NONLINEAR STORIES TOLD BY CUPS AND SAUCERS

SMART REPLIC AS WITH RESPONSIVE 3D AUDIO

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Introduction

In museum exhibitions historical objects are usually shown by visual display, in a showcase with extra textual information added to it. Museum visitors can never touch the objects, let alone use them. As a result, visitors 'scan' the displayed objects from a distance, something that needs reconsideration in our present time where the 'experience' is essential. To provide a way around this situation, the so-called 'smart replica' was proposed in the previous issue of Ar[t] (Roozenburg, 2012): a new kind of reproduction, in the shape of a 3D print, that stretches the boundaries of the replica's concept as an autonomous object based on a historical artefact. New methods of access and new digitization strategies based on the study of the relationship between the 'bits' and 'atoms' are being developed. We hypothesize that by using these 3D imaging techniques the value of our cultural heritage can be increased. In other words, the goal is not to make the most realistic copy of the original, but to analyse, communicate and enhance those gualities of the historical artefact that are the most meaningful to us, now. Here we present the design project of Lotte de Reus in connection with this paradigm shift. Completed as a graduation project, it presents an auditory environment to augment the artefact in an unobtrusive and non-linear way. The objects that are central in this project are seven teacups and saucers that are part of the collection of Museum Boijmans Van Beuningen. These are currently on display in a new exhibition on design and pre-industrial design. Depicted in figure 1, each of these teacup and saucer sets represents a milestone in the Dutch history of porcelain. Starting with the first import of porcelain from China in the seventeenth century by the Dutch East Indies Company; followed by the invention of Delft's blue as an attempt to copy Chinese porcelain, and ending with the small scale production of porcelain in the Netherlands.

Active enrichment but not entertainment?

Museums and their collections house a specific group of objects with their corresponding historical data. They draw audiences in through exhibitions and related facilities, including museum shops, restaurants and so forth. The artefacts shown and experienced in an exhibition construct a powerful medium which instils visitors with thoughts they perhaps have not yet fostered. Knowledge and culture become more accessible because of the actual presence of the objects. In the vision of the curator, paying a visit to an exhibition enables the visitor to have an intimate encounter with the artefacts on display (van Dongen, 2012). These types of encounters could correspond with respectively a museum or a theme park.

went on to the next; leaving the exhibition behind, full of untold stories. Our hypothesis is that more active means will lead to a more comprehensive museum experience; thereby increasing the opportunity to reflect and learn even after the visit. An important part of the collection are the nonlinear narratives, networks of information associated with the object, consisting of stories, locations, materials, rituals, the collection's past and the like. Augmented matter - the mixture between bits and atoms - allows novel interaction techniques to embody these networks of information. For this design project our aim was to convey the following qualities of interaction: intrigue, understanding, satisfaction, and integrity. These qualities feed the resulting research questions: How can museums anticipate and facili-



Figure 1. THE SEVEN CUPS AND SAUCERS picture by HUGO BES

In the spectrum of recreational activities, the exhibitions of Boijmans Van Beuningen can be characterised as enriching experiences: an encounter in which the visitor is conscious of the artefact and the (hi)story it represents. This means that a museum requires the visitor to reach out for information, while the information passively waits for the visitor act upon it. The engagement of visitors is limited as they are not experts on the particular subject of the exhibition. Because of the passive character of the objects and their corresponding information, it takes effort on the part of the visitors to maintain concentration. In the project discussed here, a focus group that visited the museum exactly proved this problem case in hand. -Visitors' overall interaction with Boijmans' exhibitions can mainly be described as scanning. The participants walked into a room, started at a random showcase, looked at an object briefly, and

tate the active assemblage of old and new stories - and how do these stories refer back to the replica's original? How can digital databases be employed in linking smart replicas to their collections? On a philosophical level: does the original still attract interest? In the case of pre-industrial utensils such as the teacups and saucers this question is very relevant.

Concept of tangible interaction with responsive audio

For the seven teacups and saucers that have been chosen to represent the history of the Dutch quest for porcelain, the ECR-model is used to classify the valuable information (Wong, 2012). This storytelling model categorises the information in three layers: engagement, context and reference, as shown in Table 1.

ECR_Phase	Information	Interaction characteristics
Engagement: Draw the visitors' attention; the moment when a visitor has some immediate sensory, emotional or intellectual response to the artefact.	a. Ambient soundscape (audio).	Spatialised audio, depending on user location / viewing angle. Triggered by proximity to object.
	b. Narration 1, information on the role (audio).	Close proximity to object.
Context: Draw the visitors' attention; the moment when a visitor has some immediate sensory, emotional or intellectual response to the artefact.	c. Identification data (text, visual).	Information plaque.
	 d. Narration 2 – information on specifics that can directly be related to the object (audio). 	Triggered by handling an object.
Reference: Gives the visitor the opportunity to draw conclusions and connect to related resources. It provides more detailed and interpretive information about the work.	e. Background information (text and images).	Exhibition app, available after the exhibition.

Table 1. PROPOSED DIALOGUE BETWEEN VISITOR AND EXHIBITION.

In the first phase, visitors are attracted to participate in the experience by other visitors who are listening to the 3D audio clips. These audio clips give the impression that they are experiencing more: it is as if their auditory attention has doubled their visual attention (Erens, 2012). Together with an app that is made available, the visitor is intrigued and triggered to participate in the exhibition.

When the visitor is in the proximity of an object, a 3D ambient soundscape that fits in with the history of the specific teacup and saucer will appear – once the first soundscape has been heard, it attracts the visitor to go to other objects accompanied by a spatial soundscape. Arriving in close proximity of the teacup and saucer, the spatial audio of a narrator starts. The narrator tells about the role the specific objects ("audio story"). When the visitor picks up a replica, the narrator focuses on the features of the teacup or saucer ("audio specifics"). In this stage the visitor is encouraged to turn and explore the object, connecting the narrative with what is visualised about the object. The visitor can put down an object and pick up another object, while retaining the soundscape.

The app contains more background information on porcelain and the objects. When the visitor returns home, she can consult the app at her convenience; to browse the additional information for example.

Enabling spatial audio

As discussed in Table 1, every teacup and saucer holds a series of three audio clips. The audio clips are played when the visitor shows interest through their actions; proximity to an object and the handling of an object. Auditory feedback enriches the visitors' experience actively, without visual clutter and conserves traditional values on how art should be experienced. Furthermore, audio clips allow temporal cues; it works more associatively, and speaks directly to the visitor (Erens, 2012). The soundscape is the auditory equivalent of an ambient image; non-visual immersive content, typically with so-called earcons which represent specific objects or events. The technology to spatialise audio was developed two decades ago; see Burgess and Verlinden (1993) for example. The character of 3D audio relates to the idea that the sounds seem to come from sound sources placed anywhere in a space (a surround sound effect). When listening through headphones, the brain places the sources of the audio clip in your head. An example of a high quality 3D audio clip is "In your head" by Big Orange. We used AudioStage to produce our audio clips with a visual interface, cf. Figure 2.

To connect this aspect to the exhibition visitor, position and orientation tracking of the human head as well as the objects at hand is required. Here optical or magnetic tracking principles also make sense, as they are fit for indoor use. With the use of tangible replicas and 3D audio clips, scanning behaviour can be transformed into an immersive encounter.

Preliminary evaluation

The core of the concept was tested during the Object design fair (Rotterdam, 7-10 February 2013). Information about the teacups and saucers was presented via text or audio clips. Ambient soundscapes were on or off, yielding four permutations. 140 people interacted with a selection of the configurations presented in pairs, they were asked to choose between the two displays and support their reasoning.

The essential observations include:

- Participants seem to enjoy the ambient soundscape: it triggers the imagination and the recognition that the objects used to be utensils and not art object as they are now.
- Presenting the information via responsive audio facilitated the visitors to consciously turn the object to find the image that the narrator referred to.
- Presenting the information via audio, whilst the visitor is holding the object, does not clutter the visual sense.
- Participants appeared to be pleased with the responsive auditory system, even those visitors who preferred text to audio clips.



Figure 2. SPATIAL AUDIO INTERFACE OF AUDIOSTAGE.

Conclusion

Once the teacups and saucers were objects of dailylife and their form, weight, substance, texture, colour, decoration make sense primarily in the context of their functions and relations to other objects, as well as the people who used them. Combining ambient soundscapes, tangible interaction with physical replicas and the connection between information and corresponding visuals, triggers an immersive encounter in which this sensibility is restored: the passive, one-sided encounter with the objects now becomes an active two-sided encounter.

The proposed system is by no means the first auditory guide for exhibits; it rather extends the existing strengths with emerging technologies such as indoor tracking and spatialised soundscapes. Furthermore, it is more or less compatible with existing gear already employed by many museums.

In essence this proposal presents a new type of relationship between visitor and object that has interaction qualities equal to a human conversation. Firstly, this poses an intriguing quality that pulls the visitor in by using 3D audio clips and ambient soundscapes, creating curiosity and making visitors want to engage with the artefacts. Because the visitor has a direct intellectual sensory dialogue with the object, this will lead to a more meaningful experience. Secondly, understanding is nurtured because the encounter is intuitive and the information presented by the artefact responds to the visitor's body language. Thirdly, a satisfactorily quality is propelled, by the layered structure of the narratives, which can be browsed in a non-linear mode by the visitor. Through the app, the experience is saved, and can be connected to various forms of social networking websites and location-based services.

Lastly, the experience fits in with the integrity values of the museum Boijmans Van Beuningen - the 3D scanned and printed, moulded physical replicas afford what Dutch historian Johan Huizinga has called a "historical sensation", the feeling as though you are somehow "in touch" with the past (Ankersmit, 2005).

Future work includes experimenting and researching the effect of the design in the environment of a museum:

- 1. Experimentation with augmenting untouchable artwork with ambient soundscapes.
- 2. Implementation of responsive audio tours in the current exhibition context.



Figure 3. IMPRESSION OF THE PRELIMINARY EVALUATION.

- 3. Prototyping indoor tracking and interaction sensing possibilities, with special attention to smartphone infrastructure.
- Creating guidelines on how the concept could be implemented to suit different kinds of objects in the museum (or maybe even utensils in our everyday context).

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More information

- Video presentation of this project (headphones required): http://www.youtube.com/ watch?v=enR1Ggbuf_8
- Software to render binaural output by visually placing audioclips in 3D: http://www.longcat. fr/web/en/prods/audiostage
- Interactive installations regarding preindustrial utensils: http://new.pentagram. com/2008/05/new-work-detroit-institute-of-1
- In your head; a high quality 3D audio example: http://www.big-orange.nl
- Official Smart Replica blog: http://smartreplicas.blogspot.nl



Lotte de Reus

Lotte de Reus recently received her Master's degree in Design for Interaction at the Faculty of Industrial Design Engineering at Delft University of Technology. In July 2012 she started her graduation project for the Smart Replicas project; she was driven by a fascination for porcelain and the wish to create effective storytelling experiences. During the project she was pleasantly surprised by the world of audio, something she had not vet encountered in her studies. New technologies such as augmented audio, immersive soundscapes and 3D audio now hold a new, special interest for her. In the future, Lotte would again like to work in the domains that combine art and technology. Her portfolio can be found at www.lottedereus.nl.