despite it's apparent simplicity. In interviews it became apparent that to avoid leaving the child in isolation the CCTs should 'afford' action. Considering these needs, it is clear that content, system and response structure are central considerations for many of the authors. A simple action may result in an immediate and clearly correlated response, or the response may be dislocated, implying a holistic view to the behavioural interaction between user and system. Andersson and Cappelen note that they structure ORFI's software and musical compositions using three layers: sound nodes, compositional rules and narrative structure. They explain their aim to be a balance between absolute cause-effect and playful, or surprising responses from the CCTs. The authors suggest that the narrative structure may also create

expectations, not all of which will be satisfied, occasioning further intervention in turn. Here we enter a symbolic level involving time and memory, where interaction does not need to be directly connected to real-time audio. Symbolic approaches to computer-aided composition, music representation and musical interaction have been established practice for decades, and could be a wealthy source of appropriation when further exploring symbolic level possibilities in a music and health context.

Interviews with family members stress the importance of 'having things at home that inspire them to interact and have fun together'. One of the many challenges discussed through the articles is how a CCT may function, on simultaneous levels, for co-creators of different ages and abilities to mutually interact. Whether concerned with one-way interaction, such as mimicry, or two-way processes, where both sides influence the next action, by designing a layered meta-structure users can 'create' without need for refined techniques, yet explore in greater depth as their interactive skills develop. Realising a layered meta-structure appealing to simultaneous users of different interests, needs and abilities is a challenge. From my own experience as a composer of interactive sound installations and music performances, I observe that people inevitably find the interactive experience stimulating in ways appropriate to their personal interests, understanding and curiosity, where system and content are key. Putting technology to one side and considering content provides a starting point. For a somewhat amusing example I can reflect on my own childhood and experience as mother. Certain cartoons that were funny for me as a child are still hilarious to me as an adult. Simple comedy, appealing to a child, is combined with fast associations and connotations creating jokes appealing to teenagers and adults. Child and parent can watch the same show and both truly laugh!

The needs of a child and their family may change from moment to moment as well as develop over shorter and longer time-spans. CCTs cannot continuously be removed from the environment for redesign and reprogramming. If we look to the future, they need to adapt to these changing circumstances without the need for professional assistance. Interactive technologies are however tending to integrate intelligent emergent systems that learn through interaction and dynamically develop over time. Already, sophisticated social robots with cameras for eyes can study an infant over periods of time to detect signs of autism spectrum disorders, as well as be an educational tool and companion. Other robots are designed specifically to help children with autism learn how to coordinate their attention with other people and objects in their environment. We can easily speculate how the possibilities offered by intelligent emergent systems will further the advancement

of interactive tools within health related contexts. In the two-way interaction between child and digital agents, the system learns through doing, tailoring its behaviour specifically to each child's changing needs. In terms of sound and music it is here important to remember that the direct connection between touch and acoustic resonance is not necessarily a linear process: vibration and sound are logically entwined in terms of tactile and auditory perception, yet when sound changes its *behaviour* through time, it takes on characteristics of an intelligent companion. Meaningful information extracted from audio signals, which in computer music is termed 'machine listening', can be used as input for the emergent system.

The subjects in the RHYME project each present unique needs. Are there universal concepts to guide the design process? The authors continuously return to this, and other questions, through analysis, interviews and discussions.

References

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