

A New Golden Age for Computer Architecture

This paper goes into review the history of computer architecture including instruction set development, assessing both successes and failures. It then discusses the current state of processors and how Moore's law has declined due to the change in Dennard scaling leading to a need for architectural improvements besides increasing the transistors count including different methods of parallelism, branch prediction, and domain specific architectures. Another key point made was about the need for security, with Spectre and Meltdown pointing out flaws in processor architecture at the time. It further discusses the current direction of domain specific languages and architectures as well as highlights the importance of open source and agile development with RISC V and using FPGAs along with modern design tools, making new computer architecture development quicker and more iterative. This paper is more of a summary of the current state of computer architecture, which is why we don't see any experiments being run, however, I think it could have benefitted from more data supporting the trends and opinions expressed about open source and domain specific development. I think it did highlight some relevant new ideas for the time including the need for security as Spectre/Meltdown had just occurred along with opensource. The next step regarding this paper would be to update it slightly based on the state of computing currently as it is now about 6 years old, and we can see that AI/ML has become more in the forefront of computing advancement. It also would be interesting to have more discussion on how domain advances can push the need for computer architecture advancements like we are currently seeing with AI.