

Interactive Textures: Engaging Through Knitted E-textiles

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Abstract:

In the thriving development of human-computer interaction, tangible interactive electronic textiles (e-textiles) are redefining the boundaries between users, intelligent device, and their physical surroundings [1]. Current research has investigated the incorporation of touch-sensitive and illuminative fabrics in areas, such as, multisensory environment [2], smart wearables [3], and interiors [4]. This research investigates the effects of integrated knitting textures on delivering interactive interests, as opposed to earlier techniques that rely on aesthetic embellishment, such as, colour and pattern [5]. Knitting offers a versatile panel, with variations in stitch patterns, structures, and densities crafting a rich tapestry of visual and tactile experiences, along with deformability. Knitting smart materials may provide opportunities for more in-depth and engaging user interactions [6]. Consequently, we introduce an interactive textile wall panel composed of polymeric optical fiber (POF) and capacitive textile sensors integrated into seamless machine knitted fabrics. This innovative wall panel serves a dual purpose, adding to the atmosphere of intelligent spaces by allowing for delicate adjustments to the lighting by touch. The interactive wall panel primarily comprises two distinct sections: illuminative textile and knitted sensor by using neutral yarns, conductive yarns, and POFs. The knitted illuminative textiles utilize varying wave patterns in their structures, wherein POF is intricately inlaid within the knitted fabric to craft textures characterized by elongated and short floating lines, thereby manifesting a dynamic flow of light. On the other hand, the knitted sensors employ an array of techniques such as links, Ottoman, Birdseye jacquard, and yarn changing to engender textile textures, exhibiting diverse convex effects and geometric patterns. The project delves into user tactile interaction by varying knitted sensor designs across different structural dimensions. In a systematic workshop, participants were presented with a series of knitted samples, encompassing a variety of patterns, structures, and yarn types to engage in tactile exploration. The results obtained from this experimental session showed that segment protruding structures enhance the intuitive interactions that are provoked. This conclusion was drawn utilizing methodologies that combined observation, questionnaires, and structured interviews to capture a comprehensive perspective of the

tactile engagement process. This project capitalizes on the softness and adaptability of sensors and POF textiles, offering dynamic light displays and sensory responses that evolve with user interactions, thereby paving the way for novel interactive environments.

Keywords: e-textiles, POF textiles, seamless knitting, tactile interaction, knitted textile sensors.

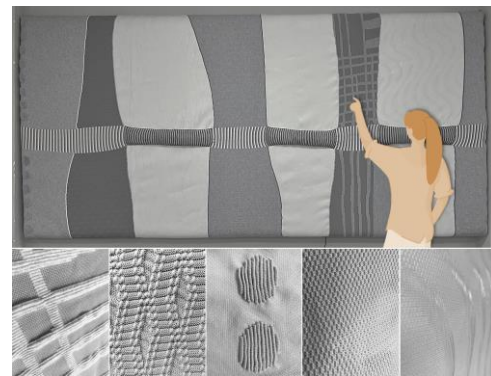


Figure 1 Touch-sensitive and illuminative interactive textile wall panel with knitted textures.

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