CECS GUEST LECTURE

Passive Supply Voltage and Frequency Scaling (PVS)

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Abstract

Batteries are typical energy sources of portable systems, but their output voltage does not often exactly fit to the supply voltage of microprocessors. The battery output voltage is a strong function of its state of charge, and thus it continuously drops as it discharges. Therefore, a microprocessor is generally powered by a regulated DC source, but the regulation process generally results in significant energy loss.

This talk introduces a new supply voltage scaling namely PVS (passive voltage scaling) that eliminates the use of a DC-DC converter, but the battery is directly connected to a microprocessor. PVS monitors the battery voltage drop as discharge progresses (50% in alkaline batteries) and scales down the clock frequency accordingly for a reliable operation. Opposite to DVS (dynamic voltage scaling), PVS does not achieve the optimal energy consumption of the microprocessor, but aims at the system-wide power optimization minimizing the loss of the voltage regulator, peripherals and battery, which achieves the ultimate longer operational lifetime. We positively utilize the continuously decreasing throughput characteristic of a PVS-enabled sensor node by the battery state of charge loss and we achieve energy awareness with a traditional performance-driven routing.

Biography

Naehyuck Chang received BS, MS and PhD degrees all from Dept. of Control and Instrumentation, Seoul National University, in 1989, 1992 and 1996, respectively. He has been with the department of EECS at Seoul National University since 1997 and currently is an associate professor. He served as a visiting professor at Arizona State University in 2005. He has been with Sindoricoh, Co. Ltd. as a Technical Advisor since 2001. His research interest is focused to embedded systems and low-power systems, and proposed several new system-level low-power design areas including LCD backlight luminance scaling, cycle-accurate energy measurement of embedded systems, dynamic voltage scaling aware of a DC-DC converter and memory, bus encodings for high-performance memory buses, and charge management of portable fuel cells.

He served and serves as Technical Program Committee of ACM SIGDA and IEEE Circuits and Systems Society major conferences and symposiums that cover low-power design, including DAC, ICCAD and ISLPED. He is the chair of ACM Low-Power Technical Committee (LPTC). He also serves as Committee Member of ACM SIGDA PhD Forum, ACM/IEEE ASP-DAC Student Forum, and SIGDA Graduate Scholarship.

Thursday, December 20th, 2007
Refreshments at 1:30pm, Lecture begins at 2:00pm
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