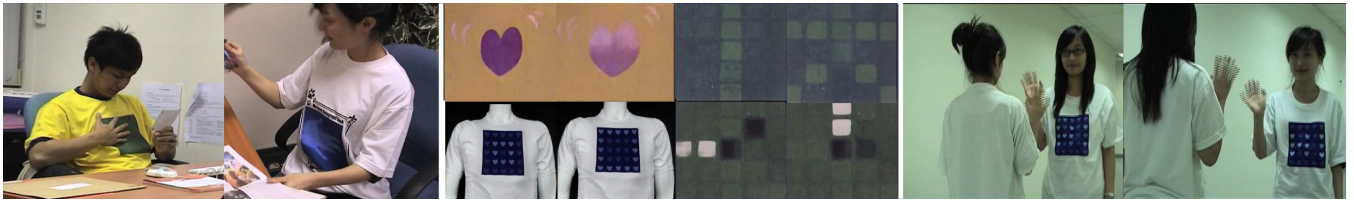


AmbiKraf: An embedded non-emissive and fast changing wearable display

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1 Introduction

AmbiKraf is a novel non-emissive analog fabric display that has rapid color changing capability. It is integrated into the soft fabric enabling novel animations and interactive scenarios in the normal clothes that we wear. The core novelty of this project lies within the actual implementation of a fabric embedded with Peltier junction semiconductor to form a robust and wearable fabric display. In addition, our key novelties extend to its fast, accurate and bidirectional control through in-fabric semiconductor based heating and cooling systems. This enables the capability of displaying animations and facilitating many interaction scenarios through everyday clothes.

Fabric displays are gaining more attention as a novel form of wearable displays. Researchers are looking into new ways of converting fabrics for many purposes ranging from information display to a medium of expression. Fabric displays are generally categorized as emissive and non-emissive displays. Emissive displays include a range of displays that embed lighting material including LEDs, electro-luminescent wires and sheets, etc. These displays, are less popular as a daily item of clothing as they draw too much attention, are obtrusive and distracting. Usually such displays are used for more specific functionalities or purposes such as advertising.

Due to such limitations of emissive clothing, researchers have focused on non-emissive technologies for displays. Fabcell [Shibutani and Wakita 2006], uses liquid crystal inks as a multicolor non emissive fabric display with conductive yarn as the source of heat to actuate the color change. Liquid crystals are able to display a range of colors. Thermochromic inks have also been used for non-emissive fabric displays. They have the advantage of being robust and washable. However, thermochromic inks provide single color change, which allows it to only reveal an image or a color by heating. Such displays have typically used conductive yarn as the source of heat for actuation. Without any cooling technology for thermally actuated color change, these fabric displays are unidirectional with slow color change, as there is no way to actuate them back to the original color. Therefore the disadvantage is that animations or fast color change is impossible on these thermochromic fabric displays.

Overcoming these limitations such as the unsuitability of emissive displays in more social and home environments, or the non-robustness, slow and one directional change of current non-emissive displays, we thrive to innovate a novel concept of non-emissive fabric display technology which is robust for wear, can display impressive subtle animations with high speed control of

color change, and enable more interactive scenarios through fashion.

2 System Description

AmbiKraf uses thermochromic ink as the color changing agent. A novel fabric consisting of light weight and small semiconductor Peltier junctions intertwined into it is used for temperature actuating. Each Peltier junction provides heating and cooling, thus enabling bidirectional accurate and robust control. With the use of a tuned control circuit, a matrix of such Peltier modules are controlled in the cloth. We use thermochromic inks with optimized color actuation temperatures to suit the wearers comfort and the speed of color change. Different thermochromic inks are mixed and combined with textile binder and screen printed on to the fabric thus enabling easy implementation and robustness of the display allowing wearability and washing. These two customized technologies together present us the fast and accurate control of a multicolor display thus presenting the capability of animated sequences as a breakthrough in non-emissive display technologies.

3 User Experience

From simple calming animated displays, we demonstrate AmbiKraf's usage in novel interaction-based scenarios that enable bidirectional display based multimodal communication. To demonstrate, the users can experience bidirectional interaction as they send and receive color actuated interactive messages by wearing the clothes. In addition they can experience different color animations in their clothes as they move closer or further away from each other. Through these scenarios visitors can explore this novel technology as a personal and emotional experience.

4 Conclusion

AmbiKraf is a multicolor non-emissive fabric display that is robust, fast, and accurate that presents novel animated and interactive fabrics. This paves the way to new concepts and applications in the field of wearable media. By embedding such technology in a true wearable form, we envision it to revolutionize the society through new forms of interactive and communicative wearable.

References

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