Shade Pixel

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1. Introduction

As a result of the rapid increase in the number of information sources, humans interact with numerous visual displays every day. However, the excessive use of traditional light emissive displays leads to unwanted visual noise. Therefore, intended or not, people are exposed to visual noise in their everyday environments. Ambient displays are one form of solution to mitigate this problem. Ambient displays embedded in everyday objects or in the environment deliver peripheral information in subtle ways that do not divert the focus of users’ attention. On the other hand, designers are concentrating on developing displays that provide new and enjoyable user experiences. Their approaches include aesthetics in data visualization, the exploration of interesting materials and movement of physical pixels in ways that are not considered in typical displays. Physical displays or materialized pixels, such as mechanical mirrors [Rozin 2007], as well as those known as Eavesdripping [Pohflepp 2005], the PingPongPixel [Breejen et al. 2005] are good examples.

2. Design concept

Shade Pixel is a type of physical display that uses deformable skin to represent information such as alphabets, numbers or images (Figure 1). Shade Pixel, just as the name implies, uses shade to visualize information in a manner similar to Cuneiform or Sunken-relief. This evokes primitive naturalness and provides sensorial and hence emotional comfort to users. In addition, its non-luminescent nature and simple appearance reduces unnecessary visual noise, especially when it is not in use.

The main difference from other physical displays is that Shade Pixel can be applicable to the surfaces of everyday products or to the environment as an informative skin. Most examples of the physical displays stated above have a heavy volume or use inappropriate materials with a complicated structure. Thus, their usage is limited to the installation itself. However, Shade Pixel is relatively thin and its structure is applicable for curved surfaces as well as plane surfaces. Moreover, its skin is detachable and can be replaced according to different user preferences. Therefore, Shade Pixel can be embedded into the surfaces of everyday products such as home appliances, furniture, or other aspects of the everyday environment as an ambient display.

3. Implementation

The Shade Pixel prototype is a 7 × 11 pixel screen that consists of two main parts. First, a skeleton is made up of a matrix of 77 solenoids and a frame with 77 holes. The shape and arrangement of the pixels vary according to the shape and arrangement of the holes. Secondly, a skin covers the frame. For the skin, Spandex, whose exceptional elasticity is proper to achieve deformable skin, was used. In addition, the skin includes magnets that attach the fabric to the solenoid cores. The skin is detachable from the frame; thus, users can replace the skin according to their preferences of requirements. Figure 2 shows a schematic diagram of Shade Pixel. An iron core pulls the fabric to make a concave surface, which creates shade.

![Figure 2: Schematic diagram of Shade Pixel](image)

4. Conclusions

The components and the mechanism behind Shade Pixel are not new apart from the adoption of an elastic fabric for its cover. However, its intriguing approach for displaying pixels with the shade generated by simple skin-like fabric makes Shade Pixel special. It is expected that Shade Pixel will become an ambient display in the form of an informative skin of everyday products or environment. For this, the current prototype requires technical improvement in terms of its thickness. The present thickness of the prototype is approximately 45mm; however, if small-sized electromagnets or piezo actuators are used instead of solenoids, it will be possible to reduce the size and thickness significantly.

In future versions of Shade Pixel, we plan to explore various applications of this technology. One example is a display with an organic shape, of a type that is at present difficult to consider in traditional displays or physical displays. A combination with a printed or projected image on the skin is also possible. A mixture of a static image and dynamic shade pixels will generate an interesting effect. In addition, a tactile display with a dynamic concave surface is another possible application of Shade Pixel.

References