

The Design and Creation of Tactile Knitted E-textiles for Interactive Applications

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Research Objectives

- Develop knitted e-textiles with a range of visual and tactile designs to fit various interactive applications
- Explore how the design of interaction can integrate into textile design practice

Background

Research in e-textiles has led to more sophisticated ways of integrating electronics with textiles, moving away from the obtrusive attachment of electronics onto textiles, to e-textiles that integrate electronics directly into the fabric structure.

However, there are two aspects of textile-based e-textiles that are often overlooked: tactility and aesthetic value. Tactility can be used to indicate interactive textiles areas, but it is also particularly beneficial in sensory stimulation applications. Aesthetics serves as a means of making the final product appealing and meaningful to the user.

While knit structures have been employed in e-textiles, the focus has often been on the functionality, and not on how the design of the e-textiles might fit into the design of the whole product. It is also necessary to consider the impact of advanced technologies on the design and production of e-textiles. Computerised knitting machines have the potential to make the production of e-textiles components more efficient, while also allowing for the production of complex knitted structures. This in turn can lead to a wider variety of functionalities and designs. At present, e-textiles produced using computer aided processes tend to have limited design complexity. In contrast, handcrafted e-textiles, while varied in terms of design can be time-consuming to produce, making creating large-scale or replicable e-textiles pieces difficult or impractical.

Methodology

The research takes a practice-based research approach, with the author taking on the role of a knitted e-textiles design 'Practitioner-Researcher'.

Mixed methods approach:

- Quantitative data - Evaluate the functional aspect of e-textiles, i.e. sensor readings or textiles properties
- Qualitative data - Evaluate user preference, nature of the human-textile interaction

Conclusion

Future work aims to build upon the basic knitting techniques established during the initial research, by revising techniques developed on the hand flat knitting machines for the computerised knitting machines, or designing more complex knit structures. While this work focuses on the development of e-textiles fabrics, it is expected that these designs will be applied to other live projects during the course of this PhD. This would allow them to be evaluated in a real-world context. It is expected that the PhD will be completed by December 2020. It is hoped that this work will encourage the creation of e-textiles for interactive applications by demonstrating a scalable means of producing a diverse range of e-textiles.

Work in Progress



Knitted polymeric optical fibre jumper

Knitted Polymeric Optical Fibre

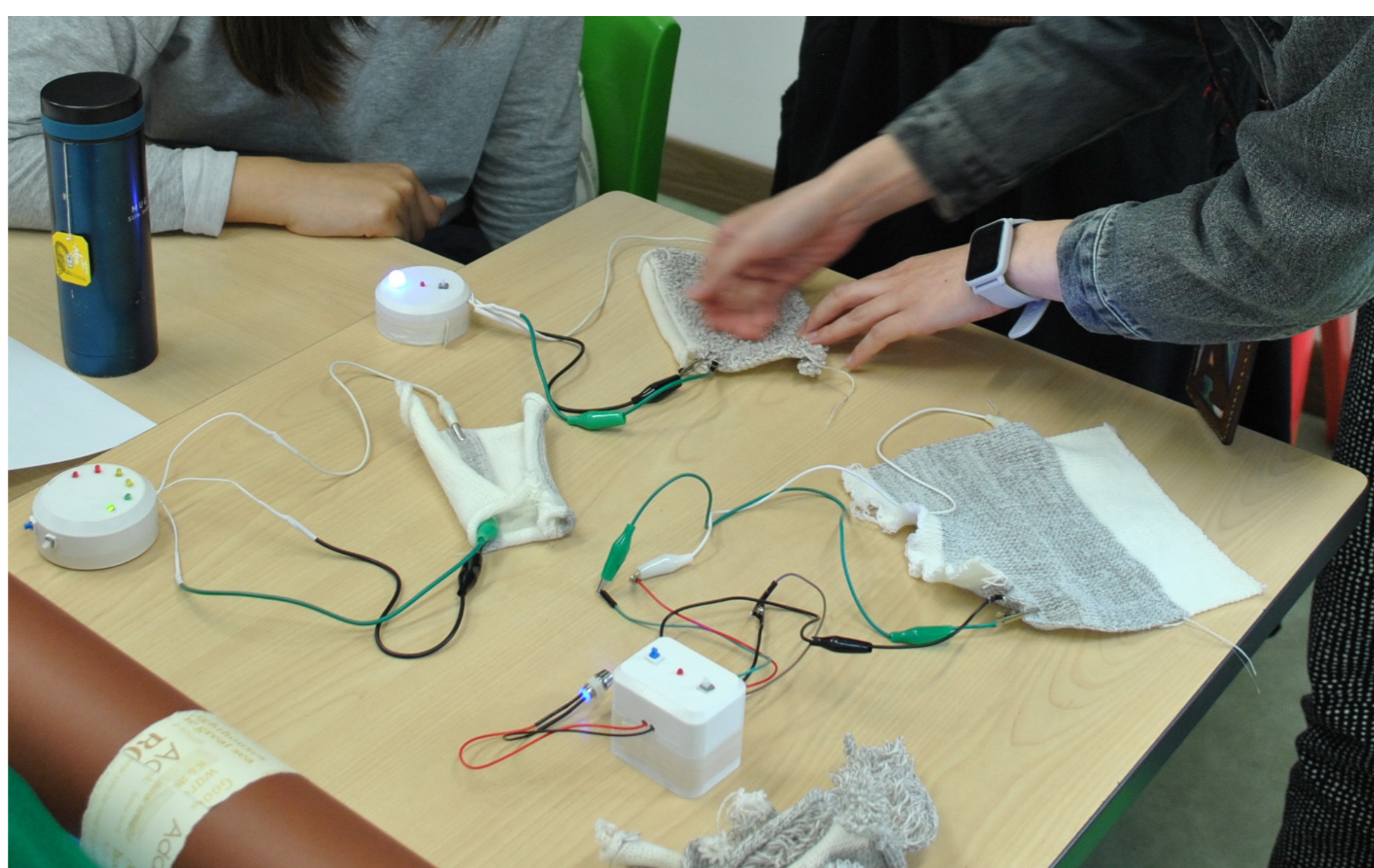
Developing an alternative means of incorporating polymeric optical fibre (POF) into the knitted textiles structure to create novel illuminating fabrics.

Knitted tactile e-textiles sensors

Improving the functionality, appearance and the production method for the touch sensitive knitted e-textiles sensors



Left: Touch sensitive knitted towelling. Right: Knitted braided conductive yarn



Resistive sensing interaction modules connected to knitted conductive fabric

Interaction Module

Visualise the interaction with the e-textiles fabric through a device that is portable and simple to use