

Synthesising design methodologies for the transmission of tactile qualities in digital media

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ABSTRACT

In this paper we discuss the use of established, design methodologies and conventions to inform digital content creation relating to the capture and communication of people's sensory perceptions of 'textile hand'*. We explore the advantages of such methodologies in relation to the creation of interactive digital textile swatches (known as Shoogles, created using the interactive media tool Shoogleft.com [1]) and the conveyance of tactile (textile hand) qualities through such digital media.

* Textile hand as defined by Philippe *et al.*: 'is the reaction of the sense of touch, when fabrics are held in the hand. (...) "hand" can be considered as a meta-concept that takes into account not only the sensory aspect but also aspects such as formability, aesthetics, drapability and tailorability.' [2]

Categories and Subject Descriptors

D.2.10 [Software Engineering]: Design – *design process, analogue studies, multi-modal studies.*

General Terms

Design, Human Factors

Keywords

Mood Boards, Shoogles, Shoogles, Textiles, Textile Hand.

1. INTRODUCTION

As part of the Digital Sensoria Project the experiments described in this paper have been carried out in an attempt to create a new language to communicate sensory stimuli and enable consumers to capture digitally their perceptions of textile products. Interactive digital tools were created for Digital Sensoria to enable the depiction of digital textile swatches, the primary tool being Shoogleft [1] We will examine how the generative process described can inform the design and filming of interactive video content (created using Shoogleft) to allow better transmission of textile hand qualities in digital media.

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2. IMAGE AND TERM MATCHING

A key tool in the repertoire of designers, particularly from the fashion and textile industries, is the 'Mood Board'. Used successfully by Moody *et al.* [5] as a generative tool to express perceptions of textiles, Mood Boards are collections of found imagery, collaged together to express a theme or concept which is often intangible and emotionally or sensorially based [See Figure 2].

A literature review was conducted with the aim of discovering descriptive terms that had been used in previous studies of textile hand and to examine any standard taxonomies. Terms used in these studies were logged and through the consideration of various factors (terms were removed if preference based (hedonic), descriptive of a textile type rather than its hand qualities or not comprehensible). A taxonomy of sixty nine terms was produced. These terms were then ranked by incidence of use and formed into bi-polar pairs. From these pairings, four were randomly selected from the ten most commonly used pairs, which formed the basis of subsequent studies.

Thick – Thin, Stiff – Flexible, Warm – Cool, Rough – Smooth

To understand how our chosen pairs of descriptive terms could be conveyed by images that are evocative of sensory experience and therefore how visual elements of an interactive textile swatch could evoke such experience, we began to investigate the associations of images to sensory labels or terms. Though discussed by Gumtau [3,4] as a desirable tool, a system of tactile semiotics has yet to be fully developed. This paper lays the groundwork for a large-scale survey of the tactile associations of imagery alone. To study the full semiotic associations of a tactile sensation is beyond the scope of our current resources.

Initially we sought to understand whether images chosen by the research team to depict the eight terms (four pairings) would be understood by study participants as relating to the correct term.

When attempting to survey the sensory and semantic associations of a sample of differing individuals we acknowledged that our study would be necessarily limited. Even those participants who may appear to be ethnically and culturally homogenous would have different life experiences that will influence their perceptions.

Fifty undergraduate students were recruited from diverse backgrounds; not all were native English speakers but had English language skills appropriate to their level of study. This variability was desirable in order to test the experimental limitations previously detailed. Participants took part in a 'flash card' matching test. Flash cards of the eight terms and twenty-four images (three to represent each term) were randomly placed

on a table before the participant, and they were asked to match each term to a single one image. This can be considered a 'quick and dirty' prototype analogous to the creation of a 'Mood Board' as it associates an image to each sensory label, producing quick results to test the validity of the approach.

As Figure 1 shows, a reasonable degree of accuracy was attained with all terms except 'Stiff' being accurately communicated over 70% of the time. It may be that this is not a well understood tactile property or that the images chosen by the researchers did not convey the property accurately.

Having piloted an image and term matching experiment, which yielded promising results, we expanded our study in order to source imagery from a wider user base.

Mood Boards representing the terms 'Rough', 'Smooth', 'Thick', 'Thin', 'Stiff', 'Flexible', 'Warm' and 'Cool' were produced by sixteen design students. Each student was assigned two terms at random. Having collated the images used in the Mood Boards, their ability to transmit the perceptual term for which they were chosen will be tested in future studies (see 4).

3. INFORMING THE DESIGN OF SHOOGLE CONTENT

We have sought to understand the link between terms which describe textile hand (as obtained in 2) and evocative images. As part of the process to develop design methods to generate interactive digital content of textile materials that communicate the 'hand' of a specific textile, we are generating a lexicon of semantically tagged imagery. If the creator of the digital textile swatch perceives the textile they are representing to be warm they can seek out images representing this quality to see what common features the images share. These features can then be portrayed or amplified in the content of the digital swatch they create. As ShoogleIt creates interactive content from standard video it is easy for the creator of the Shoogle to 'stage' or 'direct' their filming of a textile swatch using such appropriately selected visual cues.

When carrying out qualitative analysis of the Mood Board imagery several features become apparent relating to lighting and textural qualities. On the axis of warm and cool, soft, diffuse lighting is apparent in many warm images. By contrast harsh white lighting with sharp highlights is often utilized for cool images. Also, warm images are often highly colour-saturated compared to cool images. Additionally the rough-smooth axis shows usage of directional lighting, providing contrast and shadow on rough textures and reflection on smooth surfaces. Thick and Thin images often rely on a view of the edge of an object or material. There appear to be no related trends in Stiff and Flexible images.

Based on the features identified we hypothesise that lighting of a textile and manipulation of the structure and surface of the textile can be exploited to influence the perceptions of the viewer of a digital textile swatch. For example, we propose that pleated fabric will better convey thickness as it will show the folded edge of the textile, and its ability to hold the structure of a pleat will demonstrate stiffness and flexibility. [See Figure 3] Also, through appropriately chosen lighting techniques we can amplify perceptions of the qualities rough, smooth and temperature.

4. FUTURE WORK

To verify our Mood Board studies to date we are in the process of undertaking a series of 'Design Gaming' workshops as utilised by Brandt *et al.*[6] and Bang [7]. It is suggested that more reliable data can be obtained from such processes as participants are more actively engaged in the research process.

The process of image and term matching is also to be conducted online using a novel crowd-sourcing interface currently in development by Padilla *et al* [8]. It is hoped that this will allow the distribution of our experiment to a suitably wide sample of participants so that we can expand our lexicon of semantically tagged imagery. This may also remove some of the 'noise' related to outlying, individual subjective judgments if images are word tagged by a large number of users.

Finally, we will conduct user studies to compare Shoogles of pleated textiles and textiles with directional lighting amplifying their perceived tactile characteristics to un-pleated and diffusely lit textiles. We hope to discover if such manipulations enhance the transmission of textile hand properties to the user as we hypothesise.

We believe that this research may have an important role in the communication of tactile information while true, mass market haptics are still in their infancy. Furthermore it may offer insight into the effective development of content for such haptic interfaces as they become more widespread.

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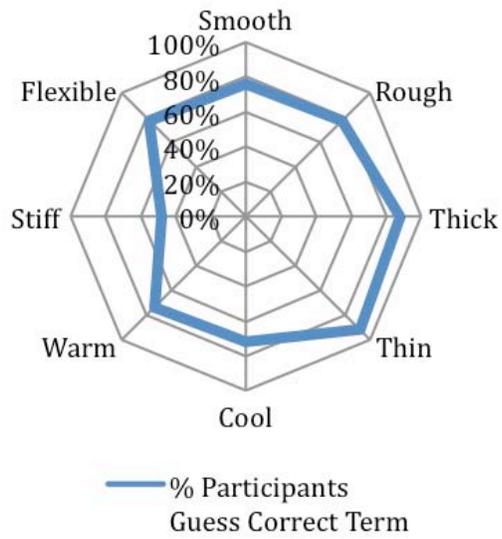


Figure 1: Percentages of correctly matched terms and images in the pilot term and image matching experiment



Figure 2: Participant Mood Board representing the term 'warm'.



Figure 3: Examples of pleated and directionally lit textiles being manipulated.