Reducing Power Consumption of LED Screens by Backlight Dimming

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Motivation

As the world community becomes increasingly aware of the repercussions of the increased CO_2 emissions, the need to tackle this dilemma on all levels of development is apparent.

In modern televisions the picture is often produced by a RGB pixel plane, producing the colors and a white light plane (LED plane) producing the backlight needed to illuminate the color plane. The idea is, through smart algorithms, to decrease the need for unnecessarily high backlight for dark areas of an image, and thus gain increased power savings. This in turn results in an extended bonus by improved contrast between light and dark.

"*Advanced backlighting technology using LED-based light sources and segmented control can create a vibrant viewing experience, while also significantly reducing power consumption in LCD TVs by as much as 80%*".[1]

Theory

Backlight dimming can be categorized into dimensions, with each dimension reflecting the complexity of the algorithm used, from 0d to 2d.
- **0d**: dimming of the entire backlight uniform across the display
- **1d**: dimming across a single axis.
- **2d**: dimming done across two axis (horizontal and vertical) is classified as 2d

Within this definition there is a sub-definition referred to as 1.5d dimming technique. This type of dimming is relevant when working on hardware with the LED backlights positioned at the edge of the main screen and not behind the pixel plane. 1.5d allows for the LEDs on either side of an edge in a single axis to be controlled individually, increasing the controllable dimming zones.
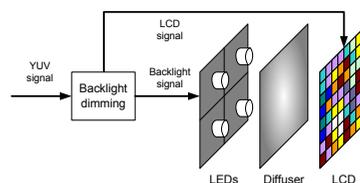

Figure 1: Depiction of physical backlight representation

Hardware

The hardware used during the project is a B&O television with its 16 LED backlights, positioned on each vertical side (8 on each side) pointing at the centre. To measure the power usage a power meter is used.

Goal

During the project I set out to prove that implementing 0d and 1.5d dimming techniques decrease the end power consumptions, as a prove of concept.

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[1] de Greef, P., Groot Hulze, H., & van der Heijden, H. (2.29-2008.). *eetimes.com*. Retrieved 30.04-2014 from http://www.eetimes.com/document.asp?doc_id=1273804