USING A SYSTEMATIC DESIGN PROCESS TO INVESTIGATE NARRATIVE SOUND DESIGN STRATEGIES FOR INTERACTIVE COMMODITIES

Daniel Hug

Universities of the Arts Linz & Zurich
Linz, Austria / Zurich, Switzerland
daniel.hug@zhdk.ch

ABSTRACT

Computing technologies turn everyday artifacts into narrative, procedural objects. This observation suggests that the narrative sound design strategies used in films and video games could also be applied for the design of interactive commodities. However, it is unknown whether these strategies from immersive media can be applied in physical artifacts of everyday use. In this paper we describe methodological considerations and outline a structure of a revisable, design oriented, participatory research process, which allows to explore narrative sound designs and their possible application in interactive commodities in a systematic yet explorative way. The process, which focused on interpretational aspects, has been applied in two workshops and their results are reported and discussed.

1. INTRODUCTION

1.1. The Nature of Interactive Commodities

Computing is increasingly moving out of the desktop into household appliances, entertainment systems, mobile communication devices, clothes and to places we might not even know about, turning objects of everyday use into interactive commodities. One thing such interactive commodities have in common, is the reduced importance of visual display. Also they are often "black boxes", objects who's inner workings are unknown. Such devices may seem to have a will of their own and to act without assistance. Sound can provide useful means to give such devices a "display", a means of expression and communication, and a sonic identity, which is present even in the peripheral awareness of people.

1.2. The Potential of Narrative Sound Design

There is still little knowledge available about how to design sound for interactive commodities. Designers are starting to work on scenarios and prototypes [1] and first approaches to a sound design oriented theory for such devices have been made (e.g. [2], [3]). It has been proposed that the sound design of interactive commodities could be informed by narrative and even fictional design strategies [4]. Artifacts in general are socio-cultural components in the narratives of our everyday lifes, expressing our personality, status, emotions and attitudes. Moreover, they are not static "dead" things, but interactive, dynamic agents in social networks and deeply narrative in nature. This is even more true for computerized artifacts which become procedural and interactive in nature, even anthropomorphized or "magical" [5].

1.3. Strategies for Designing Narrative Sounds

Fictional media, in particular film, have developed an immense body of knowledge and know-how about how to convey meaning through the narrative qualities of sounds. Moreover sound designs in films are often highly elaborated, semantically rich and subtly tuned to the identity of the protagonists, objects and processes depicted. Also the sounds of films embody often complexity, variety and balance, which are characteristics of sounds that contribute to livable hi-fi soundscapes [6]. This satisfies several fundamental requirements for sounds of interactive commodities, which are to become a meaningful, enriching and appreciated part of our everyday life. Thus it seems worthwile to investigate possibilities to leverage this design knowledge. Although documentations and reflections on sound design are relatively scarce, there are several publications that shed light on how meaning is made not only by a sounds functional use in the audio-visual medium but also by its compositional and phenomenological qualities (e.g. [7], [8], [9]). Some texts also provide examples to how such sounds could actually be designed (e.g. [10], [11]). The use of semantic layers, archetypal templates, the play with familiarity, traces of materiality and traces of psychology are examples of commonly applied sound design strategies. These are described in more detail in [4]. But two important issues need to be taken into consideration which prevent the straightforward application of film sound design strategies in the context of interactive commodities.

1.4. Issue 1: Immersive vs. Non-immersive Media

Even if it turns out to be possible to extract and describe the design strategies used for specific narrative and dramaturgic aims in narrative audiovisual media, this does not grant their applicability in the domain of actual physical artifacts and everyday interactions. The reason for this is mainly that films and games are *immersive* media. They are consumed - not used - and their consumption takes place in a more or less defined spatiotemporal context. Activity and intentionality is present only through a protagonist's audiovisually represented actions and intentions. However the artifacts investigated here are of an altogether different nature. They are used non-immersively, pragmatically and in the periphery of attention. Different interpretative strategies are thus to be expected.

1.5. Issue 2: Interpretation of Schizophonic Artifacts

The possibility to integrate a practically limitless range of sounds into physical objects by means of miniaturized electroacoustic devices and to control them through computer technology makes the relationship between physical object and its sound arbitrary. Not only can the sounds naturally occurring from an interaction with a physical object be extended with signals, but also it is possible to transfer physical qualities, even a virtual presence of other artifacts (and the associated semantic qualities), into artifacts. This

creates inherently *schizophonic*[1] artifacts and it is unknown how such sounds will be interpreted and what varieties of synchresis and diegetics are emerging.

2. METHODICAL APPROACH

As described above, the proposition states that narrative sound design strategies from fictional media like film or games could inform the sound design of interactive commodities. The research pivots around questions of interpretation in two different experiential settings: immersive and non-immersive, disembodied screen and schizophonic, physical artifacts.

A single methodological framework is not sufficient for dealing with the complex socio-cultural context of this research in a non-reductionist manner. This is the case in most design oriented research, and it has been suggested to take a pragmatist stance towards methodology, selecting and combining methods according to their usefulness for achieving specific goals [13]. Another challenge was to formulate initial design hypotheses which would not be biased by analytic theories specifically related to film sound. For this reason, aspects of Grounded Theory [14] were adopted in the process, in particular for the collection, coding and clustering of interpretations.

2.1. Research Through Design

As sounding interactive commodities are supposed to be part of our everyday life, the understanding of our experience of technology as a dynamic, dialogical process [15] forms the philosophical foundation of this work. Hence, the research methodology has to support the collection and evaluation of interpretive strategies and to ”grasp lived cultures” [16]. However, this research deals with possible futures rather than actual present or past. Therefore instances of possible lived experiences have to be created that can be further investigated, which calls for an integration of design as creative component. Designing artifacts which can then serve as cases for further study is a useful practice in research and provides an ideal link between what designers and researchers can do best (c.f. [17], [18]).

The selection and integration of design strategies also makes sense when dealing with complex socio-cultural issues: Following Rittel, Krippendorff argues that design deals with ”wicked” problems, as opposed to more or less well structured technological problems and that it has been successful in developing methods to cope with this challenge [19]. ”Research through design” thus is a suitable strategy for tackling the issues presented here [20].

2.2. Designing a Revisable Design Process

The design process had to be structured in such a waythat it supported the creation and exploration of ideas while allowing to compare specific aspects of the outcome to an initial design hypothesis. Moreover the research process needed to be accessible and open to the contribution, both in discourse and application, of designers at any moment.

Krippendorff suggests a ”systematic collection of accounts of successful design practices, design methods and their lessons (...). It also (...) [provides] methods for validating designs.” ([19], p. 209) Such a systematic methodological collection can in turn be used to implement designerly practices into research processes. Thus, by joining documented design methods in a structured way, artifacts can be created that can be evaluated against an initial design hypothesis [20].

The aim of this study was to compare the interpretations of the sound designs in interactions represented in immersive, fictional media with sound designs for actual interactions with artifacts. Krippendorff proposes several human-centered design methods of which the following were selected as conceptual building blocks to create the framework for this research [19]:

- Reframing: Useful for creating conceptual spaces, similar to brainstorming but following specific cognitive devices
- Narratives of ideal futures: Analyzing fictional scenarios and their depiction in movies and games can help to understand stakeholder’s concepts, motivations and visions.
- Stakeholder participation in the design process: For this research both analytic as well as creative processes involved group work.
- (Re)designing the characters of artifacts: First desirable attributes for the character of an artifact or an interaction are defined. Then related sensory manifestations are designed and evaluated against the initial descriptions.
- Designing expressive artifacts, guided by narratives and metaphors

2.3. Experience Prototyping and the OZ Paradigm

As mentioned, part of the research goal was to create instances of possible futures and lived experiences that then can be evaluated and discussed. This is a common practice in design called ”experience prototyping”. According to Buchenau and Suri, researchers need ”to explore and communicate what it will be like to interact with the things we design” ([21] p. 424). They describe experience prototypes as ”any kind of representation, in any medium, that is designed to understand, explore of communicate what it might be like to engage with the product, space or system we are designing” ([21] p. 452). For this research a variation of the Wizard-of-Oz prototyping method was used. The method was developed in the eighties by John F. Kelley to simulate natural language computing and he describes it as an ”(...) experimental simulation which I call the OZ paradigm, in which experimental participants are given the impression that they are interacting with a program that understands English as well as another human would” ([22], p. 26). More recently a variation of the method has also been used in the context of auditory display research [23].

2.4. Implementation in a Workshop Setting

Participatory workshop settings have been found useful in many cases to deal with complex, design oriented issues like the one presented here (see e.g. [24] [1], [23], [25]). Therefore a structure for participatory workshops has been conceived and applied. By going through a specific sequence of steps from analysis to evaluation with the group of participants, and by iterating the overall process, we increased the reliability and validity of the findings. So far, over 30 individuals participated in the process, and about 20 more will be added to this number in future.

The following research process was set up for the workshop structure:

1. Analysis of existing narrative ”metatopics” (explained in section 3.2.) and sound design strategies, describing them in sufficient detail so that they can be used as orientation points for designing comparable interactions involving physical artifacts.

[1] Schizophonia is the term coined by R. M. Schafer to denote the separation of sound from their - natural - sources by means of electroacoustics [12].

2. Formulation of scenarios for possible future artifacts, proposing suitable narrative metatopics. These are to be selected from the previous analysis to establish comparability with the proposed explorative designs.
3. Implementation of the concept as experience prototypes, aiming at sonic elaboration. Technological implementation or even feasibility is secondary. Part of the prototype design is the creation of a theatrical presentation.
4. Interpretation of the results based on the experience of a theatrical performance or of one's own interaction, following a semi-structured protocol for presentation and discussion.

3. THE WORKSHOP STRUCTURE

So far two workshops have been carried out. Each iteration maintains the basic structure in order to establish comparability of specific aspects. Other aspects may be slightly modified in order to accommodate circumstances and insights from previous iterations.The thorough documentation of each iteration makes it possible to identify differences and their possible impact, thus preserving accountability. The core components remain unchanged and are applied in every iteration. They are described in the following.

3.1. Step 1: Establishing Fundamental Competences

For the overall research strategy to yield the desired results it has to be assured that all participants share a comparable and sufficient level of sound related competence. This is necessary for both analytic and creative tasks.Therefore, the following topics are introduced:

- Introduction to Sonic Interaction Design, especially about the characteristics of interactive artifacts and the rationale to use sounds in their design. This is illustrated with examples from industry and design research, e.g. [26].Also an overview of the activities of the European COST-Initiative Sonic Interaction Design[2] is provided.
- Competence for dealing with sound conceptually, linguistically and practically. This involves an introduction to sound studies and acoustic communication as well as ways of analyzing and describing sonic objects, sonic events and soundscapes.
- Competence related to the relationship of sound, object and interaction. This includes product sound quality and the analysis of action-sound relationships [27]. This is combined with the creation of a "foley-box", containing all kinds of objects with interesting sounds, to inspire creation and provide material for recordings.
- Competence in a theory of sounding interactive commodities. This entails the considerations about object-sound reconfigurations, which extends the argumentative basis for using sound in interactive commodities (mostly built on [4]). A typology for analyzing sounding interactive commodities based on [3] is provided as well.

3.2. Step 2: Analyzing Fictional Sound Designs

A collection of up to 23 short extracts from movies and 5 extracts from video games are provided to the participants. Each clip contains a narratively closed scene, depicting either an interaction with an artifact, or changing internal states of objects or protagonists (provided the change is mediated by an artifact). The sound design should play an important role in the interpretation. The clips are divided in two sets and anonymized.

The clips are provided together with an analytic protocol. According to the protocol, the following analytical steps have to be followed (summary):

- Short description of the narrative content (protagonists, actions and events)
- Interpretation of the narrative content
- Introspection about what lead to this interpretation (visual or acoustic aspects, narrative context, characteristic actions)
- Creation of labels with qualitative keywords for the narratives depicted in the scenes. This abstraction makes it possible to find cross-links between narratives and their judgement. Each label should be composed of an *adverb*, a *verb*, an *adjective* and a *noun* (e.g. "dangerous movement of fragile box")

After this first part of the analysis, the second part focuses on the sonic aspects:

- Description of reason why a particular sound might have been important for the interpretation
- Description of the sound itself and the supposed design strategy to create it
- Investigation of the relationship between action and sound (using the framework provided in step 1)
- Creation of labels with qualitative keywords for the sounds, again using attributes, objects (possible source) and verbs. Also here the labels provide an abstraction that aids cross-linking and comparison.

The labels are then written on post-it notes of two different colors, one for general interpretations and the other for sound specific aspects. After that, the short description and the labels for each scene are grouped and stuck to a big matrix with one clip per column. This process results in an extensive collection of condensed narratives and the related interpretations by each group for each clip (see Figure 1).

Figure 1: *An analytic matrix. Each post-it color stands for a class of labels.*

Finally, the descriptions and interpretations are discussed together with all participants. The researcher moderates this discussion and everything is recorded to allow a closer evaluation later on. In the last and most important step, so-called *"metatopics"* are formulated. These are abstracted narrative themes and attributes of artifacts and interactions that appear in several clips and seem

[2] http://www.cost-sid.org

important recurring elements of storytelling using sound. To this end, the abstractions provided by the labels for qualities of both general narratives and the associated specific sound designs are used. First, common attributes across cases are highlighted and subsequently grouped along their common denominators. Based on these semantic clusters the moderator proposes and discusses the emerging metatopics with the participants. This process is a "rapid" version of coding, memo-writing, clustering and saturation known from Grounded Theory [14].

3.3. Step 3: Collecting and Analyzing Everyday Interactions

After the clip analysis, participants are asked to document everyday interactions and objects using video recordings. These interactions have to be analyzed using the same steps as the movie clips (step 2). This helps to prepare the ground for the next step.

3.4. Step 4: Sonic Redesign of Everyday Object Interactions

The participants are asked to find narrative links between the fictional metatopics identified and the everyday experiences documented, and to redesign the sounds of the everyday experiences, using the available sound designs identified in the fictional scenarios of the clips. This allows the rapid prototyping of design ideas, relying on the elaboration and quality of professional sound design, without having to go through an elaborate sound design process. It also allows a preliminary verification of the usefulness and transferability of the fictional metatopics to everyday artifacts.

3.5. Step 5: Experience Prototyping

This step consists in the conception and development of an experience prototype by each team. The only requirement is, that it has to deal with an interactive artifact and that metatopics should drive the sound design. In order to provide a fruitful work environment, every team receives a package of the basic tools and materials needed for electroacoustic prototyping including a midi keyboard.

After making sure that every team has a goal and there are no obstacles to the design process, the lecturer remains in the background, only intervening when problems with implementation of an idea occur. The sound designs in particular should be kept secret by the teams. This serves to assure a certain level of "ignorance" from the lecturer and the teams, which allows them to participate in more or less equal position in the final interpretation and discussion.

3.6. Step 6: Interpretation of Prototype Performances

In the final step the participants perform their scenario, interacting with the prototypes. These performances are given without initial explanations. After the performance there is a discussion, following a semi-structured protocol. The topics discussed follow the same structure as the analysis of the clips, in order to maintain comparability: what were the interactions? what was the role of the various actions and objects? what could have led to a specific interpretation? to what extend sound was relevant and what sonic aspects would contribute to the interpretation? After the interpretations are formed and discussed, the presenting team can provide their explanations, which helps to verify whether the interpretations of the demonstration corresponded to the intentions of the designers.

4. PILOT WORKSHOP AT UNIVERSITY OF HELSINKI

4.1. Background

The initial workshop was held on October 21st and 22nd 2008 at the Helsinki University of Technology, hosted by lecturers Cumhur Erkut and Inger Ekman. It was held in the "Design Factory"[3], which provided an ideal environment. Thirteen students attended, all of them had a background in audio engineering, some also in music. None of them had a formal education in design, but they had taken courses in which design-oriented methods were taught and used. This ensured a degree of familiarity with design related issues.

The workshop was run to pilot the whole process. The duration was one and a half days, which required a few modifications to the program described above: Step 2 and 3 were carried out simultaneously in two separate groups and the number of clips and the number of everyday situations to be analyzed was reduced. Moreover step 4 and 5 were merged and step 6 was slightly simplified. All essential elements of the overall process were still contained in the program and it provided sufficient data to contribute to the overall research.

Figure 2: *Students doing field recording and adding content to the clip analysis.*

4.2. Metatopics Identified

The following metatopics were identified in the group discussion of the clips (indexed for further reference):
1a) Artifact turning evil
1b) Artifact matching user
1c) Autonomous or remote control
1d) Scary or positive magic
1e) "(In)correct", (in)appropriate use
1f) Life and life-cycle of artifact

4.3. Prototyping Results

Group 1: Large Hadron Collider
Raine Kajastila, Olli Oksa, Matti Pesonen

The group developed a sound design for a short story about a scientist operating the Large Hadron Collider[4]. Several operational steps can be heard however it is clear something is not working. The scientist attempts to start the collider but fails. He then fixes it with a mechanical device but when the machine is restarted something goes terribly wrong.

[3] http://www.aaltodesignfactory.fi

[4] The Large Hadron Collider (LHC) is the world's largest and highest-energy particle accelerator. See http://lhc.web.cern.ch/lhc/

The sound design combined several field recordings that were interpreted similarly like the metatopics investigated, e.g. combining pneumatic or glassy sounds with film sounds associated with "magic".

The following *metatopics* and sounds design strategies were used: *1b, 1d, 1e, 1f*

Group 2: Ancient Autonomous Steel Tape Measure
Emil Eirola, Tapani Pihlajamäki, Jussi Pekonen

The scenario from this group featured a "living" measuring tape.It was presented in a small performance using a real tape measure, synchronized with a pre-fabricated sound design. First the protagonist extends the tape, however it rapidly becomes uncontrollable. The protagonist fights with the tape, tries to submit it and finally succeeds, forcing the tape to snap back.

The sounds used came from field recordings and were mixed with sound extracts from clips associated with the metatopics of interest. These were enhanced with effects like reverb or distortion, partially to create sonic coherence, partially to enhance the expressive quality of the sounds.

The following *metatopics* and associated sound design strategies were used: *1a, 1c, 1d*

Group 3: Dangerous Microwave Oven
Sakari Tervo, Juha-Matti Hirvonen, Joonas Jaatinen

This project presented the interaction with a microwave oven that turns into a dangerous device, almost killing its user.

The design was built on a distorted recording of the hum and the familiar beeps of a microwave oven and several sounds from various clips associated with the desired metatopics but also with phenomena like energy discharge. The sounds of the microwave oven were partially reversed or played faster to create familiar yet strange sounds.

The following *metatopics* and associated sound design strategies were used: *1a, 1f*

Group 4: Door to a Restricted Magic Place
Qiwen Shao, Esko Järnfors, Antti Jylhä

In this scenario, a person opens a door, which leads to a magic place. After entering, everything is fine at first, but then the protagonist breaks something. This disturbs an order of the place, which makes it angry. All of a sudden it become hostile and uses its magical powers to attack the protagonist.

The magical door was created using several different squeaking door sounds to establish a degree of familiarity. These everyday sounds were specifically chosen to contain either aggressiveness or eeriness and were mixed with samples from clips associated with the metatopics.

The following *metatopics* and associated sound design strategies were used: *1d, 1e*

5. WORKSHOP AT ZURICH UNIVERSITY OF THE ARTS

5.1. Background

The second iteration of workshops was held between December 3rd and 19th 2008 at Zurich University of the Arts (ZHdK) in the Design Department. This version of the workshop lasted for 12 days. The longer time span allowed for more introductory exercises and for more time to be spent on both the production of sound designs and on the actual prototypes. Wizard-of-Oz techniques were used extensively for prototyping and for the theatrical performance (see figure 3). The clip analysis was extended, both in breadth and duration, including also several clips created from video games. The increased duration allowed also to create physical prototypes, either as novel constructions or by "hacking" and modifying existing artifacts. The workshop was attended by 16 students. Their background was Interaction Design (5) Game Design (9), Scenography (1) and Style&Design (1 student).

Figure 3: *The workspace of a "wizard". The keyboard controller is used to trigger and control sounds.*

5.2. Metatopics Identified

The larger corpus found in this workshop, in combination with longer discussions, significantly increased the number of metatopics. We created a new index to reflect this and it is shown here:
2a) Atmospheric machine
2b) Moody / emotional machine
2c) Presence or infestation with alien power
2d) Dead matter becoming alive
2e) Anthropomorphization of machines
2f) Moral attitude
2g) Known/friendly, unknown/evil
2h) Level of power
2i) Invisible energy
2j) Charging / discharging (energy)
2k) Comprehensible or incomprehensible magic
2l) Metamorphosis
2m) Compatibility
2n) Inappropriate use
2o) Speed
2p) Pain

5.3. Prototyping Results

Group 1: TakeMeAway (Figure 4)
Balz Rittmeyer, Daniel Lutz, Bruno Meilick

Sometimes we receive a call when we do not want to be disturbed, and have to invent an excuse. The phone service proposed by this group allows a callee to transport herself sonically into an imaginary reality, making such excuses more convincing. Buttons on the phone activate virtual soundscapes and modify the voice of the callee to fit the scenario. For example, the callee might decide to pretend to be in a church, on a busy road or in the middle of a war.

It was proposed that the phone itself could change its character based on the moral decay of the user, reflected in the amount of times the function was used or in the extremity of the chosen fake scenarios.

The following *metatopics* and associated sound design strategies were used: *2f, 2h, 2l*

Group 2: Assembly Line (Figure 5)
Philipp Lehmann, Julian Kraan, Didier Bertschinger

According to this group, in the near future assembly lines for car manufacturing will be entirely virtualized. Robotic arms exe-

Figure 4: *Preparing the demonstration of the phone prototype. On the right is a "wizard", controlling the sound events.*

cute the precision work, remotely controlled through touch screens. The manipulative gestures of a car manufacturing expert on the touchscreens are mediated by audiovisual representations.A complex sonic environment gives feedback about the movements and expresses aspects of precision and overall quality in a multilayered sound composition.

The sounds were designed using abstracted synthesized representations of car sounds and musical metaphors of dissonance, consonance and closure. Different basic keynotes were used to represent different areas of the car and provided the context for the sounds that represented the process.

The following *metatopics* and associated sound design strategies were used: *2a, 2i, 2l, 2m*

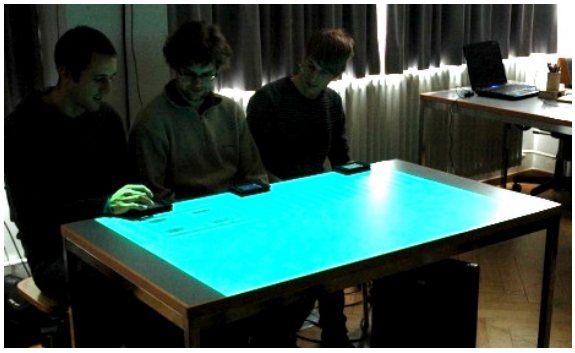

Figure 5: *Demonstration of the audiovisual assembly line.*

Group 3: Franz, the Smart Pen (Figure 6)
Rosario Azzarello, Konradin Kuhn,Patric Schmid

This scenario features a smart, precious pen with a history: It has been given from father to son through many generations and has changed its character over the centuries of its existence.

The pen would react to the users movements. For instance, as it is an old pen, it would start blurring the sounds when becoming dizzy from abrupt movements. The sounds would change also depending on how the paper is touched, how fast it was moved or when the exhausted pen falls asleep and is waken up by shaking. Thus, the sonic expressions of Franz's moods and emotions merge with a feedback related to the way "he" is operated.

The following *metatopics* and associated sound design strategies were used: *2b, 2d, 2e, 2n, 2o, 2p*

Group 4: Smart Home (Figure 7)
Luigi Cassaro, Christoph Böhler, Miriam Kolly, Jeremy Spillmann

Figure 6: *Trying to wake the pen up.*

This performance featured a flat inhabited by a single man. He owns three different interactive commodities: His sofa modulates the sound of sitting down, depending on the amount of people and the social context; the fridge expresses his content or discontent with the selection of food contained in it, judging the user morally; and the home-office chair reacts friendly when a user sits on it, signaling a successful connection to the internet when the user assumes a healthy seating position.

The following *metatopics* and associated sound design strategies were used: *2a, 2f, 2i, 2j*

Figure 7: *Interacting with sofa and fridge in the smart home.*

Group 5: Moody Hat (Figure 8)
Kai Jauslin, Monika Bühner, Simon Broggi

This group demonstrated a hat with an attitude. First it would attract a potential wearer by whispering and making attractive sounds. When somebody would pick it up it would attach itself violently to the person and finally sit on his head, grabbing it firmly. Depending on wether the person would touch it appropriately it would create different sounds and start to comment on the wearer, either insulting or praising him. Also the hat's sounds would have a close link to the gestural interaction with it, e.g. when touching its rim.

The following *metatopics* and associated sound design strategies were used: *2b, 2c, 2d, 2e, 2f, 2g, 2i, 2j, 2n*

6. DISCUSSION

6.1. Metatopics to Guide Interpretations

The strategy of deriving narrative metatopics from film and game scenes was successful. It allowed the metatopics to be used both

Figure 8: *Various interactions with a moody hat.*

as analytical entities as well as design material within the process. The high overlap (over 75%) of metatopics identified in both workshops indicates that they provide a relatively consistent and reliable tool. Finally, the transfer of narrative metatopics to the sound design of interactive commodities worked surprisingly well in most of the cases, their interpretation was usually very close to the intended meaning.

In a few cases, however, the interpretation was biased by the way the artifact was presented in the theatrical performance. For example, the virtual assembly line (group 2 of the second workshop) was initially interpreted as a musical performance by many participants due to the setting chosen. This suggests that a prototyping method refinement is needed, which helps to eliminate potentially undesired interpretive associations at an early stage.

6.2. Fictional Realities - Realistic Fiction

The sound design approaches chosen by the participants usually relied on a mix between sounds from field recordings and narratively significant sounds extracted from the clips. Often the modification of the everyday sounds followed patterns identified in the clip analysis (adding reverberation, distortion or modification of speed or pitch and the like), a strategy which helped unify the aesthetic and semantic merging of sounds from different sources. Quite often participants found strong parallels between narrative components in the fictional clips and their own everyday sound recordings, even if unedited. This was very often the case when the sounds were detached from the recording context (source). Finding narrative aspects in the "natural" sounds helped creating aesthetically fitting mixes of everyday sounds with fictional sounds. And conversely, the transfer from fictional to real life scenarios seemed to work especially well where the sound design in the fictional scenario would rely already on a certain familiarity with a real life experience, usually associated with material qualities. Examples are sounds of unstable structures (wobbling, creaking) or electric discharges.

It was interesting to observe how the identifiability of a specific sound became a tool for design: One strategy was to "defamiliarize" sounds that had an identifiable source, e.g. by cutting or processing. Sometimes at the same time hints to possible sources, e.g. traces of materiality, were left in it. This common strategy from film sound design (see introduction) transferred well into the realm of physical artifacts.

6.3. Hermeneutics as Challenge

Interpretations are hard to do, especially without resorting to structuralist and reductionist strategies. Many participants struggled with expressing their experience and why something was interpreted as it was. Circular statements like "the scenery was oppressive, hence the interpretation" were quite common, especially during the pilot workshop. In general it seemed hard for participants to express their thoughts freely. This issue is difficult to address, but essential for this research. In the second workshop it was addressed with a stronger moderation of the interpretations in a open discussion setting. This requires a lot of time but seems to be absolutely necessary. Last but not least, even after extensive introductions into sound design vocabularies and strategies to communicate about sound, a comprehensive, systematic yet accessible vocabulary for everyday sounds remains one of the bottlenecks for such investigations.

6.4. Evaluating the Design Process

To approach the complexity of sound design using the "ready-made" sounds from film in the everyday film clip remix exercise (step 4 of the process) made the topic accessible. At the same time this strategy was surprisingly successful in anticipating where a design idea could lead.

The Wizard-of-Oz paradigm for prototyping was successfully used within this design process. Building functional prototypes can be very problematic as it is dependant upon sufficient resources and skilled expertise, dragging attention away from sound and interaction design. The workshop's setting could be improved to help create more possibilities for thorough introspection or protocol analysis by people interacting with the prototypes. The aspect of interpretation-in-action needs further attention. This can be achieved by slightly altering the creative process, for example by establishing team-internal test sessions with protocol analysis. A post-review stage could be added to integrate interpretations from people who did not attend the workshop.

7. CONCLUSIONS AND FUTURE WORK

The design research process implemented in the workshop structure described in this paper helped not only to investigate how sounds of interactive commodities become meaningful and how a narrative approach performs for interactive commodities. It made possible to test and evaluate elements of a design process for the practice of Sonic Interaction Design. The concept of narrative metatopics emerged as useful help for formulating and evaluating sound design hypotheses. The process requires a few more iterations in order to be finetuned. Future workshops are planned for this purpose. Each one of these events provides a different setting that will have to be taken into account by adopting the overall process. The internal coherence of each step within the process allows the different formats of workshop to contribute results to the wider framework, providing multiple viewpoints on the same issue and rich data for further analysis. This process, grounded in structured participatory design experiences, will provide a solid basis for the development of design heuristics which then can be tested in experimental setups.

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