

# Loop optimizations in C and C++ compilers

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## Abstract

The evolution of computer hardware in the past decades has truly been remarkable. From scalar instructions through superscalar and vector instructions to parallel execution, processors are able to reach astonishing speeds, if programmed accordingly. Now, writing programs that take all the hardware details into consideration for the sake of efficiency is extremely difficult and error-prone. Therefore we increasingly rely on compilers to do the heavy-lifting for us.

A significant part of optimizations done by compilers are loop optimizations. Loops are inherently expensive parts of a program in terms of run time, and it is important that they exploit superscalar and vector instructions. In this paper, we give an overview of the scientific literature on loop optimization technology, and summarize the status of current implementations in the most widely used C and C++ compilers in the industry.

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