AUTHENTICITIES AND VIRTUAL REALITY THE CASE STUDIES *JUPITER COLUMN* AND *KALEIDOPHONIC DOG*

AUTENTICIDADES Y REALIDAD VIRTUAL. LOS ESTUDIOS DE CASO COLUMNA DE JUPITER *Y* KALEIDOPHONIC DOG

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Abstract:

The common notion of digital replicas is mostly dominated by the idea that a digital 3D reconstruction should be as faithful to the original artefact as possible. However, the resulting 3D models need often too many computing resources for displaying, so that it is barely possible to experience them with accuracy in a virtual environment. In order to make complex 3D replicas more accessible, the polygonal mesh has to be decimated at the expense of the details loosing "authenticity" in an "auratic" sense. Against this background, we test a pluralistic notion of authenticity that relies more on conserving meanings rather than on conserving physical features by contextualizing 3D objects in VR environments. For this purpose, we use two case studies, the Ladenburg's Jupiter Column (II AD), and the audio-kinetic sculpture Kaleidophonic Dog (1967) by Stephan von Huene.

Key words: virtual archaeology, kaleidophonic dog, jupiter column, synesthetic documentation, authenticities

Resumen:

El concepto habitual de réplicas digitales está mayoritariamente dominado por la idea de que la reconstrucción 3D ha de ser tan fiel al artefacto original como sea posible. No obstante, los modelos 3D resultantes son a menudo tan complejos que es casi imposible experimentarlos con detalle en un entorno virtual al requerir demasiados recursos computacionales para su representación gráfica. Para hacer más accesibles las réplicas 3D hay que diezmar la red poligonal a costa de los detalles perdiendo "autenticidad" en un sentido "aurático". Con este trasfondo probamos una noción pluralística de autenticidad que consiste más en la conservación de siginificados que en la conservación de características físicas contextualizando objetos 3D en entornos de realidad virtual (RV). Con este fin usamos dos ejemplos, la Columna de Júpiter (II A.D.) y la escultura audiocinética de Stephan von Huene Kaleidophonic Dog (1967).

Palabras clave: arqueología virtual, kaleidophonic dog, columna de júpiter, documentación sinestésica, autenticidades

1. Introduction

In the "Nara Declaration" (1994) authenticity is described to rely on "thruthful and credible values" (ICOMOS 1994). This implies a variable approach that overcomes the object-related and classic notion of the "original's aura" as the essential form of cultural tradition (Benjamin 1935). The widely spread use of optical and computer based technologies for the documentation of cultural heritage in recent years has favored the conceptual enhancement of authenticity as a working criterion for faithful and accurate documentations within the framework of virtualization, but we seldom find projects that consider authenticity as a "layered concept" in a consistent way, e.g., by taking into account the check list of the "Nara Grid" (Van Baalen 2008) for the re-creation of meaning in different social contexts. Rather, in the

"Seville Charter" (2012), which directly addresses virtual archaeology, we find a predominant aura-related notion of authenticity. According to the "Principles of Seville" on virtual archaeology, which actually enhance and update the guidelines formulated in the "London Charter" (2009), "authenticity must be a permanent operational concept in any virtual archaeology project" (§ 4), i.e., a requirement for virtualizing original objects. But that doesn't mean that there is no place for other interpretations. Even if the "Principles of Seville" do not explicitly relate to the ambitious definition of authenticity formulated in the "Nara Declaration" (1994), we can infer that some aspects of it are present in § 4.1 such as the idea that "archaeology is complex and not an exact and irrefutable science", and therefore, "it must be openly committed to making alternative virtual interpretations provided they afford the same scientific validity." In this sentence, the authenticity is determined in a similar way

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as proposed in the "Nara Declaration", i.e., through „thruhtful and credible values" related to the presumably original context (cf. Nara 1994, § 9). "The Nara Document on Authenticity" (1994) goes beyond that considering time, space and cultural aspects as key factors of authenticity. But even here, authenticity is considered as an abstract entity linked to the original context or contexts of the past and not as a variable quality that changes depending on different uses and social memories, including present and future projections.

Based on two case studies on digital cultural heritage, we will argue that contextual enhancement and new forms of virtual interaction are needed in order to re-enact all the possible meanings and "authenticities" of the object. For this purpose, we follow theoretical and practical approaches on authenticity in the field of virtual archaeology and cultural heritage (e.g. the idea of "progressive authenticities", Lowenthal 2008) and art conservation with a special focus on core strategies for the conservation of media art such as emulation, re-interpretation and digital re-enactment (cf. Variable Media Network 2004; Rinehart and Ippolito 2014, Muñoz Morcillo *et al.* 2014).

2. The Case Studies *Jupiter Column* and *Kaleidophonic Dog*

The Jupiter Column of Ladenburg was used to test interdisciplinary research methods that make perceptible the various dimensions of cultural heritage. Built roughly 200 AD, destroyed shortly thereafter and then reconstructed and changed, this typical landmark in the Roman provinces was accidentally discovered in the 1970s, buried in a former well (Heukemes 1975). For the 3D reconstruction of the column, different methods were used. Researchers at the KIT-Institute of Photogrammetric and Remote Sensing (IPF) provided a photogrammetric reconstruction based on 700 photographs with a resolution of 36 megapixels using Agisoft (Fig. 1a and 1b), one of the most popular and efficient photogrammetric software, achieving a photographic looking model with original colors and a very high resolution. Researchers of the Heidelberg University FCGL (Forensic Computational Geometry Laboratory) applied structured light using the Breukmann SmartSCAN-3D-HE with an extreme high resolution but no texture information. This procedure in combination with geometrical filters helped for deciphering an overwritten inscription. (Fig. 1c). Finally, a web application for contextualizing the results using geodata and 3D annotation was developed by the Geoinformatics Research Group at the Heidelberg University (http://ors.geog.uni-heidelberg.de/musieke). Against this background, the spatio-temporal distribution and the speculations on the varying purposes of the statue put the general question of authenticity of cultural heritage to the fore. The object itself demanded a processual display, because of its complex record of findings and interpretations. Using 3D annotations and geodata in connection with a web application, researchers and the general public can not only examine the 3D reconstructed Jupiter Column, they also can understand, in which place the column was found, where it was supposed to have been before, and where similar

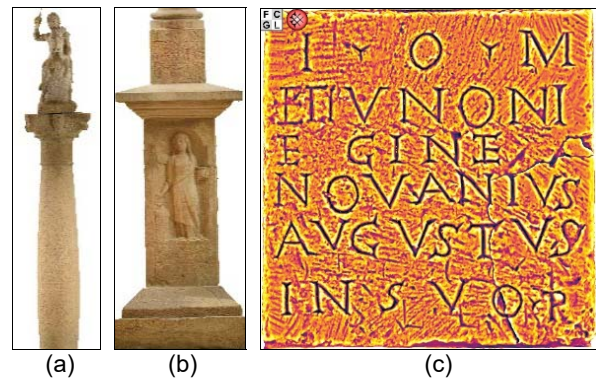sculptures were located, allowing a study of the Jupiter Column as a type.

Figure 1: (a) and (b) Ortho perspective of the photogrammetric reconstructed Jupiter Column in two sections. Photo: IPF/KIT; (c) Detail of the inscription, digitized by applying structured light. Fictive colors. Photo: FCGL/Heidelberg University.

In our accompanying research, we found that both computer scientists and heritage professionals acknowledge "the original" and attributions of its auratic qualities. However, researchers in our sample stressed the importance of exact and accurate methods in digital reproductions. It can be said, that in creating digital versions, the "aura" of the original is replaced by the zeal and effort of the "accurate" and "geometrically exact" scientific research process. Moreover, the same researchers evoked the necessity to transmit scientifically produced knowledge to a larger audience. Hence, accurate, realistic, sustainable, and manageable representations help both to determine what the original artefact potentially was and to reveal its processual nature, providing thus a basis for further research and public communication. This notion of providing knowledge about and access to the artefact is congruent with the above-mentioned definition of the "Nara Declaration" (1994) demanding a transparent and therefore "credible" presentation of the sources of information.

The audio-kinetic sculpture Kaleidophonic Dog (1967, Fig. 2a) by the US-american-german artist Stephan von Huene (1932-2000) was virtualized for documentation and conservation purposes using VR-technologies as part of a methodological approach to a new kind of "informational preservation" (cf. Muñoz-Viñas 2011, p. 25). It consists of 8 wooden pipes, a xylophon, a wooden drum, a cymbal, and a wooden dog lying on his back and covered with red leather, with movable front legs, mouth and head. The 21 kinetic and acoustic parts are regulated by valves and bellows within a complex pneumatic system actioned by both a vacuum and a blowing motor. For this case-study, an interdisciplinary team composed of KIT-members of the Intelligent Sensor-Actuator-Systems Laboratory (ISAS) and the ZAK applied photogrammetric reconstruction based on 380 photos using VisualSFM, fine modelling in the 3D modelling software Blender as well as two game engines –Unity for testing and Unreal for the final implementation of sound and kinetic parameters–, and VR technologies for a lifelike experience of the results (Fig. 2c). We decided to include full sensory perception, such as spatial, kinesthetic, and acoustic experience levels, since they also transport important information for under-

standing cultural assets. At the KIT, we address this issue with the tests on an Oculus- and Kinect-based VR-system, developed by the ISAS Laboratory that allows the user for freely walking in a virtual environment (Faion *et. al.* 2012). We used this system for the virtual re-enactment of media art into an "e-Installation". An e-Installation is a virtualized media artwork that reproduces all synaesthesia and interaction levels of the artwork identified as relevant for the production of meanings (Muñoz Morcillo *et al.* 2014). It consist of the 3D model of the artwork, the inner logic – i.a. audio-visual, haptic, and sensor information– embedded in a game engine, and the appropriate tracking and VR-system to immersively experience the results. Based on a documentation of the artwork, which followed the pluralistic and multi-perspective approach of the "Variable Media Questionaire" (by Ippolito, Depocas *et al.* 2003), we opted for the use of new textures for UV mapping the 3D model instead of following the photogrametric information of the original. The manual texturing was formalistic nearer to the creation process of the artwork than using reconstructed textures, since the artist also covered 3D objects (i.e., hand carved wooden parts) with 2D surfaces (i.e., leather pieces, cf. Newmark 1972; Danieli 1968). In this sense, the making of the "virtual" Kaleidophonic Dog focuses on "the craftsman's contribution to preserving authenticity" as described in "The Nara Grid" (Van Balen 2008, p. 40).

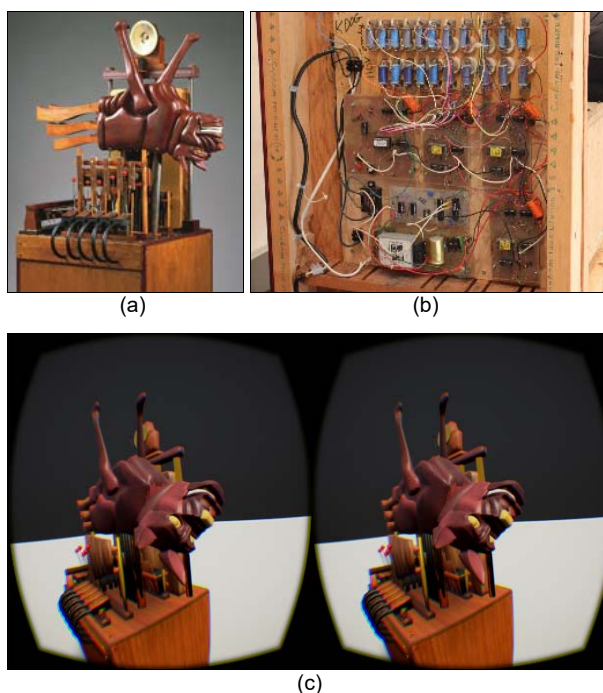(a)   (b)

(c)

Figure 2: (a) Kaleidophonic Dog (1967). Photo: Artist's State; (b) EPROM circuits for the control of the instruments and kinetic parts; (c) VR-version in Unreal. Photos: ZAK-ISAS/KIT.

As for the composition –a pseudo haphazard mixture of sounds–, there are two historically documented versions: the first one worked with five punched tapes in different length that activated the bellows of the instruments and kinetic parts, and the second one based on EPROM-circuits and relais (Fig. 2b). As the artist described (Kipphoff and Altner, p. 58), there are aesthetical differences between the pneumatically and the electrically regulated sculpture: the first version with

punched tapes was much more "sensuous" because of the fully pneumatic control, therefore it had a more noticeable corporeal presence. Changing some parameters in the game engine, the reproduction of this different versions is also possible. The composition principle itself was virtualized making a mixture of migration of the original binary code stored in the EPROMs and emulation of the timing and counter information of the circuits by blueprint programming these parameters in Unreal. The mentioned parameters were retrieved for the first time thanks to the virtualization effort.

3. Interim Findings: Authenticities

The "over-authenticity" of 3D objects such as the Jupiter Column promises an additional value for research activities. If those 3D objects are also embedded in convenient multimodal virtual environments, a pluralistic approach to the "authenticities" and "meanings" involved is possible, as the virtual re-enactment of the Kaleidophonic Dog and its multi-versional representation demonstrate. The preservation of media art in practice promotes a concept of authenticity in terms of continuity of representation, critical analysis and decision-making models for future challenges.

In the field of archaeology, we also need a pluralistic concept of authenticity. As the case study Jupiter Colum shows, researchers and the general public can greatly profit from digitally reconstructed cultural artefacts that reveal layers of meanings and historical speculations in time-space annotations. The idea of the relative irrelevance of the physical source for the documentation of its meaning in a truthful sense is even clearer in the field of "informational preservation" as we see in the case study Kaleidophonic Dog or in the "digital conservation" in general. The source can be understood as its absolute physical condition but the authenticity is the result of the faithful transmission of its meanings that does not rely on the physical source but in its contextualization and creation processes. A transmission procedure based on scientifically testable virtualizations cannot utterly ensure the conservation of every meaning layer of an artwork, but is not necessarily worse than the transmission of ancient texts, which authenticity mainly relies on criticism and philological analyses.

Furthermore, the virtualization of the Kaleidophonic Dog was a complex knowledge process that allowed us to document the audio-kinetic composition principle of the artwork by studying the electronics: the documentation made during the virtualization process revealed the timing and counter parameters for the first time.

4. Conclusions

The interim results of the two projects discussed provide interesting findings for a reassessment of criteria for contextualizing 3D models: 1. there are more than only one authentic result regarding the 3D reconstruction using different methods: every result is a valid one, and the sum of them enhances the perceptible informational basis of the original; 2. we need several contextualization layers in order to understand the meanings of the objects through time and cultural contexts; and 3. the discovery of new documentation

aspects through virtualization processes supports an investigative notion of authenticity.

Last but not least, these experiences in VR archaeology and digital re-enactment of media art encourage some emendations in § 4.4 of the Seville Charter regarding authenticity in the sense of the Nara Declaration and the media art conservation theory: VR-Archaeology "must be openly committed to making alternative virtual inter-pretations provided by scientific validity", whereby scientific validity should be based on truthful and credible values for different versions of an object, different uses through time as well as different cultural contexts and memories, and maybe even future projections of meanings.

Acknowledgements

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