



Compilers

Peephole Optimization

- Optimizations can be directly applied to assembly code
- Peephole optimization is effective for improving assembly code
 - The “peephole” is a short sequence of (usually contiguous) instructions
 - The optimizer replaces the sequence with another equivalent one (but faster)

- Write peephole optimizations as replacement rules

$$i_1, \dots, i_n \rightarrow j_1, \dots, j_m$$

where the rhs is the improved version of the lhs

- Example:

$\text{move } \$a \ \$b, \text{ move } \$b \ \$a \rightarrow \text{move } \$a \ \$b$

- Works if $\text{move } \$b \ \a is not the target of a jump

- Another example

$\text{addiu } \$a \ \$a \ i, \text{ addiu } \$a \ \$a \ j \rightarrow \text{addiu } \$a \ \$a \ i+j$

- Many (but not all) of the basic block optimizations can be cast as peephole optimizations
 - Example: `addiu $a $b 0` \rightarrow `move $a $b`
 - Example: `move $a $a` \rightarrow
 - These two together eliminate `addiu $a $a 0`
- As for local optimizations, peephole optimizations must be applied repeatedly for maximum effect

- Many simple optimizations can still be applied on assembly language
- “Program optimization” is grossly misnamed
 - Code produced by “optimizers” is not optimal in any reasonable sense
 - “Program improvement” is a more appropriate term