

## **The Power of Belady's Algorithm in Register Allocation for Long Basic Blocks**

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### **Abstract**

Optimization techniques such as loop-unrolling and trace-scheduling can result in long straight-line codes. It is, however, unclear how well the register allocation algorithms of current compilers perform on these codes. Compilers may well have been optimized for human written codes, which are likely to have short basic blocks. To evaluate how state-of the art compilers behave on long straight-line codes we wrote a compiler that implements the simple Belady's MIN algorithm.

The main contribution of this paper is the evaluation of Belady's MIN algorithm when used for register allocation for long straight-line codes. These codes were executed on a MIPS R12000 processor. Our results show that applications compiled using Belady's MIN algorithm run faster than when compiled with the MIPSPro or GCC compiler. In particular, Fast Fourier Transforms (FFTs) of size 32 and 64 run 12% and 33% faster than when compiled using the MIPSPro compiler.