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Topic 23: Compiler Construction - Chapter 7 (Register Allocation)

Abstract

Register allocation is one of the most sophisticated things, that compilers do to optimize performance. The intermediate code uses unlimited number of temporaries, but processor can have only final number of registers. So, the problem of register allocation can be described as a problem how to rewrite the code, that it does not use more temporaries than machine registers, and at the same time, the behaviour of program does not change.

Several algorithms were proposed to solve this problem. For example, *Linear Scan Allocation Algorithm* and *Graph Coloring Register Allocation Algorithm* are one of the global register allocation methods. We will take a closer look at Graph Coloring Register Allocation Algorithm.

The advantage of Linear Scan Register Allocation Algorithm is its speed. Scanning through the liveness intervals and mapping them to physical registers is really linear.

Graph Coloring Register Allocation Algorithm starts with building an interference graph, which is built from the liveness intervals. After that, the algorithm continues with coloring the graph, where the colors are physical registers. The problem, if there is an R-coloring in the graph, is NP-complete. Nevertheless, we know some heuristics to make the graph simpler.