

# INFINITE - an E-textile Toolkit Designed for Fashion and Textile Designers

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Embedded interactive systems have become popular in fashion and textile disciplines in recent years as interactive technology can help to enhance design concepts and achieve new functionality in projects. Fashion and textile designers have aesthetic aims alongside functional requirements, however, many existing e-textile toolkits aim to either educate novices in basic electronics [1–4] or encourage personalization whilst requiring a level of electronics skills [5]. Few of these toolkits are designed in a professional or higher education fashion and textile design context, supporting balance between the physical design and functionality, or responding to the specific requirements by designers.

Based on a survey into textile and fashion designers’ interests in incorporating interactive functionality in their design practice, we designed Infinite - an e-textile toolkit for these designers who have no or limited experience in electronics. The toolkit features modularity which allows fast prototyping and it also encourages open-ended free interface design through a diverse palette of materials. The toolkit consists of: a series of attachable modular blocks (Fig 1) whose input and output function choices are based on the survey findings; an e-textile sensor template (Fig 2); a selection of conductive materials to support designers with different textile construction skills; online instructions and online e-textile sensor tutorials.



Fig. 1. Infinite e-textile toolkit hardware

We studied two iterations of the Infinite e-textile toolkit with two art universities in the UK with 36 textile design students in total. We also used the toolkit to teach e-textile and interaction design to 18 students from diverse backgrounds ranging from mechanical



Fig. 2. E-textile sensor templates

engineering to fashion design; we then formed six interdisciplinary design groups matching fashion or textile design students with students from science and engineering backgrounds to create wearables. The preliminary results suggests that the Infinite e-textile toolkit is an effective tool to help students learn interactive technology through a materials-centric lens, and it is suitable to be used in the textile and fashion design applications. The majority of participants were satisfied with the toolkit functions, pointing out that the functions are sufficient for achieving their desired outcome. Based on the participants' feedback, we iteratively updated the toolkit by adding new sensor and actuator functionality, and updating the online tutorial with more visualized instruction. The results suggest that functions with open-ended implementation solutions can be better integrated into textile structures, making them more popular than functions that are assembled into pre-set shapes. Moreover, visual-led tutorials were found to be more accessible to design students than text-based instructions. The modular blocks enable designers to easily prototype specific input and output functions across design stages and support ideation and iterative adjustment of the whole design. The e-textile sensor template and tutorials help designers to understand electronic sensor principles from a material perspective, and the provided conductive materials further enabled customized e-textile interface exploration in an applied textile or fashion design scenario. We found that textile and fashion designers could construct interfaces within the context of their designs with a variety of textile construction techniques which helps to achieve more integrated wearable and textile designs. In addition, we found that the toolkit can support communication and collaboration in interdisciplinary groups.

CCS Concepts: • **Human-centered computing** → **Systems and tools for interaction design**; **Interface design prototyping**.

Additional Key Words and Phrases: Design education, Design process, Textiles, Wearable, Fashion and clothing, Electronic textile

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