

Optimal register allocation in Polynomial Time

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Register allocation in general is very important part of compilation process. First of all, the difference in access time between registers and main memory is still very drastic, so good assignment of program variables to physical registers can make a big difference in the run time of output program. Moreover, the time spent during register allocation is also significant in total compilation time, which means that register allocation algorithms resulting in close to optimal allocation can make compilation much longer.

We would like to focus on currently used algorithms for the register allocation, which are often NP-hard. This fact means that the register allocators have to use heuristics which result in non-optimal register allocation. Also we will explain complications, which have to be faced during register allocation, such as coalescing, register aliasing etc.

Last but not least, our presentation will try to explain the results of study made by Philipp Klaus Krause on optimal register allocation in polynomial time. This study resulted in a prototype implementation of graph-coloring register allocator which can handle structured programs in polynomial time. Furthermore, it is not restricted to programs in SSA form as other implementations and respects other criteria such as spill and rematerialization costs.