1 Summary

Mobile CPU's rise to power: Quantifying the impact of generational mobile CPU design trends on performance, energy, and user satisfaction (2016): The authors quantify the performance, power, energy, and user satisfaction trends across mobile CPU designs released between 2009 and 2015, which cover 7 generations of CPU technology and 8 different architectures. Their crowdsourcing-based user study spans more than 25,000 participants using Amazon's Mechanical Turk service. They observed that user satisfaction improves with both single and multithreaded performance improvement, both still have room for improvement for next-generation applications, and that the CPU capability remains critical for high end-user satisfaction even for applications that utilize other system-on-chip components. They also examine the limits of mobile CPUs following a desktop-like CPU scaling due to very strict physical constraints not seen for desktops, asserting that mobile CPU designs should look for optimizations in fundamentally different ways than previous generations in order to keep up with future mobile compute demands. The potential result is a change of the mobile CPUs role in the system.

2 Strengths

- Figures 2-5 in Section 2 are great visual representations of the discussion on generational mobile CPU trends in terms of performance, power, and energy; they make the impact of newer microarchitectures on performance and energy more evident, like how the performance improvement between A8 and A9 can be attributed to the transition to out-of-order pipelines, or how these designs are trending towards a "power wall" for mobile as energy consumption hovers around 1.5 W.

- The wide range of mobile apps they included in their survey (Angry Bird, Epic Citadel, Photoshop, Facebook, Particles, etc.) is a good sweep of applications that could benefit from the different computational resources provided by microarchitectures they looked at. This helps support their conclusions that user-satisfaction correlates with latency sensitivity and improved with designs that positively impacted responsiveness, such as out-of-order pipelines and multicores.

3 Weaknesses

- The study primarily focuses on Android/Samsung phones; while Android is more significantly used around the world and Samsung had a lion's share of the smartphone market in the mid-2010s, Apple/iOS phones and others (Nokia, LG, Huawei, etc.) were not insignificant. If it is feasible, it would also be interesting to see how the technology trends impacted design decisions for other manufacturers, as well, and even show the relationship between end-user experience and how ARM came to dominate the mobile computing space.

4 Rating: 3

5 Comments

The paper makes an interesting point in the need to contextualize the mobile development space in terms of mobile CPU trends and influences by end-users, especially given how "young" the technology is. They assert their "first-of-its-kind", large-scale survey takes into account user experience to inform future CPU designs; UX is usually used to gauge things like usability and marketability of particular softwares/applications running on these devices. While their data and observations are convincing, they also could have made the same conclusions about mobile CPU development without the insights from the user experience surveys. Compared to desktops, PCs, supercomputers, data center infrastructures, etc. mobile computing doesn't compare, but development to improve its performance is likely to continue, probably in a manner that the authors recommend diverge from desktop-like scaling. Based on their discussion in Section 4 about the limits of following trends for desktop (the differing thermal and energy constraints and CPU usage), information and data prior to the surveys could have been used to make arguments about the feasibility or infeasibility of the design trend of the time.