From Traditional to Virtual Interactive Puppetry:
A Comprehensive Approach

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Puppetry is one of the most ancient forms of performance in the world. Even though it was universally popular in the past, most of traditional puppet theatres have lost their appeal and their vital communication with communities. In ancient times, puppetry played an important role as village "ritual", as shown in many world puppetries. There is clear evidence of how ritual objects such as masks have been transformed into puppets throughout time, showing the inherent connection between ritual and puppetry[1]. As an example, Wayang Kulit, Indonesian shadow puppetry, is one of the most ancient forms of puppetry, storytelling, and ritual[2]. The shadows are considered spirits of the deceased, in keeping with the traditional Javanese animistic belief that everything had a soul.[3] Wayang Kulit functions as a ritual for calling spirits in order to ask for advice or help in overcoming problems related to disharmony, and to bring balance between positive and negative forces of the community.[4] In this ritualistic context, the puppeteer played the role of shaman, entering into a transformative relationship with his ritual object, the "puppet". This has later resulted in forms of freely improvised storytelling and of lively interaction with the public in the community. As in Wayang Kulit, we define the puppet as a source of energy continuously sending users into altered states of consciousness, breaking constraints, and boundaries of the material world. However, the word "puppet" frequently appears in the digital realm to indicate a form of Avatar, being mainly manifested as a representation of the materialism of real world. Deeply rooted in the Cartesian hierarchy of separation between subject and object, in the digital media culture a puppet is considered as something to be manipulated and controlled, ignoring its transformative relationship with the user. In the digital translation of puppetry, we are interested in how interactive technology will support ancient wisdoms of ritual, revealing transformative relationships of puppet and puppeteer, resulting in performances of great excitement, public engagement and reflection of the community, creating rich layers of mixed reality environments. In fact, Wayang Kulit offers complicated layers of mixed reality, which allows viewers to walk
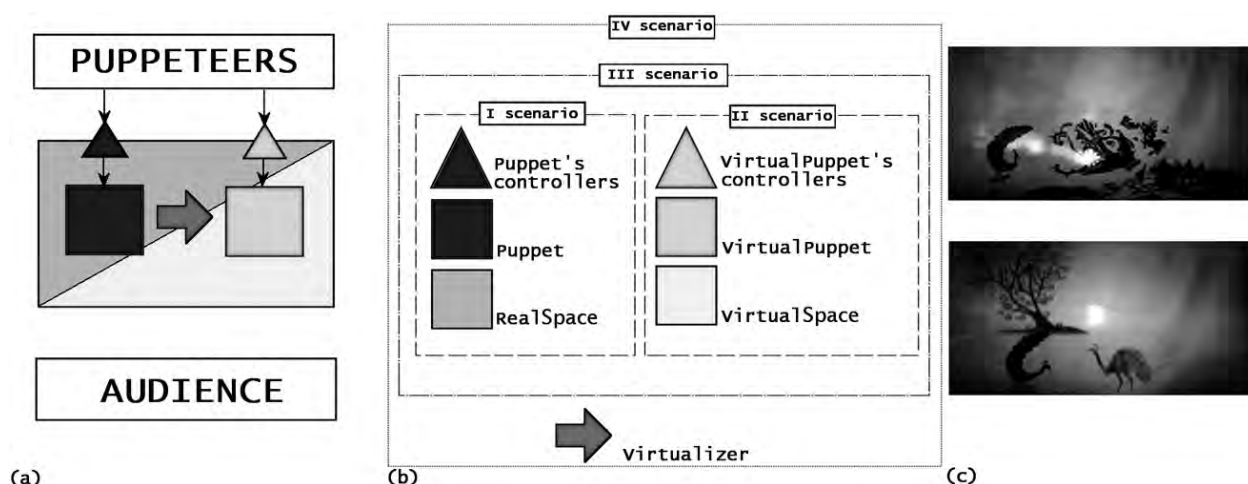

Figure 1: Diagram of the four scenarios and pictures from "Experimental Virtual Wayang" performance.

around the screen, watching the real puppet and its virtual form as a shadow at the same time. Mixed reality does not only happen in viewer/puppeteer's consciousness at the moment the shadow becomes alive with its own spirit, but also in the viewer's perception struggling between real and virtual forms of presentation, walking around the screen. This kind of setting creates rich platforms for discussing reality, virtuality and mixed reality all together, which we adopt as our methodology in order to explore the full potential of virtual puppetry.

Methodology

A virtual interactive puppetry project has started with sound-activated puppets in "Yong-Shin-Gud", addressing spiraling ways of interaction between puppet and puppeteer.[5] Technical research on Virtual sensors and distributed networks in the Multimedia Lab of the University of Rome has been incorporated with the projects "Copuppet" and "Experimental Virtual Wayang."[6] The following section shows our methodology to reveal the full potential of puppetry in complex layers of mixed reality (see Figure 1).

1. Traditional puppetry — *Mixed reality: real puppet and viewer's consciousness*
   Traditional puppetry uses diverse techniques such as fingers, hands, rods and sticks, with beautiful traditions of world puppetry, such as Wayang Kulit, Punch & Judy, Koktoo Gaksi, and Bunraku. In traditional settings, puppeteers drive puppets acting on physical Controllers on the real space where puppets are presented. We investigate how traditional techniques have supported transformative relationships between puppet and puppeteer. Diverse forms of world puppetry traditions should be investigated in ths setting.

2. Virtual puppetry — *Mixed reality: virtual puppet and viewer's consciousness*
   Virtual puppetry uses digital technology to set up novel relationships between puppet and puppeteer. It could employ single or multiple user interfaces, as shown in previous projects "Yong-Shin-Gud" and "CoPuppet". The CoPuppet project explored collaborative interaction in virtual puppetry among multiple users over the network, using VirtualSensors technology.[7] A set of VirtualSensors was used as a controller to drive the posture of a Virtual Wayang Dragon. A set of three VirtualSliders is used to detect cue points from video captured puppeteer's hand gestures. These cue points are then mapped to parameters defining the dragon tail posture. VirtualPuppets are presented on their VirtualSpace, i.e. the transposition of the digital puppet to the real space.

3. Combination of Traditional and Virtual puppetry — *Mixed reality: real puppet, virtual puppet and viewer's consciousness*
   The third scenario proposes the combination of traditional and virtual puppetry. Such a mixed environment gives us better understanding on both traditional and digital mechanisms, in terms of user interaction, usability, subject/object relationship, dimensionality, and storytelling. As an example, "Experimental Virtual Wayang" is a contemporary translation of the traditional Balinese (Indonesia) shadow puppet performance ("Wayang Kulit"), featuring virtual interactive puppets and a real-time background drawing system, bringing the spirit of live improvisation into storytelling (Figure 1.c).[8] The shadow puppet master is able to simultaneously manipulate traditional puppets as well as virtual ones fitted with infrared units monitored by a motion

and position detection system. The virtual puppet is projected on the same on which traditional shadow puppets are displayed. The shadow master changes the look of the virtual puppet and its movements according to his actions and voice. This project opens the interactive system to the public, inviting people to draw background images, interacting with puppeteer. In this setting, puppeteers drive physical puppets via puppet's controllers and virtual ones via VirtualPuppet's controllers. VirtualPuppets are presented on their VirtualSpace, while the real space is augmented with transpositions of the VirtualSpace.

4. Re-combination of Traditional and Virtual puppetry — *Mixed reality: real, virtual, realized and virtualized puppets and viewer's consciousness*
The fourth scenario proposes the re-combination of Traditional and Virtual puppetry where real puppets are virtualized or virtual puppets are realized. We detect the real puppet's position and shape by a virtualizer and reconstruct data into the form of virtual puppet, space or collision detection between real and virtual. This setting will create complicated mixed reality environments, by projecting virtual components on top of real puppets and vice versa. Mixed reality aspects can regard the puppet itself, or the relationships between puppets, between viewers and puppets, or all together. The detected relationship between Virtual and Real Puppets will create complicated layers of mixed reality, which will bring forth new potential of puppetry in digital era. In conclusion, our approach aims at creating rich platform for continuous discussions, not only about puppetry, but also about fundamental issues of digital media, such as human/computer relationship, virtuality, mixed reality and interactivity. Virtual Interactive puppetry will be explored, continuously challenging technical, conceptual and philosophical layers in order to create playful experience of users situated in complex layers of mixed reality environments.

1 Baird, B. 1965. *The Art of the Puppet*. Macmillan, p. 30.

2 Van Ness E., Prawirohardjo S. 1980. *Javanese Wayang Kulit*. Oxford: Oxford University Press, p. 1.

3 Djajasoebrata A. 1999. *Shadow Theatre in Java: The Puppets, Performance, and Repertoire*. Amsterdam: Pepin Press, p. 23.

4 Van Ness E., & Prawirohardjo S. 1980. *Javanese Wayang Kulit.* Oxford: Oxford University Press, p. 11.

5 Ryu S. 2005. "Ritualizing Interactive Media, from Motivation to Activation." In *Technoetic Arts* 3.2, edited by Roy Ascott. Bristol: Intellect Ltd, pp. 110-111.

6 Bottoni P., Faralli S., Labella A., Malizia A., Pierro M., Ryu S. 2007. "CoPuppet: Collaborative Interaction in Virtual Puppetry". In *Proc. DAW '07.*

7 Bottoni, P., Faralli, S., Labella, A., Malizia, A., and Scozzafava, C. 2006. "CHAMBRE: Integrating Multimedia and Virtual Tools." In *Proc. AVI '06*. ACM Press, pp. 285-292.

8 I Gusti Putu Sudarta, McGraw A., Ryu S., Faralli S., Romero C. 2007. *Experimental Virtual Wayang.* Richmond VA USA: Grace Street Theatre.