VIGOUR: SMART TEXTILE SERVICES TO SUPPORT REHABILITATION

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ABSTRACT

"Vigour" is a garment that shows the possibilities of smart textile services for geriatric rehabilitation exercises. It is the result of a collaborative design process between a design researcher, three therapists, an eldercare manager, a textile developer and an embedded systems designer. Vigour embodies the knowledge that was accumulated during the collaborative design process. We contribute to the theme of experimentation in design research by showing the value of experimentation in a participatory setting through the iterations leading to the final garment. Further, we will briefly describe three of the steps that lead to the final prototype.

INTRODUCTION

Ageing of the population is one of the challenges that our society in Europe is facing. One of the strategies to transform this into a more positive outlook is described as active ageing, which aims to increase "opportunities for health, participation and security to enhance the quality of life of aging people" (World Health Organization (WHO) 2002). The design of new services is one of the main means to support this transformation, since they can support the emergence of a more collaborative, sustainable and creative society and economy (Sangiorgi 2010). Framed within this context we focus on services related to smart textiles: the integration of technology, such as computing, sensors and actuators in the textile itself. As the field of smart textiles is maturing, non-technological challenges related to societal and commercial adoption are becoming increasingly important to focus on (Schwarz et al. 2010).

For the combination of smart textile services and the ageing population, McCann, et al. (2011) describe the importance of a shared language, derived through the development of prototypes created in a collaborative design processes with important stakeholders (end-users, industry and designers). Within this paper we will focus on the experimentations to come to these prototypes in a collaborative design process.

Within the Smart Textile Services project of the Dutch Creative Industry Scientific Program (CRISP) we are investigating how to design and develop smart textile services, collaboratively with small and medium enterprises from Dutch textile and technology industries, service partners, creative hubs and universities (ten Bhömer et al. 2012). We emphasize the active role of all these stakeholders in the process. For example, the design researcher takes an entrepreneurial role to drive the design process forward. Our prototype 'Vigour' is a garment that can be used by therapists in rehabilitation exercises. What we find valuable for the theme of this conference is the notion that this result was achieved through a series of experiments. In every step (Figure 1) the physical prototype plays an important role to specify the design, open-up the process for involvement of the participants and provides a platform for the discussion.

DESIGNING REHABILITATION SERVICES

Within the field of geriatric rehabilitation it is known that physical training can help people from older age groups with Alzheimer's disease to show less physical limitations and better motoric skills (Neeper et al. 1995). Besides these measurable improvements, regular exercises also contribute to the subjective health experience: strength is maintained and balance improved, for example the ability to walk or the ability to get into or out from a chair. Physical rehabilitation and exercises are included in the services offered by most eldercare organizations. To be able to design for this particular context a group of three therapists who are specialized in treating people of older age with Alzheimer's disease, worked together with a design researcher to explore the possibilities of smart textiles to further extend their rehabilitation services.

a) Measuring pressure, feedback with audio b) Measuring stretch & touch, different yarns c) Canvas to determine sensor locations

Figure 1: Different experiments created during the design process

Before explaining the final garment we will briefly introduce three of the experiments that were created in this collaborative process. The first experiment was a piece of fabric with pressure sensors that controlled a mobile phone application playing music samples (Figure 1a). In reaction to this experiment, the therapists organized a day where the design researcher was invited to observe their practice to understand the context better. In a second iteration, the design researcher showed several explorations that contained stretch and touch sensor combinations of different fabrics and yarns, and vibrating elements that can be placed on the body (Figure 1b). Based on these samples it was decided that the service experience of the rehabilitation process could be improved by designing a complete garment that can be worn during the exercises but also in daily life. In a next experiment the locations on the body to measure movements and other improvements (for example an opening on the back to help the caretakers to put on the garment quicker) were marked on a white shirt (Figure 1c).

Figure 2: Prototype of Vigour with the sensor surfaces (in grey)

VIGOUR: A REHABILITATION EXPERIMENT

Vigour is a garment that can be used during physical rehabilitation exercises of elderly. The goal of the garment is to help the therapist to improve the rehabilitation service by keeping the exercises challenging for every different client. On the other hand it aims to help the therapist and other caretakers to lower the workload, monitor physical activity and to make it easier to view the progress of their clients. It is configured with sensor areas on specific parts of the body that can be used to measure movement of the arms and lower back (shown in Figure 2). The fabric with the sensor areas was developed and knitted in collaboration with a textile developer in the TextielMuseum TextielLab. Based on feedback from the therapists and the earlier experiments the garment was combined with sound feedback. Feedback is given to the wearer with piano sounds from an external computer. The further a particular sensor is stretched, the higher the pitch of the piano. The sensitivity of the sensors and the activation of each sensor surface can be wirelessly controlled using an interface displayed on a laptop (shown in Figure 3). To provide input for a next design experiment the interface includes text-fields that make it possible for the therapists to log their usage of the prototype.

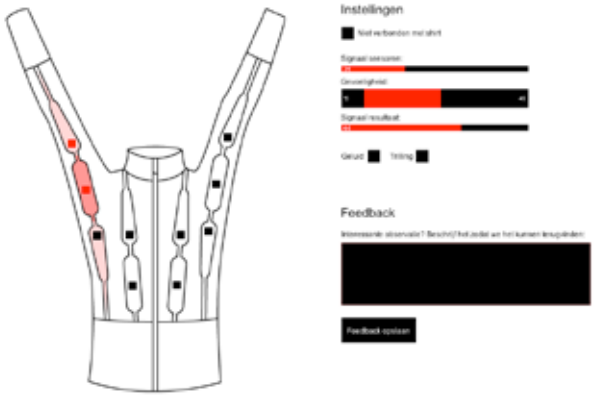

Figure 3: Interface of the application to configure the sensors

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