Archiving and Simulation of Fabrics with Multi-Gesture Interfaces

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In this paper we present a novel tool that improves on current archiving and simulation of fabrics by bridging the perceptual gap. We built upon recent research in HCI, perception and educational psychology to create a novel gestural interaction system that allows users to digitally share their designs at minimal cost.

HCI, Archiving, Interaction, Perception, Fabrics, Digital, Synesthetic, Capture, Gestures

1. INTRODUCTION

The main motivation for this work was to enable nontechnical fabric designers to archive and share their creations digitally without needing specialist equipment. Currently, it is difficult to communicate certain touch-feel qualities of fabrics with off-the-shelf devices. However, it is possible to bridge the perceptual gap and create a synesthetic response using stop-motion-animation and DIY filming techniques. This allows designers to share their textiles creations to consumers at basically no cost.

An infrastructure (web application, cloud services and iPhone app) was built to archive designs, make them accessible online and allow consumers to easily interact with fabrics on their own personal devices. While sophisticated devices for displaying and recording fabrics do exist, creating a system which will only use widely available devices was a real challenge. In our system, the recording requires nothing more than a consumer grade camera or camera-phone. Archiving and managing designs is achieved through a web application running in a browser connected to our servers, while our novel browsing and interaction interface works on iOS devices (iPad, iPhone). After introducing this system, we captured the attention of artists and clothing designers, and now we are aiming to understand how our work can help local fabric makers.

2. CONTRIBUTIONS

We built upon recent achievements in HCI and educational psychology to achieve the adoption of a novel gestural interaction system while trying to strike a balance between learning and discovery of features. In Woobrock 2009 users presented gestures based on the expected reaction, while our iShoogle interface is inspired by gestures based on searching known qualities. Orzechowski 2010 and 2011 attempted to establish a link between searching for a quality (like 'stretchy') and performing a certain gesture to assess it (pulling fabric apart with two hands). These natural movements of fabrics were transformed into touchscreen gestures in the expectation that performing them on screen will help us assess the same qualities more accurately than on the state-of-art fabric archiving tools.

Direct manipulation was another important area of research as described in Dragicevic 2008, but extended to use those natural gestures. The above system synchronises playback of a movie with movement of the mouse (for example adding a drag interaction to a filmed snooker ball) - user's actions seem to be directly influencing the position of an object (ball), rather than the movie. In iShoogle when a gesture is performed it triggers a stop-motion animation of a fabric being deformed by a similar gesture (e.g. pinching triggers the animation of a pinched fabric), the direction and

speed of the gesture directly influence the movement of the fabric. Multiple deformation sequences of a fabric are pre-recorded and they share certain frames which make it possible to switch between different gestures performed by the user. The effect is a simulator-like interface where movements correspond directly with the visual stimuli displayed on the touchscreen.

The final branch of research and inspiration was Cognitive Load research looking into using Mirror Neuron System, an ability to learn body movements by observation without engaging too much mental resources (Koning 2011). Using measurements by Paas (paper on clt scales) and studies by Marcus (origami paper) we are currently investigating whether a touchscreen interface which uses well known real-life gestures (stroking, pinching, crunching) is easier to learn than interfaces using unknown gestures or even known GUI elements such as sliders.

3. DESCRIPTION

The demo will consist of a number of iPads running iShoogle fabric simulators and a setup where conference attendees will be able to archive fabrics or objects that they carry with them such as scarfs or sweaters. With their agreement, these objects will be archived to the cloud and users can interact with them using our mobile app.

4. ACKNOLEDGEMENTS

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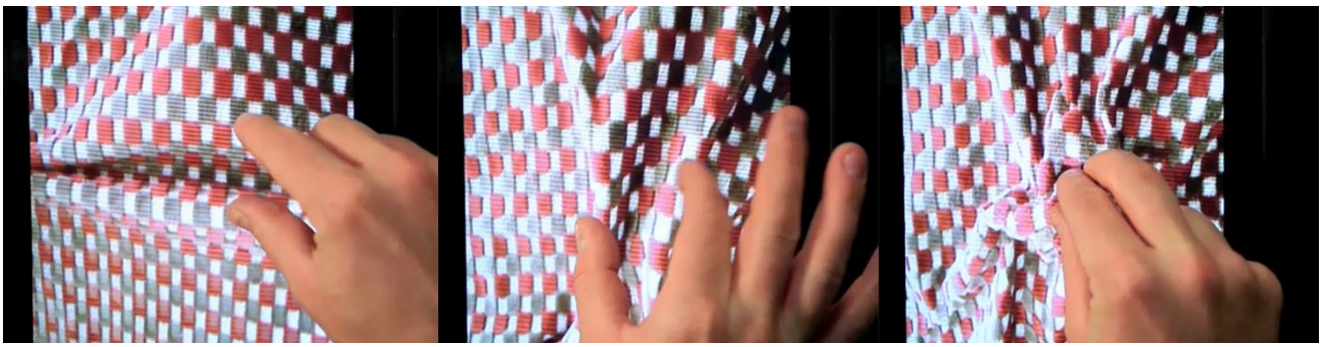

Figure 1: *Example of some interactive gestures on the mobile app.*