DIGITAL RE-PRESENTATION AND SIMULACRUM IN AUGMENTED REALITY

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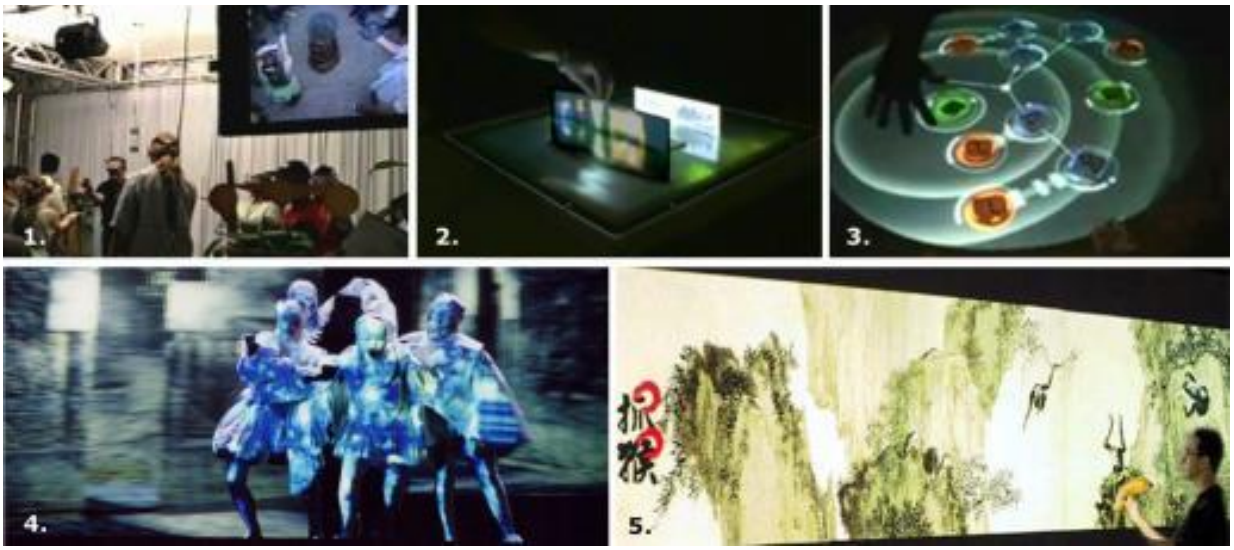
This paper presents new definitions of digital re-presentation, simulacrum and pleasurable design for augmented reality (AR). We use this definition to survey some recent digital artworks. We move from AR to digital re-presentation, building on Baudrillard's ideas. Digital information processing can amplify AR, allowing virtual objects and virtual reality to join together. It makes a simulacrum world in which we can take pleasure in immersing.



Contact Water (2001) Fig. 2. Tablescape Plus (2006) Fig. 3. ReacTable (2006)
Fig. 4. The Jew of Malta Opera (2002) Fig. 5. Immersive Chinese Painting-The Ten Gibbons (2005)

Examples of Digital Re-presentation in Augmented Reality

This section gives examples of the application of digital re-presentation and augmented reality in digital art. In each of the augmented reality system described below, an object acts as a "marker" for projecting or recording information for the augmented reality.

- Augmented Reality in Interactive Entertainment

  Art Digital entertainment art contains the potential for teaching and pleasure. Artist Taisuke Murakami's*Contact Water* was presented at SIGGRAPH in 2001. [3] Participants donned head-mounted displays and hand sensors, and were able to virtually take a miniature dolphin out of a central pool, and pass it to other participants (Fig. 1). This interaction was both fun and an example of augmented reality. A digital re-presentation of each dolphin was projected onto the hands (marker) of participants. The participants were able to use their hands to transfer the virtual dolphin re-presentation to other viewer's hands, creating a sensation of virtual physical touch.

- Augmented Reality in Interactive Story AnimationAugmented reality can advance animation from passive to active participation. Tokyo University's*Tablescape Plus* [4] used augmented reality in interactive story animation (Fig. 2). This work projects animated characters and scenery onto real objects marked on a tabletop display, using a camera which can recognize objects (markers) on the tabletop display. When the participant puts marked objects close to each other, the characters react to each other, as if in a movie. The user's operation is the key step in the digital re-presentation of these cartoon stories. By creating conversation among selected object, *Tablescape Plus*enhances the sense of exemplary viewers' involvement, and shows the fun in the stories. The audience can enjoy the story animation and have intellectual and emotional pleasure.

- Augmented Reality in Interactive Visual Art
  Visual art transmits the artist's idea visual impact. Interactive effects can improve art works and deepen the impression of the audience. Clara Boj and Diego Diaz's *AR Magic System* [5,6] records participants' faces (markers) and exchanges the faces with different bodies in a screen projection (See the URL at reference [6] for an image from this artwork.) This "digital re-presentation" causes a strong visual impact and a funny confusion of identity exchange.

- Augmented Reality in Interactive Sound Art
  Sergi Jordà at Universitat Pompeu Fabra used augmented reality in his 2006 *ReacTable*. [7] ReacTable is a collaborative musical instrument. People place different blocks (markers) on the table to control musical loops and filters (Fig. 3). These interactive sonic displays allow participants to feel relaxed and enjoy an interactive musical performance of the digital re-presentation.

- Augmented Reality in Interactive Opera
  PerformanceAugmented reality has begun to be applied to interactive performances. Germany's ART+COM used augmented reality in the stage setting and costume design of the opera *The Jew of Malta* premiered at the Opera Biennale Munich in 2002. [8] Both the furniture (markers) and all other aspects of the stage were white, as was the costumes (markers) of the actors. Using tracking technology and gesture-based control, the system projected images onto the stage setting and costumes – a milestone in using augmented reality in opera (Fig. 4). This production also broke down the fence between stage design and costume design. Through digital re-presentation created plentiful dramatic effects and different morphological visual images projected onto the stage and costume design.

- Augmented Reality in Interactive Digital Archives
  Recently, digital archives have been used in interactive art and become a vital part of culture preservation. It creates new opportunities to teach, create interest in, and present historic artifacts. We have used augmented reality technology in our 2005 work *Immersive Chinese Painting-The Ten Gibbons*. [9] Pu Hsin-Yu (1896-1963) painted The Ten Gibbons, which today is owned by the Taiwan National History Museum. We used augmented reality technology and infrared cameras to allow the participant to move a banana with his hand to attract the gibbons to the original position in Pu's painting (Fig. 5). The sight of the gibbons hanging on the trees or standing in a valley presents a humorous visual "digital re-presentation".

Simulacrum World in Augmented Reality

Patrick Jordan's 2000 book *Design Pleasure Products*, argued that producing pleasure products is a central function of design. [10] Jordan's book is a response to the same motivations as augmented reality –

pleasure is the central goal. Canadian anthropologist Lionel Tiger presented four concepts of pleasure in his 1992 book *The Pursuit of Pleasure.* [11] Tiger's four concepts play an important role in designing augmented realities:

- Physio-pleasure: This pleasure comes from the sense of perception organ, including the sense of touch, taste and smell. *Contact Water* is a good example of physio-pleasure in augmented reality.
- Socio-pleasure: This pleasure comes from the interactive relationship between oneself and others. *AR Magic System* is a good example of socio-pleasure in augmented reality.
- Psycho-pleasure: This pleasure comes from emotional reactions. The design should be able to cause cognitive emotional reaction. *Tablescape Plus* and *ReacTable* are good examples of psycho-pleasure in augmented reality.
- Ideo-pleasure: This pleasure comes from people's values and their sense of knowledge. *Tablescape Plus*, *The Jew of Malta* and *Immersive Chinese Painting-The Ten Gibbon*s are good examples of ideo-pleasure in augmented reality. The works teach and encourage participants to speculate and learn.

Augmented reality technology makes virtual world and real environments meet each other through digital information processing. It creates "digital re-presentations" and "simulacrum worlds," and also creates a new language and direction in digital art.

French sociologist Jean Baudrillard's Simulacra and Simulation argued that reality has been displaced by symbolic simulcara. [12] Baudrillard thought that the world simulated by media is more "real" than "reality," creating a "hyper-real" world, in which it is difficult to distinguish the real and unreal.

This paper discusses how in the digital era people become conscious of and interact with reality and simulacra, through the pleasures of art appreciation and immersion. By analyzing the media and form of augmented reality, we have new ways of discussing "simulacrum" and "re-presentation". Augmented reality uses information processing to deconstruct, transform, and re-combine, creating digital re-presentations and simulacra worlds where virtual images and reality coexist, enabling people to perceive hyper-reality. For example, AR_Magic_System processes people's faces to create "face re-presentation" and "identification re-presentation." It creates a hyper-real identity in a simulacrum world generated through augmented reality, and participants can become immersed in this simulacrum world by viewing and interacting with the art.

Conclusion

The origin of Jean Baudrillard's Simulcara and Simulation lies in the age of television, and it takes at times a cynical view of simulation in society. Baudrillard's concept of re-presentation mostly focuses on negative messages re-combined by the media and to create a simulacra world which transcends reality.

In contrast we take a more optimistic attitude. Augmented reality creates "simulacra world" in which we can take pleasure in immersing. Its re-presentation can stimulate participants (exemplary viewers) to think further about the purpose of the creators in using virtual information to project onto or replace real objects. By selecting and transforming virtual markers, augmented reality builds a complete different frame of mind and atmosphere. By interactively mixing simulacra and reality, participants can derive pleasure and enjoy the interactive feedback from the artwork.

In this paper, we simply point these concepts. We hope more discussions will be presented in the future.

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