

## Accepted Manuscript

Fully automated OLED display power modeling for mobile devices

Yonghun Choi, Rhan Ha, Hojung Cha

PII: S1574-1192(18)30258-X  
DOI: <https://doi.org/10.1016/j.pmcj.2018.07.006>  
Reference: PMCJ 956

To appear in: *Pervasive and Mobile Computing*

Received date: 1 May 2018  
Revised date: 21 June 2018  
Accepted date: 21 July 2018

Please cite this article as: Fully automated OLED display power modeling for mobile devices, *Pervasive and Mobile Computing* (2018), <https://doi.org/10.1016/j.pmcj.2018.07.006>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.





Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Pervasive and Mobile Computing

journal homepage: [www.elsevier.com/locate/pmc](http://www.elsevier.com/locate/pmc)



### Fully automated OLED display power modeling for mobile devices

Yonghun Choi<sup>†</sup>, Rhan Ha<sup>‡</sup>, and Hojung Cha<sup>†1</sup>

<sup>†</sup> Department of Computer Science, Yonsei University, Seoul, Republic of Korea

<sup>‡</sup> Department of Computer Engineering, Hongik University, Seoul, Republic of Korea

#### ARTICLE INFO

*Article history:*  
Submitted

*Keywords:*  
OLED display  
Automated modeling  
Power estimation  
Supervised learning  
Support Vector Regression

#### ABSTRACT

The power consumption of an OLED ([Organic Light-Emitting Diode](#)) display depends on the color distribution of the image contents. Previous studies predicted OLED display power using a pixel color-based linear model. In recent mobile devices, however, the relationship between a color and its power consumption has become complicated, due to the various options for display settings in the device and to device diversity. This makes it hard to predict the power consumption of a display accurately with the conventional linear model. In this paper, we propose a technique to automatically generate an OLED display power model optimized for a specific target device, as well as for each display mode, thus generating an accurate power model effectively. The technique automatically learns the power model through the RGB value of each pixel and its power consumption using Support Vector Regression (SVR)-based supervised learning. We evaluated the power models for recent smartphone models, and the results show that, on average, the accuracy of the pixel modeling is about 99% for the device models and display modes used in the experiment. Furthermore, the power consumption for real images is estimated with an accuracy of about 95%, on average.

#### 1. Introduction

The display accounts for a large portion of the power consumption of mobile devices. Unlike LCDs ([Liquid Crystal Displays](#)), where power consumption is proportional to the brightness of the backlight, the power consumption of an OLED display depends on what color combination is displayed. Most previous studies estimated the power consumption of a pixel using a linear model, based on the relationship between the RGB ([Red, Green, and Blue](#)) value of the color and its power consumption. The power consumption of the entire display is then acquired as a

<sup>1</sup> Corresponding author. Tel.: +82 2 2123 5711.

E-mail addresses: [hjcha@yonsei.ac.kr](mailto:hjcha@yonsei.ac.kr) (H. Cha), [cyh0967@yonsei.ac.kr](mailto:cyh0967@yonsei.ac.kr) (Y. Choi), [rhanha@hongik.ac.kr](mailto:rhanha@hongik.ac.kr) (R. Ha).

Download English Version:

<https://daneshyari.com/en/article/6888583>

Download Persian Version:

<https://daneshyari.com/article/6888583>

[Daneshyari.com](https://daneshyari.com)