Indian Institute of Information Technology, Vadodara

Parallel Programming(CS403)

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Lab 06

Submission Date - November 24, 2016 **Deadline** - Nov 26, 11:59 PM

Introduction

In computing, an optimizing compiler is a compiler that tries to minimize or maximize some attributes of an executable computer program. The most common requirement is to minimize the time taken to execute a program; a less common one is to minimize the amount of memory occupied.

Optimization Table

Methods

These options control various sorts of optimizations:
-O
-O1
Optimize. Optimizing compilation takes somewhat more time, and a lot more memory for a large function.
Without -O, the compiler's goal is to reduce the cost of compilation and to make debugging produce the expected results. Statements are independent: if you stop the program with a breakpoint between statements, you can then assign a new value to any variable or change the program counter to any other statement in the function and get exactly the results you would expect from the source code.

With -O, the compiler tries to reduce code size and execution time, without performing any optimizations that take a great deal of compilation time.

-O2
Optimize even more. GCC performs nearly all supported optimizations that do not involve a space-speed tradeoff. The compiler does not perform loop unrolling or function inlining when you specify -O2. As compared to -O, this option increases both compilation time and the performance of the generated code.
-O2 turns on all optional optimizations except for loop unrolling, function inlining, and register renaming. It also turns on the -fforce-mem option on all machines and frame pointer elimination on machines where doing so does not interfere with debugging.

Please note the warning under -fgcse about invoking -O2 on programs that use computed gotos.

-O3
Optimize yet more. -O3 turns on all optimizations specified by -O2 and also turns on the -finline-functions and -frename-registers options.
-O0
Do not optimize.
-Os
Optimize for size. -Os enables all -O2 optimizations that do not typically increase code size. It also performs further optimizations designed to reduce code size.
If you use multiple -O options, with or without level numbers, the last such option is the one that is effective.

Examples

Loop unrolling
Example:

```
// old loop
for(int i=0; i<3; i++) {
      colormap[n+i] = i;
}
// unrolled version
int i = 0;
colormap[n+i] = i;
i++;
colormap[n+i] = i;
i++;
colormap[n+i] = i;
```