9 REFERENCES

9.1 RELEVANT PUBLISHED PAPERS

[1] Cosmin Cernazanu, **Marius Marcu**, Anomaly Detection Using Power Signature of Consumer Electrical Devices, Advances in Electrical and Computer Engineering Journal, 15 (1), pp. 89-94, 2015, ISSN: 1582-7445, IF2015: 0.529

[2] Cosmin Cernazanu, **Marius Marcu**, Alexandru Amaricai, Stefan Fedeac, Madalin Ghenea, Zheng Wang, Anupam Chattopadhyay, Jan Weinstock, Rainer Leupers, Direct FPGA-based Power Profiling for a RISC Processor, IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2015), Mai 2015, Pisa, Italia

[3] Stefan Fedeac, **Marius Marcu**, Cosmin Cernazanu, Alexandru Amaricai, Energy Profiling of FPGA Designs, 2014 IEEE Symposium on Robotic and Sensors Environments (ROSE2014), Oct. 2014, Timisoara, Romania

[4] **Marius Marcu**, Power–thermal profiling of software applications, Microelectronics Journal, 42 (4), pp.601-608, Apr. 2011, ISSN 0026-2692, IF2015: 0.836

[5] **Marius Marcu**, Dacian Tudor, Energy Consumption Model for Mobile Wireless Communication, Proceedings of the 9th ACM international symposium on Mobility management and wireless access (MobiWac 2011), pp.91-94, Oct. 2011, Miami, Florida, ISBN: 978-1-4503-0901-1

[6] **Marius Marcu**, Dacian Tudor, Power Consumption Measurements of Virtual Machines, Proceedings of the 6th IEEE International Symposium on Applied Computational Intelligence and Informatics (SACI 2011), pp.445-449, May 2011, Timisoara, Romania, Print ISBN: 978-1-4244-9108-7

[7] **Marcu Marius**, Tudor Dacian, Moldovan Horatiu, Fuicu Sebastian, Popa Mircea, Energy Characterization of Mobile Devices and Applications Using Power-Thermal Benchmarks, Microelectronics Journal, 40 (7), pp.1141-1153, Jul. 2009, ISSN 0026-2692, IF2015: 0.836

[8] Tudor Dacian, **Marcu Marius**, Designing a Power Efficiency Framework for Battery Powered Systems, Proceedings of Israeli Experimental Systems Conference (SYSTOR 2009), pp.1-8, May 2009, Haifa, Israel, ISBN 978-1-60558-623-6

[9] **Marius Marcu**, Dacian Tudor, Sebastian Fuicu, Horatiu Moldovan, and Voicu Groza, A View on Mobile Terminal Power Efficiency of Wireless Communication, Proceedings of the 25th IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2008), pp.382-387, May. 2008, Victoria, Vancouver Island, Canada, ISBN 978-1-4244-1540-3

[10] **Marius Marcu**, Mircea Vladutiu, Horatiu Moldovan, Mircea Popa, Thermal Benchmark and Power Benchmark Software, Proceedings of the 12th IEEE International Workshops on THERMal Investigations of ICs and Systems (THERMINIC 2006), pp.203-208, Sep. 2006, Nice, France, ISBN 2-916187-0409

Record 1 of 1

Title: Anomaly Detection Using Power Signature of Consumer Electrical Devices

Author(s): Cernazanu-Glavan, C; Marcu, M

Source: ADVANCES IN ELECTRICAL AND COMPUTER ENGINEERING **Volume:** 15 **Issue:** 1 **Pages:** 89-94 **DOI:** 10.4316/AECE.2015.01013 **Published:** 2015

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Abstract: The use of the smart grid for developing intelligent applications is a current trend of great importance. One advantage lies in the possibility of direct monitoring of all devices connected to the electrical network in order to prevent possible malfunctions. Therefore, this paper proposes a method for an automatic detection of the malfunctioning of low-intelligence consumer electrical devices. Malfunctioning means any deviation of a household device from its normal operating schedule. The method is based on a comparison technique, consisting in the correlation between the current power signature of a device and an ideal signature (the standard signature provided by the manufacturer). The first step of this method is to achieve a simplified form of power signature which keeps all the original features. Further, the signal is segmented based on the data provided by an event detection algorithm (values of the first derivatives) and each resulting component is approximated using a regression function. The final step consists of an analysis based on the correlation between the computed regression coefficients and the coefficients of the standard signal. Following this analysis all the differences are classified as a malfunctioning of the analyzed device.

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Language: English

Document Type: Article

Author Keywords: Feature extraction; Pattern matching; Signal analysis; Signal processing

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Publisher Address: UNIV SUCEAVA, FAC ELECTRICAL ENG, STEFAN CEL MARE, UNIVERSITATII 13, SUCEAVA, 720229, ROMANIA

Web of Science Categories: Computer Science, Artificial Intelligence; Engineering, Electrical & Electronic

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Direct FPGA-based power profiling for a RISC processor

9 Author(s)

Cernazanu-Glavan, C. ; Comput. & Software Eng., Politeh. Univ. of Timisoara, Timisoara, Romania ; Marcu, M. ; Amaricai, A. ; Fedeac, S.
more authors

This paper investigates the possibility of creating an energy profile of a RISC processor instruction set in the prototyping phase, using FPGA implementation and physical measurements. In order to determine the power consumption at instruction-level, several programs have been developed and run on the processor implementation on FPGA. The experiments have focused at the following groups of instructions: arithmetic and logic (ALU) instructions, memory access instructions, control instructions, compare and move instructions. The main goal of our work is the investigation of the correlation between dynamic power consumption of a RISC processor design implemented in different technologies (FPGA vs. ASIC) and manufacturing processes, called power technology gap. The achieved correlation coefficient between the FPGA 45nm physical power measurements and ASIC 45nm power estimation is 86.39%.

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Pisa

DOI:
10.1109/I2MTC.2015.7151514

Publisher:
IEEE

Record 1 of 1

Title: Energy Profiling of FPGA Designs

Author(s): Cernazanu-Glavan, C; Fedeac, S; Amaricai-Boncalo, A; Marcu, M

Book Group Author(s): IEEE

Source: 2014 IEEE INTERNATIONAL SYMPOSIUM ON ROBOTIC AND SENSORS ENVIRONMENTS (ROSE 2014) **Published:** 2014

Cited Reference Count: 14

Abstract: This paper investigates the possibility of energy profiling for FPGA based designs by means of direct board based measurement. We aim to determine how different design parameters and FPGA components usage affect the overall power and energy consumption of the device. The power and energy measurements have been performed on a Digilent Atlys board with Xilinx Spartan-6 device. We have varied the following parameters: the usage of slice-based resources, the usage of DSP block, the usage of BRAM memory modules and the clock frequency. Our goal is represented by the development of an accurate energy profiling methodology which will enable to estimate the power consumption of FPGA designs.

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Language: English

Document Type: Proceedings Paper

Conference Title: 12th IEEE International Symposium on Robotic and Sensors Environments (ROSE)

Conference Date: OCT 16-18, 2014

Conference Location: Politehnica Univ Timisoara, Timisoara, ROMANIA

Conference Sponsors: Inst Elect & Elect Engineers, IEEE Instrumentat & Measurement Soc, Movidius, Robcon TM SRL

Conference Host: Politehnica Univ Timisoara

Author Keywords: energy profiling; FPGA design; embedded systems; power consumption

KeyWords Plus: POWER-CONSUMPTION

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Reprint Address: Cernazanu-Glavan, C (reprint author), Politehn Univ Timisoara, Comp & Software Engn, Timisoara, Romania.

Publisher: IEEE

Publisher Address: 345 E 47TH ST, NEW YORK, NY 10017 USA

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Record 1 of 1

Title: Power-thermal profiling of software applications

Author(s): Marcu, M

Source: MICROELECTRONICS JOURNAL **Volume:** 42 **Issue:** 4 **Special Issue:** SI **Pages:** 601-608 **DOI:** 10.1016/j.mejo.2010.09.012 **Published:** APR 2011

Cited Reference Count: 25

Abstract: Power consumption and heat dissipation are becoming the major factors that limit the performance evolution of current state-of-the-art microprocessors. As they become key elements in the design of both high performance computers and battery powered devices, different power and thermal management strategies have been proposed and implemented during the last years in order to overcome this performance limitation. Considering that software applications have a large impact on power consumption and thermal map of the CPU cores, these design strategies tend to be addressed at higher levels even as they are usually implemented at lower levels of systems abstraction. The work presented in this paper evaluates the relation between power consumption and thermal response of CPU cores when different software applications are executed. The goal of this study is to identify how software applications can be used in thermal management process and whether it is feasible to implement thermal-aware software applications. (C) 2010 Elsevier Ltd. All rights reserved.

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Document Type: Article

Author Keywords: Power profiles; Thermal profiles; Thermal management; Energy efficiency

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Publisher: ELSEVIER SCI LTD

Publisher Address: THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

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Record 1 of 1

Title: Energy Consumption Model for Mobile Wireless Communication

Author(s): Marcu, M; Tudor, D

Book Group Author(s): ACM

Source: MOBIWAC 11: PROCEEDINGS OF THE NINTH ACM INTERNATIONAL SYMPOSIUM ON MOBILITY MANAGEMENT AND WIRELESS ACCESS **Book Series:** ACM International Symposium on Mobility Management and Wireless Access **Pages:** 191-194 **Published:** 2011

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Abstract: Mobile wireless devices continue their fast seizure of our daily lives as they become smarter, powerful and faster. However, the new features built in these devices come with an increase of resources usage and energy consumption. Therefore, prolonging the battery lifetime of mobile devices was one of the main research topics in mobile computing for the last decade. The main goal of our work is to find specific models for application level estimation of energy consumption in order to build energy aware mobile applications. In this paper, we propose a general model based on decomposition of the whole system in hardware and software components that can be monitored and evaluated separately. Next we try to personalize this model for energy consumption of mobile wireless communication. The proposed model is based on monitoring components' measurable parameters and computing component specific efficiency metrics. Based on this model and the associated metrics we intend to propose and build a software framework for power-aware applications support.

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Language: English

Document Type: Proceedings Paper

Conference Title: 9th ACM International Symposium on Mobility Management and Wireless Access

Conference Date: OCT 31-NOV 04, 2011

Conference Location: Miami, FL

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Author Keywords: Energy-efficiency; wireless communications; mobile applications; energy-aware

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Marcu, Marius	C-3914-2011	

Publisher: ASSOC COMPUTING MACHINERY

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Research Areas: Computer Science

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Power consumption measurements of virtual machines

2 Author(s)

Marcu, M. ; Comput. Dept., Politeh. Univ. of Timisoara, Timisoara, Romania ; Tudor, D.

The environment sustainability is one of the main directions of intervention for all developed countries. Solutions for alternative energies generation and energy reduction are already discussed. Furthermore, energy efficiency has become an important aspect in data centers and large server systems. Virtualization is one of the main research directions for both large scale data centers and servers. This paper explores how virtualization solutions influence the power consumption of physical systems they are implemented on and which is the most effective way to test and measure the energy efficiency of these solutions. In our tests we used two physical machines (one laptop and one desktop), both running Windows and Linux operating systems and we selected the VMWare virtualization solution.

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Record 1 of 1

Title: Energy characterization of mobile devices and applications using power-thermal benchmarks

Author(s): Marcu, M; Tudor, D; Moldovan, H; Fuicu, S; Popa, M

Source: MICROELECTRONICS JOURNAL **Volume:** 40 **Issue:** 7 **Pages:** 1141-1153 **DOI:** 10.1016/j.mejo.2008.05.001 **Published:** JUL 2009

Abstract: Power consumption and heat dissipation are the major factors that limit the performance and mobility of battery-powered devices. As they become key elements in the design of mobile devices and their applications, different power and thermal management strategies have been proposed and implemented during the previous years in order to overcome the mobility limitation due to the battery lifetime. A new energy management approach is to build energy-aware applications so that we have knowledge on the consumed energy while the device is running. In this paper we define two new types of benchmarks, called power and thermal benchmark, which are software applications intended for the run-time system level to provide power and thermal characterization. These benchmarks are an easy way for the applications to adapt their execution pattern, in order to finish their tasks both in time and in the battery lifetime. (C) 2008 Elsevier Ltd. All rights reserved.

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Document Type: Article
Author Keywords: Energy characterization; Power management; Thermal management; Power benchmark; Thermal benchmark

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Tudor, Dacian	C-4967-2011	
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Designing a power efficiency framework for battery powered systems

Authors: Dacian Tudor Politehnica University of Timisoara, Timisoara, Romania
Marius Marcu Politehnica University of Timisoara, Timisoara, Romania

2009 Article

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SYSTOR '09 Proceedings of SYSTOR 2009: The Israeli Experimental Systems Conference
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The continuous expansion of modern battery powered devices with complex and resource hungry feature sets have shown that battery life time does not scale according to their evolution. The problem of supporting extended battery life time has been drawing a lot of attention in recent years, especially for mobile communication systems. Besides the advances in power efficiency for hardware components, another emerging dimension has been opened by energy-aware software components. In this paper we briefly survey some of the most recent directions in supporting power efficiency for battery powered devices. In order to promote power-aware application, we propose an open power efficiency framework which addresses some of the shortcomings of existing approaches towards power aware software. We describe both generic and specific concepts of the proposed framework together with a new evaluation dimension at both lower and higher layers. Last but not least, we define the architecture of the framework which we aim to realize and evaluate through several battery powered mobile systems.

Record 1 of 1

Title: A View on Mobile Terminal Power Efficiency of Wireless Communication

Author(s): Marcu, M; Tudor, D; Fuicu, S; Moldovan, H; Groza, V

Book Group Author(s): IEEE

Source: 2008 IEEE INSTRUMENTATION AND MEASUREMENT TECHNOLOGY CONFERENCE, VOLS 1-5 **Book Series:** IEEE INSTRUMENTATION & MEASUREMENT TECHNOLOGY CONFERENCE, PROCEEDINGS **Pages:** 382-387 **DOI:** 10.1109/IMTC.2008.4547065 **Published:** 2008

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Abstract: The evolution of portable and mobile computation systems towards an increased feature set and increasing hardware and software requirements demand, together with the significant increase of market penetration in our modern society, is raising complex problems from a reasonable energy consumption level point of view under different usage scenarios. The multitude and complexity of components that implement a large spectrum of communication protocols on these devices requires closer evaluation and understanding in respect to power efficiency. As there is very little analysis on the relationship between wireless specific components and their power profile in the context of mobile wireless communication we investigate the landscape of wireless communication efficiency methods. Next we apply power efficiency metrics on different wireless systems and analyze the experimental data we obtained through a monitoring application Evaluation scenarios start with different wireless communication systems (WLAN, Bluetooth GSM) and then analyze power consumption and efficiency in several scenarios on the WLAN communication system.

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Document Type: Proceedings Paper

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Author Keywords: power consumption; energy efficiency; mobile applications; wireless communication

KeyWords Plus: ENERGY; DESIGN

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Marcu, Marius	C-3914-2011	

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Thermal Benchmark and Power Benchmark Software

M. Marcu, M. Vladutiu, H. Moldovan, M. Popa

Submitted on 12 Sep 2007)

Power consumption and heat dissipation become key elements in the field of high-end integrated circuits, especially thc transistor count and clock frequencies. Dynamic thermal management strategies have been proposed and implemented that can be used to evaluate DTM strategies and thermal response of real life systems. Therefore, in this paper we intrc benchmark software as a software application for run-time system level thermal and power characterization

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