

Control-Flow versus Data-Flow Supercomputers

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This presentation starts with a comparison of various supercomputer types as far as the following issues: (a) Speed, (b) Power, (c) Size, (d) Programming effort, (e) Debugging effort, and (f) Compilation time. It continues with details of the Maxeler approach to data-flow supercomputing, using a number of examples. It concludes with a projection of future trends. It finishes with an elaboration of a PHD research methodology inspired by the scientific success of Maxeler (a spinn-off of Stanford and Imperial College London).

DataFlow supercomputers compile application code down to the gate level, which helps obtain a number of advantages over ControlFlow supercomputers of the same purchasing price. Speedups, for various applications in physics/chemistry/biology, are about 20 times or more, and up to about 200 times for specific business applications, as published by JPMorgan (a 20% owner of Maxeler). Monthly electricity bills are down for the factor of about 20, which is an important issue, since the two-year electricity bills may overpass the initial investment in the case of ControlFlow supercomputers. The size reductions go down also for the factor of about 20.

Speedup related data are shown for selected applications in physics, geo-physics, banking, and conometry. A group of PhD-student researchers in Belgrade now develops code for a number of applications not covered so far. They all follow the same methodological path, the details of which will be elaborated in this talk.