Ubiquitous embodied learning with e-textiles

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ABSTRACT

Electronic Textiles (e-textiles) have already proven their practical use in wearable garments, and are now also increasingly featuring in non-wearable items, such as in furniture and shared surfaces inside a smart home and driverless car interiors. E-textiles, whether worn or not, have the potential support their users' embodied learning, augmenting their perception based on contextual information collected unobtrusively about its users. In particular, this presentation will outline e-textiles' potential to be used in learning given the advances in behavioural research and unobtrusive sensing within the ubicomp community.
Keywords: e-textiles, embodied learning, ubiquitous computing.

1 EMBODIED LEARNING

Exploiting the capability of interacting with objects for learning is a welcome challenge to traditional pedagogy which presumes higher learning as a "disembodied" activity, as if it happens only in the brain [1]. A more natural approach to learning considers that perception, emotion and experiences are always embodied. However, traditional learning technologies have not exploited this fact in the way that e-textiles, and wearable technologies can. Embodied learning is defined as learning which explicitly uses physicality and tangible interactions amongst learners and with physical objects rather than with just abstract concepts.

2 E-TEXTILES FOR EMBODIED LEARNING

Electronic textiles (e-textiles) become 'smart' through the incorporation of electronic elements that allow them to sense and adapt to their environment [3]. In addition, smart textiles can store and supply power [4] as well as support wireless communication.

When textiles are embedded with fully integrated sensors, actuators, and power systems, these can support embodied learning. It is predicted that this technology will disrupt learning as they are being increasingly popular with the make movement [5]. Those interacting with e-textiles can learn about technology through sewing, relatively unconventionally, compared to personal computers, printed circuit boards, and microcontrollers – a unique embodied learning activity that engaging different cultures from a range of backgrounds [6].

These technological components would otherwise not be found in traditional textiles, but their existence can provide data from their handling. However, both terms are used interchangeably in the field which creates problems that determine what abilities a textile with embedded technology has and the extent it can interact with its environment and/or owner. The need for more definition and scope of electronic textiles has been addressed [7]. Köhler highlights that the type of electronic components in electronics textiles will influence their means of disposal and recycle. By clarifying if a textile is purely smart or contains electronic circuits/components, broad descriptions such as introducing 'smart functionality' [8] can be replaced with specified descriptors of behavior and characteristics. A specification which alludes to its ability to sense, actuate, and interpret. Hence, e-textiles can be truly interactive by humans and be used to wirelessly connect to connected devices for a range of applications. Whether it is garment-form collecting physiological data to monitor health in sport [9] and in medicine [10] to teach biological concepts in an educational setting. Or in furniture in smart homes [11] and in automotive interiors [12] to teach how sensors communicate together and can utilise artificial intelligence [13] to create context from data.

3 CONCLUSIONS

We argue that the integration of electronic components into textiles create a distinction between 'smart textiles' and 'electronic textiles'. For e-textiles to be able to support embodied learning, they have to sense and respond to interaction in real time. Further, they are able to support ubiquitous learning by engaging the user in immersive learning experiences.

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