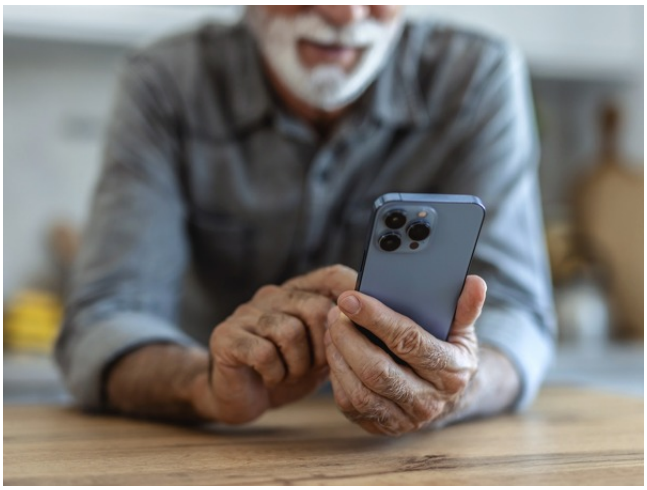
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Automatic Power Model Generation and Power Estimation for Smartphones

TECHNOLOGY NUMBER: 5035



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Category
Software
MOSS - Michigan Open Source Support

Inventor
Lei Yang
Z Mao
Zhiyun Qian
Zhaoguang Wang
Robert Dick
Birjodh Tiwana
Lide Zhang

Further information
Ashwathi Iyer
ashwathi@umich.edu

View online page

OVERVIEW

Automates smartphone power model creation using battery sensors and activity state control

- Eliminates external equipment—enabling rapid, device-specific power model generation
- Smartphone development, software energy profiling, power-efficient app design, device testing

BACKGROUND

Historically, understanding and managing smartphone power consumption has relied on manual measurement setups, including external hardware to monitor current and voltage. This traditional approach is expensive, time-consuming, and inaccessible for many developers and end-users, especially given the continual release of new device variants with differing hardware characteristics and battery behaviors. As each device exhibits unique power profiles, generalized or outdated power models frequently produce inaccurate estimations, hindering effective optimization of software for energy efficiency. The increasing complexity of embedded systems—combined with a growing demand for energy-efficient mobile applications—highlights the need for accurate, device-specific power modeling that is both easy and practical for widespread use. Without such methods, efforts to enhance battery life, evaluate software power impacts, or perform device-specific diagnostics remain limited or imprecise.

INNOVATION

This invention introduces an automated method utilizing built-in battery voltage sensors and comprehensive control over component activity states to generate accurate, device-specific power models. By analyzing battery discharge patterns while controlling system components, the method circumvents the need for specialized external measurement tools. This significantly lowers the barrier for developers and end-users to create precise power models tailored to new smartphone variants. Additionally, the PowerTutor tool leverages these models for real-time, component-level online power estimation, providing actionable insights for optimizing software and hardware energy efficiency. This dual innovation not only streamlines power profiling across diverse devices but also empowers application and embedded system developers to design, select, and test power-efficient solutions, resulting in broader adoption of energy-aware practices in the mobile ecosystem. Real-world applications include smartphone energy profiling, software optimization, and device certification testing.

ADDITIONAL INFORMATION

PROJECT LINKS:

DEPARTMENT/LAB:

- Robert Dick, Electrical and Computer Engineering (EECS)

LICENSE: