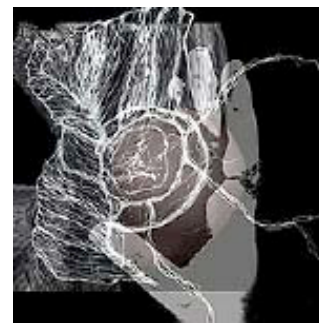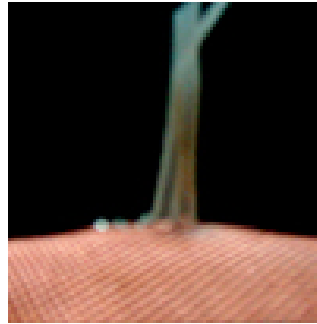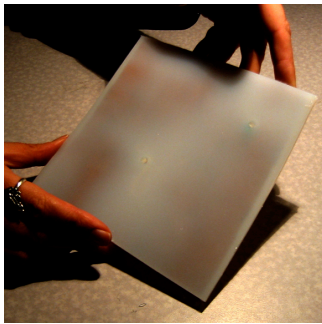# The ViscousDisplay: Adaptive Transient Interfaces in Public Space
(Sketches_0243)

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Abstract

The ViscousDisplay explores the exchange of social information through transient public interfaces. Shaped by principles of 'underground public art', the ViscousDisplay is conceived as a novel mobile communication medium, where messages can be shared in public spaces. Inspired by biological learning systems; the ViscousDisplay learns gestural motions and colors that form along traces of a participant's movements and maps this information onto a flexible display. It combines multi-modal sensing, learning algorithms, and a pliable silicone display.

Keywords

Interpersonal communication, tangible user interface, learning algorithm, gesture recognition, 'underground public art'.

1   Introduction: Social Histories

In *The Production of Space,* Henri Lefebvre describes space as a social phenomenon where history accounts for the "interrelationships of spaces and their links with social practice"[3]. He argues that the production of space is grounded in inherent conditions, where traces of social existence are forever creating our histories and our perception of space.

The ViscousDisplay is an interactive device with which we are exploring this exchange of social information through transient public interfaces. Shaped by principles of so-called 'underground public art' [4], the ViscousDisplay attempts to similarly occupy and engage shared spaces. When left in public spaces, ViscousDisplays are conceived as a communication medium between people sharing these spaces, where messages and signals spanning the continuum between private and shared information can be sited.

2   Implementation: Environmental Traces

We have developed ViscousDisplays that are embedded with learning algorithms which sample gestural motions and colors forming along the traces of a participant's movements. Abstracted visual and gestural information are taken from her/his environment and mapped onto its flexible, viscous display. As the user samples colors from her/his environment with an attached camera, the ViscousDisplay's dynamically responsive, fabric-like interface unfolds visually represented messages. After an initial training process, predictable signals develop from unpredictable environments enabled by the adaptive and temporal behavior of the computational system. The evolving characteristic of these embedded learning algorithms permits the robust transmission of complex environmental messages to this fairly simple computational device.

The malleable, sticky quality of the ViscousDisplay enables participants to attach it to many objects in the environment. When used in public spaces, this interface can become a tactile transmitter of social histories: a publicly retrievable dialogue, engaging users across an informational space to relay and retrieve symbolic messages of another's experience.

3   Physical and Computational Design

The LED based display is made of a copper mesh and flexible silicone encasement to enable sensing, folding, and manipulation of this malleable display. Small surface mount LEDs are fixed to a copper mesh to create a full-colored diffuse display. Color and gesture information is captured by three photo diodes and a compact inertial measurement unit [1] that are placed inside an optically clear spherical object, woven via flexible wires to the center of one side of the display.

The training procedure is facilitated by an atomic gesture analysis algorithm, based on a neural gas model [2], that measures gestural motion and color information sampled by the participant. The algorithmic processes perpetually receive sensing data, learn gestural paths, and adapt to the environmental information offered by the user.

4   Influences and Related Work

The ViscousDisplay was inspired by the transient and social qualities of 'underground public art' and iconic 'sticker art' [4] that attempt to encode shared spaces and engage a public dialogue.

References

1. Benbasat, A.Y. and Paradiso, J.A*.,* "An Inertial Measurement Framework for Gesture Recognition and Applications" *LNAI 2298*, Springer-Verlag, 2002. pp. 9-20.
2. Fritzke, B., "A Growing Neural Gas Network Learns Topologies." *Advances in Neural Information Processing Systems* 7, 1995, ACM Press.
3. Lefebvre, H., *The Production of Space*, trans. by Donald Nicholson-Smith, Oxford: Blackwell, 1991.
4. *Sticker Shock: Artists' Stickers;* Exhibition at Institute for Contemporary Art, University of Pennsylvania, January 15- March7,1999.

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