Fit for purpose? Pattern cutting and seams in wearables development

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This paper describes how a group of practitioners and researchers are working across disciplines at Nottingham Trent University in the area of Technical Textiles. It introduces strands of ongoing enquiry centred around the development and application of stretch sensors on the body, focusing on how textile and fashion knowledge are being reflexively revealed in the collaborative development of seamful wearable concepts, and on the tensions between design philosophies as revealed by definitions of purpose. We discuss the current research direction of the Aeolia project, in which we are now seeking to exploit the literal gaps found in pattern cutting for fitted stretch garments towards experiential forms and potential interactions. Normative goals of fitness for purpose and seamlessness are interrogated and the potential for more integrated design processes, which may at first appear ‘upside down’ (Starner 2001), is discussed.

Design process, textile knowledge, wearables, stretch sensing, seamfulness, gaps

1. INTRODUCTION

The concept of *seams* has played an important role in wearables literature. Initially an inherited ideal of transparency and disappearance, seamlessness has not been adopted wholesale by the wearables community. Rather the materiality of a system's inputs and outputs have become concerns of critical wearables practice and wider interaction design theory (Chalmers et al 2003, Galloway 2004). In the meantime, *purpose* in design has recently been brought into question in the wearables literature, with many functionality led projects criticised for being opportunistic or lacking in aesthetic consideration (Hallnas & Redstrom 2006). Indeed, Starner suggested as long ago as 2001 that the wearables design process may benefit from being ‘turned upside down’ – that is, begun with expressive aims rather than functional requirements - in order to fully exploit the rich embodied knowledge of other disciplines (Starner 2001). In the work described here, we are interested in the potential of textile knowledge to inform the materiality of the wearable interface and focus our discussion on the generation of an inter-disciplinary design process, which does not place functionality at its centre.

2. THE AEOLIA PROJECT

Aeolia explores concepts of bodily engagement with space and place. By combining feedback from remote sensors with biological data from the individual wearers of the body pieces, the work

highlights the potential for different forms of engagement with the world. Design practitioners and researchers at Nottingham Trent University examined muscular structures of the male torso to inform ideas of physicality, movement, stretch and resistance of the body. Working with this aesthetic, three prototype garment forms were developed to integrate carbon impregnated rubber cord stretch sensors that could notionally collect data or create output defined by muscle movement. Each garment explored different textile structures drawing upon embroidery, knit and weave processes (Downes & Harrigan 2009, Kettley & Briggs-Goode 2010). Frustrated by the handling and friable qualities of the pre-supplied stretch sensor, Glazzard knitted fabric stretch sensors using conductive yarns and elastic thread. These were fitted across the back and elbow of a cellist to experiment with audio output. As the cellist's arm stretched, changes in the length of the conductive path created distortions and interruptions to sound (Glazzard & Kettley 2010).

3. TEXTILE APPROACHES

With awareness of the interactive parameters of the Aeolia project, initial textile approaches set aside specific function of the outcome to explore the materiality of the textile interface and the stretch sensor with the body. Important considerations are how to integrate awkward, uncomfortable technologies seamlessly into the garment without causing irritation or restricting movement. In the original Aeolia prototypes, this is managed through

channels or seams created in the fabric for threading, or couching sensors along extension lines on the body using a fully integrated design aesthetic. The next development aims to exploit the density of fabric structures to combine stiff tectonic areas of resistance, with soft, connecting pathways that map the body, exploring the potential of greater synthesis of our own knitted, embroidered or woven stretch sensors. Practitioners work between labour intensive hand processes and advanced textile CAD and CAM to engineer fabrics to required forms.

Figure 1: *Aeolia: three textile backs with stretch sensing*
(weave: Nigel Marshall, knit: Martha Glazzard,
embroidery: Tina Downes, Fit: Karen Harrigan)

4. PATTERN CUTTING INFORMING NEW CONCEPTUAL DIRECTION

Aesthetic focus and visual synergy is provided by the stretch and static garment patterns devised collaboratively by Harrigan and Downes and developed into working prototypes by Harrigan. The stretch, one-piece pattern provides drawn lines of resistance that are imitated in the design of pattern segments for a seamed garment. The team are becoming intrigued by the gaps between the segments and wish to explore the notion of the seams becoming the garment itself, or conversely, working on whole pieces of cloth that can be fitted to the body through structural manipulation of the gaps.

5. DISCIPLINES AND KNOWLEDGE

All of these ideas have been generated through practice-based collaboration which exploits embodied knowledge of fashion and textile disciplines together with debate with experienced researchers in the field of interaction design. To work collaboratively requires sufficient awareness of each other's disciplines to create connections in thinking and language. The team see resonances

between their work and approaches in fashion (that do not necessarily relate to wearables) from stream-lined designs in current sports/performance garments, to the conceptual explorations of technology and fit by Chalayan and Margiela, to visual interpretations in seasonal ready to wear collection (Shulman 2009, Braddock Clarke & O'Mahoney 2002 and 2006). Stretching beyond our experience and scoping the need for applications for fashion and textile knowledge in new fields, the team seek connecting places for engagement with a common goal and focus to explore and extend understanding.

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