# Tactile Stories: Interactive E-textile Wall-hangings created by blind and visually impaired makers

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## ABSTRACT

We present Tactile Stories - a collection of interactive wall-hangings that were created by participants who are visually impaired. Each art piece conveys a story or association personal to its maker, created by combining e-textile circuits and switches, sound boards and traditional crafting. The result is a tactile auditory object, consisting of different textures, colours and shapes which conveys a special story for the user to explore. We demonstrate our approach to such an accessible form of making, how the e-textile technologies were used to enable this, and encourage audiences to engage with touch based forms of interaction.

#### CCS CONCEPTS

Human-centered computing → Interaction design; Interaction design process and methods;
Participatory design;
Accessibility → Accessibility technologies.;

#### **KEYWORDS**

E-textiles, Participatory making, Visual impairment, Crafting, Creativity, Touch-based interaction, Storytelling

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#### **1** INTRODUCTION

E-textiles allow for a tactile interaction different to interactions with mainstream interfaces (swiping screens or mouse clicking). By combining conductive materials with non-conductive ones, utilising different crafting techniques, so-called 'soft' sensors and switches can be created that allow for intimate or playful gestures including squeezing, stroking and stretching. Not only can these gestures be used to trigger outputs but when combined with the feel of interesting textured textiles offer a more 'sensory' experience. For blind and visually impaired (VI) people there is value in exploring the non-visual use of e-textiles and utilising them for touch. We

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ran workshops where VI people created their own interactive art pieces that they could engage with in an accessible and creative way, through touch. We explored associations or stories with participants, along with an emphasis on them being in control of all aspects of the making process. Our work builds on literature around accessibility, inclusion and making, particularly where participants work in a group setting [1], [3], [4], [5], [6], [7], [10].

#### 2 RELATED WORK

#### 2.1 Accessible Making and Wellbeing

Accessible making linked to empowerment is a strong theme in DIY-AT (Do It Yourself Assistive Technology) literature. Meissner et al. [6] focused on the importance of teaching participants with disabilities how to work with tools such as 3D printers and Arduino boards to design and make their own objects that they themselves could use. In previous research [3, 4], we have taken a similar approach but using an open e-textile kit using small weaving looms and e-textile materials where participants could design and make their own woven swatches. Accessibility goes beyond the physical; making work in a participatory workshop environment, where makers can share ideas and feel safe, has been increasingly explored. MzTEK [7], a women's led creative technology group, ran workshops for women to learn programming and electronics whilst also feeling empowered. Briggs-Goode et al. [1] worked with mental health service users, combining e-textiles with a person-centred approach to psychotherapy. Participants created e-textile objects, reflecting both on the making process and how they felt emotionally. Hernandez [5] facilitated e-textile workshops to provide a sense of 'purpose and motivation' amongst participants and describes the implementation of e-textiles within the work as making the objects 'responsive and personally meaningful'. Vogelpoel et al. [10] discuss the benefit that working in a community environment can give to participants, in their case people with sensory needs. Many of the above projects can be described as embracing the concept of a traditional craft circle, which as Price [9] highlights can create 'richer social relations'.

## 2.2 Touch and Association

People's preference for objects - their material properties and behaviours - have been explored by both Petrelli [8] and Davis [2], along with people's associations. In our research we have further researched this linking of associations and materials [3, 4]. We found that VI participants enjoyed selecting materials for their 'feel', and make these part of their tactile stories, from suede to represent a horse, corduroy to be part of a boat structure, and shiny satin to



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Figure 1: Participant connecting a circuit together.

represent water. There is clearly potential to incorporate different materials to encourage touch interactions in tactile stories.

## 3 DESIGN

#### 3.1 Interactive Art Objects

The work we demonstrate was created during six weeklong workshops for VI users. To give the participants a framework and a brief, we set the boundaries of the interactive pieces they would be building as 'interactive wall-hangings', with three e-textile buttons connected to three re-recordable sound devices. Participants were free to develop any story or event they wanted, and use materials and sounds they selected themselves.

#### 3.2 Approach to Making

E-textiles as a field often requires intricate sewing, soldering of components or knitting or weaving circuits. We investigated accessible forms of making, attaching and connecting (see figure. 1) - allowing participants to create fully functioning interactive objects, without the frustration that traditional making can involve. For example, we explored methods like gluing or using press-studs. We also explored how to break down the process of developing circuits in a modular way, using manageable steps. We used tube yarn, to make connections between objects and speakers, as a form of insulation to prevent short circuits. Parts could then be moved around during the process, encouraging people to walk through their design and 'feel' if they were placed in the way they wanted.

#### 3.3 Stories or Personal Association

Each piece was designed with a personal story or association attached to it - from a happily remembered trip, to things said by children. These are not only represented through sound recordings but also material choices made by the makers: texture, colour, shape and crafting method (see figure 2).

## 4 EVALUATION OF INTERACTIVE WALL-HANGINGS

We found that although sometimes a bit intimidated by the idea of making an e-textile circuit, the workshops were very successful



Figure 2: Participant felting an element of her work.



Figure 3: Participant interacting with her switch.

and each participant ended up with their own interactive piece that had soft buttons. The modular step-by-step approach had been very effective, and throughout the making process participants shared insights, gave each other tips and helped each other - but also each of them took charge of their own making process. Each maker took pride in presenting their work, showcasing them to each other at the end of the workshops but also in an exhibition attended by friends and family.

#### **5 DISCUSSION**

Participants being in control of their making process, choosing their own story to design work around, and construct it with their choice of materials and techniques, has been integral for a sense of ownership. Focusing on one technical aspect, in this case making e-textile circuits (see figure 3), meant that participants could learn something new whilst not be overwhelmed. Using a modular approach for the build allowed for flexibility and for late changes. These elements all contributed to a happy and empowering making experience.

## 6 CONCLUSION

Each of our participants created an interactive e-textile art piece which was personal to them and tells a story (see figure 4). The making approach taken was accessible whilst also allowing for

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Figure 4: Participant adding the final touches to her piece.

participants to experience challenges such as making an e-textile circuit and learning new crafting techniques. The making of tactile stories opens up new possibilities for people with a range of sensory capabilities to express themselves and to engage in new ways of making through technologies.

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