Expanding the role of the instrument

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ABSTRACT

The traditional *role* of the musical instrument is to be the working tool of the professional musician. On the instrument the musician performs music for the audience to listen to. In this paper we present an interactive installation, where we expand the role of the instrument to motivate *musicking* and co-creation between diverse users. We have made an open installation, where users can perform a variety of actions in several situations. By using the abilities of the computer, we have made an installation, which can be *interpreted* to have *many* roles. It can both be an *instrument*, a *co-musician*, a *communication partner*, a *toy*, a *meeting place* and an *ambient* musical *landscape*. The users can *dynamically shift* between roles, based on their abilities, knowledge and motivation.

Keywords
Role, music instrument, genre, narrative, open, interaction design, musicking, interactive installation, sound art

1. INTRODUCTION
Traditionally an instrument is something a musician plays on to perform music. What the musician plays can be written in advance by a composer, or improvised in the situation by the musician, alone or together with other musicians. In both cases special competence to play the instrument is needed, developed through years of hard training to an amateur or professional level of musicianship. In both cases the *user* is a *musician*, the *artefact* he uses a musical *instrument* and the *action* he performs is *playing*. The role, the artefact and the action are defined *mutually* by the cultural and genre competence the user possesses [5].

Today the computer is used as an instrument in itself, and as part in the construction of other instruments to add new qualities and functions to the instrument. Such computer based instruments have functions lacking in traditional acoustic instruments, e.g. a synthesizer's ability to dynamically filter and modulate the sound signal, and add background accompaniments and beats. All the same, these are, despite their special functionality, instruments to be used by musicians. However, the computer's possibilities can also be used to expand the musical experience and actions for broader groups of users. By computer based instruments we mean both instruments containing electronic hardware like sensors and input devices and software, that are controlled by the musician while playing and based on the programmed rules.

With computer based instruments, people with different musical competencies, can create and experience music together on more equal terms, and in more everyday situations. Music theorists, focusing on the everyday life experience of music, have problematized the mediation [14, 9] and action [23] level of music related activities. With the term "musicking" Christopher Small sees music as a verb, a meaning making activity that includes everyday listening, dancing, creating and performing music. [23] The central is the social activity and experiences, where all present are equal participants, no matter level of expertise or activity. But none of them have treated computer based instruments, and their specific possibilities.

In this paper we show how we have worked with the development in an interactive installation in order to *expand the possible roles*, and "musicking" related *actions,* a computer based instrument can offer. Our aim is to motivate co-creation between different user groups, with different competencies and motivations.

2. ROLES AND ARTEFACTS
What is a Role?
The term *role* originally comes from theatre terminology, but has later been used in disciplines like psychology [19], sociology and within computer games [18]. Role means to play a character in a play, or in social relations. Usually a role is something an actor, or in our case a user, *chooses* or *gets* in a given situation, related to other roles, *situations* or *artefacts*. One can choose which avatar to be in a computer game, or role to play in a social setting. Some roles are given or negotiated in relations to others, like in family settings. Being the oldest son in a family, some things are *expected*, having that role, but other things are *negotiated* in the actual family situation and based on the individual's qualities and history. The roles and related *expectations* are *mutually negotiated* in relation to each other in a specific social and cultural context [19].

Role and Artefact
The role the user chooses, consciously or non-consciously, depends on the *interpretation* the user makes of the situation and artefact. With artefact here we mean any human made object, but our focus is on objects containing computers, ubiquitous computing artefacts.

The interpretation the user does, depend on the user's knowledge, social *belonging*, *context*, and *expectations*. Some thinkers like Martin Heidegger [13], whom has been of huge importance for the Human Computer Interaction (HCI) field, focused on the artefact as tool. Here the *goal* the user wants to achieve by using the tool is the important thing. The artefact affords and enables different forms of interaction. A good tool is for Heidegger something that feels like a part of your body, and the goal becomes to master the tool, or instrument in our case. The qualities of the artefact, tool or instrument determine the user's actions. From this ideal a "good" artefact should be transparent and intuitive [21].

This position has been criticized as being technologically deterministic by sociologist Bruno Latour [16, 17], one of today's most important technological thinkers.

Based on the post-structuralist thinkers from the 1960s like Roland Barthes [6], Julia Kristeva [15], Umberto Eco [10] and Michel Foucault [11], discussing the *role of the reader*, *author* and *text*, constructivist thinkers have gone to the other extreme focusing mainly on the reading and use processes. In media studies this has been an important perspective for the last 20 years, often referred to as reception, consumption or cultural studies. And while media studies increasingly treat interactive media, the media and text theoretical perspectives have become gradually more important for the field of Interaction Design.

The focus in these theories goes from the designer's, composer's or author's history and intention, to the user's competence in the interpretation situation. It is the user's social and cultural competencies that are important for the interpretation of the artefact, or text in the broadest sense. The social and cultural aspects determine the interpretation and meaning of artefacts and the actions they encourage [8].

Artefacts and Actants

Bruno Latour who's studies concern use of physical and technical things [16, 17] has been of great importance for the HCI and Interaction Design field, in particular his Actor Network Theory and theory of mediation [16, 17]. Latour shows how things can act, not only as neutral objects or tools, but as active actors, or *actants*, as he calls them, with abilities to influence scientific results and everyday life.

Shifting Roles

The term *shifting*, like actant, comes from semiotics and originally explains how a reader is motivated by the text to identify with the text's main character. The reader, or in our case the user, can *shift role* from identifying with the main character to a more peripheral character. Latour calls this actorial shifting [17]. The users can also be motivated by the rhetoric of the text, or in our case of the design, to shift position in space to another location and time. By including an old picture of Stockholm the designer can make us imagine being there. Latour calls this *spatial* and *temporal shifting*. What Latour recognised was that when including interaction with physical artefacts, yet another type of shifting takes place, where the user of the artefact not only *thinks about* shifting. Instead the user *delegates meaning* and actions *to the artefact* by *using it*.

Open and Ambiguous

As a part in the earlier mentioned text theoretical discussion from the 1960s the philosopher and semiotician, Umberto Eco, contributed with some very influential texts: "The poetics of the open work" and "The role of the reader" [10]. These texts have been important for the music field because they discuss and analyse works by avant-garde composers like Henry Pousseur and Pierre Boulez. Eco theorises over the poetic, open, interpretative structures of these composers' works. And how the open structure represents *possible music to be realised* by the musicians while performing. From this poetics evolves an ideal of the open and ambiguous work that has been an ideal within all art disciplines, where *time* and *interpretation* are important aesthetic dimensions. And with time comes the interest for narrative and dramatic structure and experience.

HCI based on Heideggerian, functionalistic, engineering ideals has until lately advocated the opposite. Good has been synonymous with disappearing, "natural", intuitive and reduction of ambiguity. But lately, when people with an artistic background has entered the HCI and Interaction Design field the engaging and interpretative potentiality of ambiguity has

been introduced to the field [2, 12, 4]. And narratology and dramatology [7, 18] has been an increasingly employed perspective in understanding and designing a use sequence that unfolds over time, especially within computer games [1, 18].
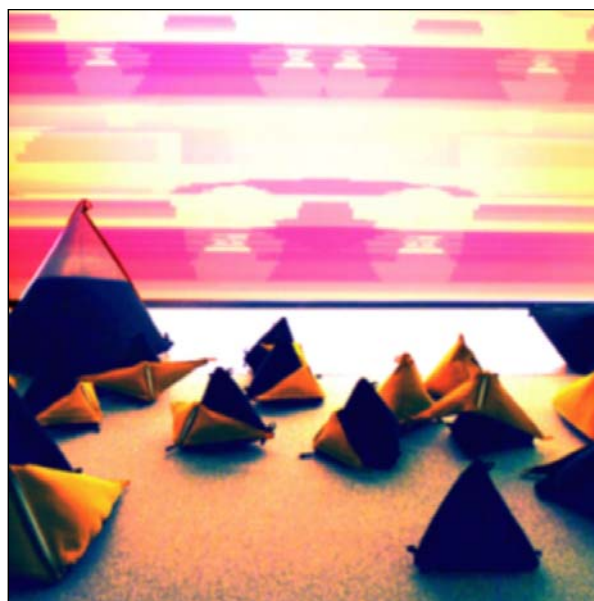
3. THE INSTALLATION ORFI

Figure 1. The ORFI landscape, the modules and the dynamic video projection.

Our case in this paper is the interactive installation ORFI. It is a tangible, cross-media installation (see Fig. 1), and a result of over 10 years of explorations within the field of tangible user interfaces for music related activities. Our work is inspired by Eco's thoughts of openness [10], adapted to the field of tangible interaction and directed towards a variety of uses. It is also inspired by Latour's theories of shifting and active actants [17] that take an active role in the communication process, by inviting, provoking and engaging. And thereby staging a real-time realized narrative experience. Knowledge from the field of narratology in relation to interactivity has been a basis for design of the software and content structure. Here Latour's insight in mediation and shifting has been an important framework for our design and composition process.

ORFI consists of 20 tetrahedron shaped soft modules or custom made cushions. The modules are made in black textile and come in three different sizes from 30 to 90 centimetres. Most of the tetrahedron has orange origami shaped "wings" mounted with an orange transparent light stick along one side. The "wings" contain bendable sensors. By interacting with the wings the user creates changes in light, video and music. Two orange tetrahedrons contain microphones. ORFI is shaped as a hybrid, a hybrid between furniture, an instrument and a toy, in order to motivate different interpretations and forms of interaction. One can sit down in it as in a chair or play on it as on an instrument, with immediate response to interaction. Or one can talk, sing and play with it, as with a friend and a co-musician in a communicative way, where ORFI answers vary musically after some time.

Every module contains a micro computer and a radio device, so they can communicate wireless with each other. The modules can be connected together in a Lego-like manner into large interactive landscapes. Or, the modules can be spread out in a radius of 100 meters. So one can interact with each other sitting close, or far away from each other. There is no central point in the installation, it is like a field [8]. The users can look

at each other or at the dynamic video they create together. Or one can just chill out and feel the vibrations from the music sitting in the largest modules as an immersive, ambient, experience.

The installation has a 4-channel sound system that makes listening a distributed experience. ORFI consists of several music genres, which the user can change between. Some of the genres use sound files that can be combined, following musical principles for layering and sequential ordering. In other genres the music and the dynamic graphics is based on programming code, making it possible to order content in layers and sequentially, based on how the users interact. These rules for interaction and music composition have been described in detail in earlier publications. [8, 3]

The many possibilities, like mobile modules and many genres to choose and negotiate between, reflect our goal to facilitate communication between different users and situations.

4. OBSERVATION AND DISCUSSION

The ORFI installation has been evaluated and user tested in many ways, and on different stages throughout the design process. After finishing the installation we have done several sessions of user observations in a usability lab with families and other user constellations.

Five families, with disabled children, spent between one and two hours at our "home look-alike" usability lab, while we were sitting behind a glass walls observing and filming from 4 angles, recording video material for later analysis. After the test period we made in-depth interviews with all family members present. We also made additional user testing at a hospital rehabilitation centre where patients made weekly visits at a Multi Sensory Environment. Here 12 users experienced ORFI for one hour, twice, with a week in between. The observations were recorded, with two fixed and one motor-controllable video camera. Together with the therapists we moved the camera during sessions and watched what were happening on a TV screen from a neighbouring room. Before the session we had introduced the therapists to ORFI on a technical level. All users were brought by their care person or family member, and they spent the hour together in the room.

4.1 One family in ORFI

In this paper we have chosen to present observations and analysis of only one family. The reason is that this family is representative for our findings in relation to **taking roles** and **shifting roles**. During only one session in the usability lab we observed how they used ORFI in a *multiple of ways*: as an instrument, a co-musician, a communication partner, a toy, a meeting place and an ambient musical landscape.

The family consists of six members: mother, father and four children. The youngest boy, with multiple disabilities, was 6 years old when we did the observations. He had two older brothers, age 8 and 11, and a teenage sister.

The observation of this family shows the relational potentiality of an open design like ORFI. This because ORFI offers many people to be present and share the musicking experience on their own terms, by offering people a possibility to take roles and shift between many roles.

Mother and Son – from Instrument, Communication Partner, to Co-musician

Mother and 6 year old son sat down on the floor, facing each other. She reached for one ORFI module, in order to see how it worked. She turned it over and squeezed its' wings to understand the causal relation between her actions and the responses. She tried to *master* ORFI and thereby gave it the role of a tool or instrument. The son, on the other hand, watched the mother's tryouts and listened to the sound.

Accordingly, he took the role of the *listener and spectator without interacting*. ORFI responded with a short light and sound to each of the mother's interactions. ORFI created a *stable, non-shifting*, response to the mother's repeated interactions with the same module. ORFI became an instrument that always gave the *same response*.

Role shifts during breaks. The mother continued to interact with one module and made a short hesitation, a break between each interaction. She repeated it three times. ORFI registered the repetitions of interaction-break, and after the third time, answered with *shifted, delayed response* in sound, in addition to direct response in light and graphics. The direct light response synchronised with the mother squeezing the wing as opposed to the sound response when she released the wing. Mother and son smiled and looked at each other. The mother and son had shifted focus from expecting a response to the initial action to focus on the break, the interval in between the sounds and the actions. They had also shifted from treating ORFI like an instrument, to treating it as a *communication partner*. That role was strengthened through *imitation* and *variation* as the mother kept on interacting. As she continued to persist on interacting with a break, ORFI increased the number of shifted responses until they formed a sequence of sounds on every release. The son shifted role from listening to *communicating* through *smiles* and *glances*. ORFI shifted role from mechanical instrument to *communication partner*.

Co-musicians create to the beat. The mother chose a particular module that played a rhythmical beat, continuously like a background drummer. She interacted with the wing on another module and started to synchronise her movements, so that they followed the beat. The son imitated her actions and moved his head and arms to the beat as if he was dancing. ORFI registered the mother's degree of synchronisation to the beat. If she was on the beat, off-beat or out of beat. If she managed to synchronise many times in a row, and over longer time. When she succeeded to synchronise three times, ORFI responded with motifs and riffs with rhythmic, melodic, timbre and chord shifting *variations*, within the musical genre. These shifting responses were played by ORFI, in addition to the direct response. ORFI took the role of *co-musician*, making musical imitations and variations, as would a *member of a band* when playing music together with another band member. The mother shifted her role from communication partner to *co-musician*, shifting down to the rhythm, trying to *synchronise her actions to the music*, expecting more variations from ORFI. The son shifted role to a *co-musician*, musicking and interpreting the sound as music through *dance movements*.

Daughter –Instrument to Meeting Place

The teenage daughter entered the room and moved towards the corner, creating her own space, away from the mother and brother. The daughter lifted up and interacted with modules from the floor, one after the other. She squeezed their wings, and saw what happened on the video projection. Each time the modules answered in light, sound and graphical changes in the video. Just as the mother, she took the role of a person *trying to master* ORFI. Each time ORFI registered and interpreted her separate interactions and answered back directly. On answering directly ORFI took the role of an *instrument*.

The teenage daughter discovered small hooks in each corner of the triangular module. She connected two modules with rubber bands that she found next to them, and put them back on the floor. She looked at them and continued to connect and try out different combinations, until the modules created an arm chair. She sat down. In the course of investigating hooks and rubber bands, she gradually had shifted role from trying to master, to *co-create* her own furniture. With its open and

modular design of hooks and rubber bands ORFI contributed and afforded the daughter's creation. ORFI shifted role from instrument to *meeting place* with references to furniture and teenage room.

Father – Ambient Soundscape

Meanwhile, the father entered the room and sat down in one of the largest, black ORFI modules. The module had speakers and played music created by the users' interaction, which made it an *ambient soundscape*. Other activities in the room, became a background to his relaxing activities.

Brothers – from Instrument to Partners

The two older brothers took one ORFI module each and started to bend the wings. They recognised the direct response and tried to *master* ORFI as an *instrument*. They started to tease each other, punching the other with the modules. It developed into full pillow war. ORFI registered their intense overlapping actions. After three times, ORFI gave a shifting response with *harsh timbre*. It ended with the younger brother covering the older with modules. They shifted roles from trying to master ORFI to *tease, compete* and *negotiate* their actions as *communication partners*. ORFI also took the role of a communication partner when it gave shifted and delayed response, with harsh timbre, *imitating* the teasing actions. As the big brothers laughed out loud, the little brother looked at them with admiration. The mother smiled and the teenager sighed. The father experienced their activities as ambient vibrations. ORFI became a *meeting place* for the whole family, where everyone could musicking on their on terms, at the same time, and still experience companionship [22] in the family.

5. CONCLUSION

In this paper we have presented and argued how to design a musical interface to facilitate *musical co-creation* between *diverse users,* by offering the users possibilities to *shift roles dynamically*. By designing an open interactive installation that offered the users possibilities to *take* and *shift* between many roles, the *musicking* experience was enriched. Instead of just being a *performer* that mastered an *instrument* or a passive listener, the user was able to shift between many roles; from being a musician playing on an instrument, to a co-musician playing intense with another *co-musician*. Or from being a communication partner communicating with a *friend*, to a more passive user, who just experienced an ambient, tactile, musical *landscape*. We observed that the users and the artefacts continuously and mutually *negotiated* the *roles*, and the *relevant actions* to expect and perform. And *how* the actions were performed and responded to. One may *hit* an instrument intensely, and one might *throw* a pillow. But one *listens* to a friend or a jazz co-musician, before one *answers*. The negotiation of roles is based on the user's cultural and social *genre* competence.

Inspired by Eco's ideal of *open wor*ks [10], Small's term *musicking* [23] and Latour's theories of *actants*, *mediation* and *shifting* [16, 17], we designed an open installation, ORFI, which we have presented in this paper. We call it an open field, because of its openness to many interpretations, interaction forms and roles to take. We have argued for the constantly accessible possibilities of shifting roles in order to co-create the musicking experience. These possibilities opened up for the user to participate in the musicking on his own terms and in his own manner. So instead of interacting in the same way, people with different abilities and competences, can all interact in their own manner and level of activity. By using the abilities of the computer we have shown and argued how we have expanded the role of the instrument, in order to facilitate musical co-creation between a diversity of users.

6. ACKNOWLEDGEMENTS

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