

Design Principals for Energy-Aware User-Interfaces on OLED-based handhelds.

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Abstract:

One of the important considerations in the design of future mobile devices is likely to be their power consumption. Our research has proposed the notion of energy-aware user interfaces that leverage new and disruptive screen technologies for energy adaptivity. This poster summarizes rule-of-thumb design principles that can guide future designs.

Keywords: OLED, Design Principles, Design

1 Introduction

The increased proliferation of mobile devices with the handheld form factor has led to their rapidly becoming one of the key markets of interest for computing systems. Since the batteries on these mobile systems are typically limited in capacity, reducing the energy consumption is one of the key challenges in designing mobile systems. Among the various components that contribute to the consumption of electrical energy, the display sub-system plays an important role. New, display technologies, such as Organic Light Emitting Diodes (OLEDs) [3], are becoming available that allow lower power consumption when a reduced area of the screen is in use. Such designs have been shown to have significant energy savings (up to a factor of 10) for longer battery life in laptops [2]. Recently we reported a user evaluation of handheld (iPAQ) screens that were designed to capitalise on the energy saving capabilities of OLEDs [1]. This poster aims to inform the design community about a disruptive new technology, its accompanying design principles against a background of early and formal user feedback.

The power consumption of an OLED display is the sum of the controller power, the driver power, and the display panel power. Of these, the display panel

power is the dominant component. This can be further broken down as the total of power consumed by each component colour for each pixel in the panel array. We developed the following simple rules for the design of energy-aware display screens: [1] *The on/off rule*: turn pixels off when not in use – this reduces the pixel power from 100% (white) to 0% (black, see bottom bar in figure 1.); [2] *the brightness rule*: dim pixels that are not in use. The reduction in power is based on a non-linear function because of gamma correction. Note that this means that rather than turning off 50% of the pixels, dimming all the pixels by 50% gets better energy benefits (top left figure 1); [3] *the colour rule*: Using primary colours such as red, green, or blue reduces pixel power compared to secondary colours. Among primary colours, for the specific version of the OLED technology we considered, green consumes least power.

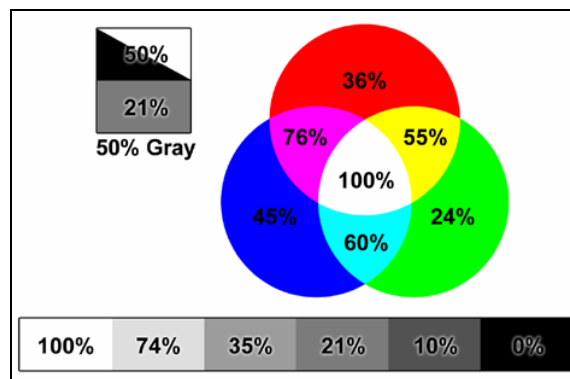


Fig. 1. Power consumption as a function of colour and grey-scales.

The poster shows how we applied these rules to a range of designs and describes how they reduce power consumption.

References:

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