Papetto: Embodied Co-Presence in Video Chat

Hidekazu Saegusa
University of Washington
428 Sieg Hall, Seattle, WA 98195
chgm@uw.edu

Kerem Özcan
University of Washington
428 Sieg Hall, Seattle, WA 98195
kozcan@uw.edu

Daniela K. Rosner
University of Washington
428 Sieg Hall, Seattle, WA 98195
dkrosner@uw.edu

ABSTRACT
In this paper, we describe Papetto, a lightweight robotic arm that moves according to face detection techniques in order to mirror facial movements such as head shaking, leaning and tilting. Using this system we examine the role of the "frame" in video chat and how embodied co-presence is defined and bounded through lightweight robotic mirroring to enable new forms of engagement in remote communication.

Categories and Subject Descriptors
K.4.0. Computers in Society: general

Keywords
Framing; mirroring; telepresence; video chat; lightweight robotics

1. INTRODUCTION
According to conventional wisdom, mirroring is a process of reproducing behavior, whether body movements such as gestures or facial expressions such as eye movements. With the onset of digital simulation, such actions frequently unfold as a simultaneously digital and physical phenomenon. In her study of digitally imaged brains, science studies scholar Morana Alač [2] depicts this simulated action thorough the 'effects of similarity' it surfaces between physical and digital bodies. Though this activity unfolds readily and repeatedly in daily life, mirroring is under-explored as a core dimension of computer-mediated communication (CMC). In this project, we ask how mirroring develops as a mechanism for extending the "frame" of communication in remote video chat, shifting the organization of the video chat experience [3]. We explore this question with the design of Papetto, a 3D printed robotic arm that relies on facial detection techniques to replicate facial movements such as tilting, shaking, and leaning.

2. BACKGROUND AND PRIOR WORK
This work builds on a growing body of telepresence research. Ziggy (http://www.gotrobots.com/ziggy), for example, is a six-legged robot designed to resemble a spider that can walk around surfaces while avoiding obstacles. The Mebot platform [1] demonstrates techniques that enable people to feel present at a distance through dynamic robotic limbs. Roillio similarly mimics people's nonverbal movements to ignite playful engagement [5]. Papetto not only extends these remote robotic platforms (e.g., [4][6]) in the domain of lightweight tools for smartphone interaction, it also enables an investigation of framing in video chat communication through mirroring.

HRI'15 Extended Abstracts, March 2-5, 2015, Portland, OR, USA.
ACM 978-1-4503-3318-4/15/03.
http://dx.doi.org/10.1145/2701973.2702696

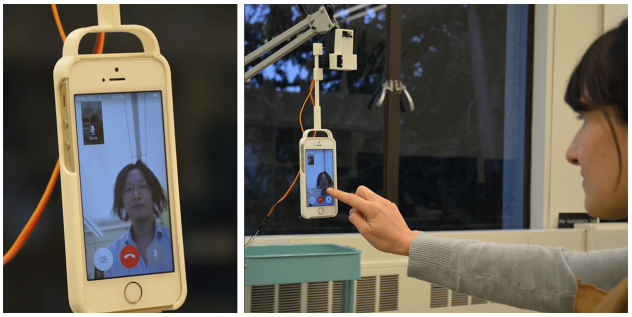

Figure 1: The Papetto system moves a robotic arm holding a smartphone in response to face tracking.

3. THE PAPETTO SYSTEM
The Papetto system consists of a web camera, laptop, Arduino board, 3D printed robotic arm, and two servomotors. The face tracking software recognizes the distance from the camera and the horizontal direction of a face using ofxFaceTracker (https://github.com/kylemcdonald/ofxFaceTracker). Two variables control the degree of movement for each servomotor based on the motions made in front of the camera. The Arduino Uno R3 drives the movement of the servomotors.

4. REFERENCES
[1] Adalgeirsson, S. O., and C. Breazeal. "Mebot: a robotic platform for socially embodied presence." In *Proc. of HRI*, pp. 15-22. IEEE Press, 2010.

[2] Alač, Morana. Handling Digital Brains: A Laboratory Study of Multimodal Semiotic Interaction in the Age of Computers. MIT Press, 2011.

[3] Goffman, E. *Frame analysis: An essay on the organization of experience*. Harvard University Press, 1974.

[4] Kim, H., S. S. Kwak, and M. Kim. "Personality design of sociable robots by control of gesture design factors." In *Proc of RO-MAN 2008.* pp. 494-499. IEEE, 2008.

[5] Michalowski, M. P., S. Sabanovic, and P. Michel. "Roillo: Creating a social robot for playrooms." In *Proc of RO-MAN 2006*, pp. 587-592. 2006.

[6] Sirkin, David, and Wendy Ju. "Producing Expressive Movement for Telepresence Robotics." *Social Robotic Telepresence* (2012): 1.