

My research is focus on the power/energy implications on GPU embedded Raspberry Pi B+ board.

The Raspberry pi B+ is having a GPU on board. The GPU model is Broadcom BCM2835. It can support 1080p30 H.264 high-profile decode. So for this research it is quite ideal and cheap.

Desrochers and Paradis and Weaver [1] wrote in his paper that for integrated GPU, is having no way to intercept the input voltage. So they introduced SmallGPU2 as an OpenCL ray-tracer. I decide to use this benchmark to test the GPU performance on the board, because I am having this paper's results as a comparison.

GPU is kind of new for study of the energy consuming, even it is using nearly the same energy as CPU. But I think more effort should be put on the study on GPU, for its multi-core structure can be easily saving a lot of power.

Abe Sasaki Peres Inoue Murakami and Kato [2] analysis that system energy can be reduced 28% with decreasing 1% performance by modifying the GPU, and it is trivial for CPU modifying for energy reduction.

Y. Jiao, H. Lin, P. Balaji, W. Feng [3] has investigate that energy saving mechanisms on GPU is totally different from CPU. They has used three different applications with various degrees of compute and memory intensiveness. They have done similar work. I would be using their work as comparison.

[1]S. Desrochers and C. Paradis and V. Weaver. "The first benchmark we look at is SmallptGPU2, an OpenCL ray-tracer." MEMSYS chapter III F section, p 4, 2016.

[2]Y. Abe H. Sasaki M. Peres K Inoue K. Murakami and S. Kato. "Our analysis on a real system discloses that system energy can be reduced by 28% retaining a decrease in performance within 1% by controlling the voltage and frequency levels of GPUs. We show that energy savings can be achieved when GPU core and memory clock frequencies are appropriately scaled considering the workload characteristics. Another interesting finding is that voltage and frequency scaling of CPUs is trivial for total system energy reduction, and even should not be applied in state-of-the-art GPU-accelerated systems." Usenix abstract 2012.

[3] Y. Jiao, H. Lin, P. Balaji, W. Feng "In this paper, we systematically characterize the power and energy efficiency of GPU computing. Specifically, using three different applications with various degrees of compute and memory intensiveness, we investigate the correlation between power consumption and different computational patterns under various voltage and frequency levels. Our study revealed that energy saving mechanisms on GPUs behave considerably different than CPUs." Green Computing and Communications (GreenCom), 2010 IEEE/ACM Int'l Conference on & Int'l Conference on Cyber, Physical and Social Computing (CPSCom) Abstract 18-20 Dec. 2010