

Better Hands

Wallace S. Lages

Center for HCI, Virginia Tech,
School of Fine Arts, UFMG,
wlages@vt.edu

Pablo Gobira

Escola Guignard, UEMG
Belo Horizonte, Brazil
pa.gobira@uemg.br

Francisco Marinho

UFMG
Belo Horizonte, Brazil
fccm@ufmg.br

ABSTRACT

Better Hands (2017) is an interactive installation that explores the limits and the role of tools in the creative process. It questions the nature of authorship by bringing the interface closer to the body, while empowering it with embedded agency. The artwork invites us to reflect on the effect of modern technology on the basic act of creation and whether we control or are defined by it.

Author Keywords

Interactive art, robotic, simulation, dynamical system.

ACM Classification Keywords

J.5 Computer Applications: Arts and Humanities; I.2.9 Robotics: manipulators; I.6.8 Image Processing: Simulation and Modeling.

SHORT DESCRIPTION

Better Hands exposes the relationship between humans and technology in the creative process. The installation captures electric signals and inertial measurements from the arm of the interactor as raw input. The signals are then fed to discrete dynamical systems, which generate brush patterns, and moderate user input to the robotic arm. The arm holds a brush that strokes on a tablet, creating digital paintings.

CONCEPT

Better Hands originated from the author's research on human-computer interaction, art, and technology. The installation was developed remotely across the United States and Brazil, inspired on the role that tools have on the creative processes.

The duality between the mechanic and organic hands, evokes the constructive cycle of M. C. Escher *Drawing Hands* (1948) lithograph. However, instead of focusing on the metalinguistic criticism, *Better Hands* invites us to think about the effect of the interface on creativity and authorship. The title of the work is a reference to Max Barry's novel, *Machine Man* (2011), which reflects on the interdependency between humans and technology [1].

The concept realization contrasts the creative media of the

modern artist (represented by the touch screen) with the most traditional and perhaps oldest artistic tool (the paintbrush). This brings into focus the question of whether there were any qualitative changes brought by technology.

Inasmuch as the robotic arm utilizes the interactor's input, one could inadvertently consider it a subservient tool. However, the mapping is not complete. The remaining space is filled by the robotic arm, which derives its own desires and ideas from the embedded dynamic processes. On the other hand, the bare-hand interface removes the physical feeling of holding a brush. This makes the connection intimate and intuitive, as the system transparently reacts to the interactor's movements.

The final visual production, thus, is not a result of either the interactor or robot alone. It is better understood as byproduct of the coupled intents of interactor and machine. The metalinguistic game not only invites a critical view of the creative production but also on the contemporary digital life, in which the interactor subjects itself to the artwork so that it can fulfill its role.

DISCUSSION

The work is related to central issues in human-robot interaction and robotic art. Is artificial creativity possible? Boden [2] discusses different ways in which computer creations could be considered creative, although they ultimately depend on deeper considerations regarding machine agency and consciousness. Even if the answer is negative, it is hard to argue against the fact that tools and machines influence the way we think and create. So, which forms could this collaboration take?

One possible approach is to consider the human a creator and robot a tool. As the tool become invisible it becomes a prosthetics. These cybernetic constructions for augmentation were explored by many artists. One example is Stelarc's "Involuntary Arm / Third Hand" (1980). Using electromyography (EMG) sensors in his leg and abdomen, he could control a mechanical hand attached to his right arm.

In *Better Hands* the embodiment is also realized by a sensory-motor loop of the arm, which includes the touchscreen and the interactor arm. We avoid the behaviorist and cognitivist perspectives by reaching for the autopoietic view of Maturana: "That which we human beings call cognition is the capacity that a living system exhibits of operating in dynamic structural congruence with the medium in which it exists" [5]. The arm cognition is

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author.

C&C '17, June 27-30, 2017, Singapore, Singapore
© 2017 Copyright is held by the owner/author(s).
ACM ISBN 978-1-4503-4403-6/17/06.
<http://dx.doi.org/10.1145/3059454.3059508>

based on a closed dynamical system coupled with the interactor *and* the drawing canvas.

The issue of creative authorship in interactive systems still evades a definitive answer. Hofstadter [4] proposes a solution that calls for a “meta-author”, the one responsible for creating the production rules. Reflecting on the relationship with his painter algorithm AARON, though, Cohen dismissed any simple attribution [3]. We tend to agree with his later view, in which the final product is considered a fluid result of the dialog between man and machine.

TECHNICAL ASPECTS

The installation is composed by a robotic arm and a tablet. The arm has five servo motors controlled by an Arduino board and holds a brush painted with conductive ink. The robot communicates with the tablet through a USB cable. The interactor wears an EMG armband (Myo), which connects to the tablet. By moving the arm around, both the interactor and the robot paint (Figure 1).

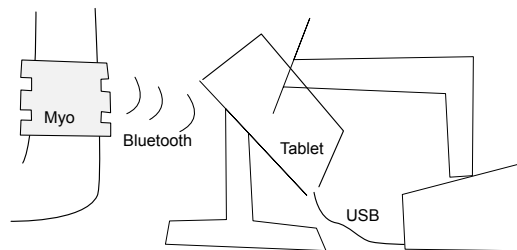


Figure 1: Installation Parts - The tablet centralizes all processing and communication.

Brush patterns are generated using an iterated function system with three affine mappings. The whole system is modulated by a four-dimensional non-linear map.

BIOGRAPHIES OF THE AUTHORS

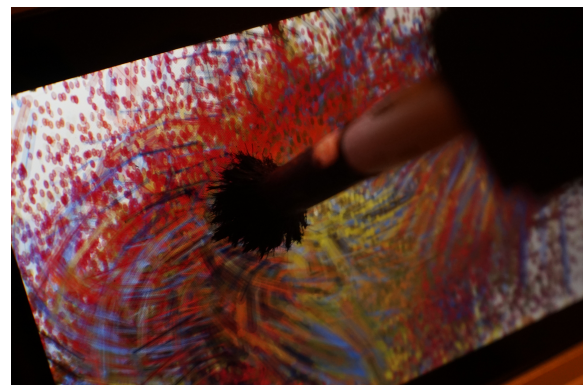
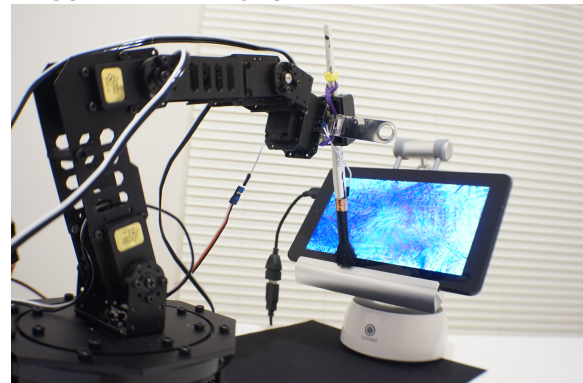
Wallace Lages is an assistant professor at the School of Fine Arts of Universidade Federal de Minas Gerais (Brazil) and Ph.D. student in the Compute Science Department of Virginia Tech (USA). He has collaborated on the conception and development of several commercial games and artistic installations. He was a co-author on installation Palavrador Openbook, winner of the 2006 digital literature prize from the ciudad de Vinaròs, Spain and featured on the 2007 Siggraph art gallery. He was also responsible for the digital interaction concept of permanent installations on the Interactive Space of Interactive Life (Belo Horizonte, Brazil). He has contributed on programming and game design of mobile, PC and console games. He is currently associated with the Center for HCI, part of the Institute for Creativity, Arts and Technologies where he is doing research on VR, AR, games, and 3D interaction.

Dr. Pablo Gobira is a professor at Escola Guignard (UEMG, Brazil), artist, curator and researcher. He is a research fellow and manager of Digital Promotion Services of the Brazilian Network at IBICT/Brazil Ministry of

Science, Technology, Innovation and Communication (MCTI). Member of the National Institute of Science and Technology INCT-Acqua (CNPq). Writer and editor of the books: “Post-digital configurations” (Forthcoming UEMG Press, 2017); “Games and Society” (Crisálida Press, 2012); Walter Benjamin “B-side” (Crisálida Press, 2011) among others books and writings. He works in curatorship, creation and production in the field of culture and digital arts and also creative economy. He is coordinating the Laboratory of Front Poetics (<http://labfront.tk>).

Dr. Francisco Marinho is a professor in the Department of Photography, Performing arts, and Animation at the School of Fine Arts of Universidade Federal de Minas Gerais (UFMG). He obtained his B.S. in mechanical engineering from UFMG (1993) and his Ph.D. from Universidade de Sao Paulo (2004). He worked several years in media production and illustration. He was the conceptual leader on installation Palavrador Openbook, winner of the 2006 digital literature prize from the ciudad de Vinaròs, Spain and featured on the 2007 Siggraph art gallery. His current research is focused on art and technology, particularly on interactive art and education. He was one of the founders of the Latin America Network of Digital Literature (Red) and runs 1imaginari0, a research group on computational poetry.

ILLUSTRATIVE IMAGES



ACKNOWLEDGMENTS

We would like to thank: CNPq, FAPEMIG, PROPPG/UEMG, ACM, and Virginia Tech's Computer Science Department.

REFERENCES

1. Max Barry. 2011. *Machine Man*. Vintage Books.
2. Margaret A Boden. 2009. Computer models of creativity. *AI Magazine* 30, 3: 23.
3. Harold Cohen. Driving the Creative Machine - Orcas Center, Crossroads Lecture Series 2010. Retrieved October 4, 2017 from <http://www.aaronshome.com>
4. Douglas R. Hofstadter. 1989. *Godel, Escher, Bach: An eternal golden braid*. Vintage Books.
5. Humberto Maturana. 2002. Autopoiesis, structural coupling and cognition: a history of these and other notions in the biology of cognition. *Cybernetics & Human Knowing* 9, 3-4: 5-34.