Lecture 3

Compiler Design

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- m * n vs m + n problem

if m source language specifications and n target specifications, then m * n compilers have to be made.
But if there is some common (universal) intermediate representation, then only m + n compilers have to be built.

Design of Intermediate Language

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Level of abstraction

Source Level	Target Level
Identifier	Memory
Expression	Register
Operator	Stack
Statement	Opcode
Condition	Addressing Mode
Functions	Libraries
Iteration	OS interaction

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- It is next to impossible to design a single intermediate language to accommodate all programming languages.
- However, common IRs for similar languages and similar machines have been designed and are used for compiler development

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- Layout parameter passing protocols: locations for parameters, return values, etc.
- Interface calls to library, runtime systems, and operating systems

Symbol Table

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- Information required about the program variables during compilation

Symbol table contains information about keywords and identifiers only. No other information about syntactic category (token_type) apart from keywords and identifiers will be stored in symbol table.

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  - Store it at a separate location.

maintain pointer to the location where the information or the attributes of identifier or keyword are stored in symbol table.

Final Compiler Structure

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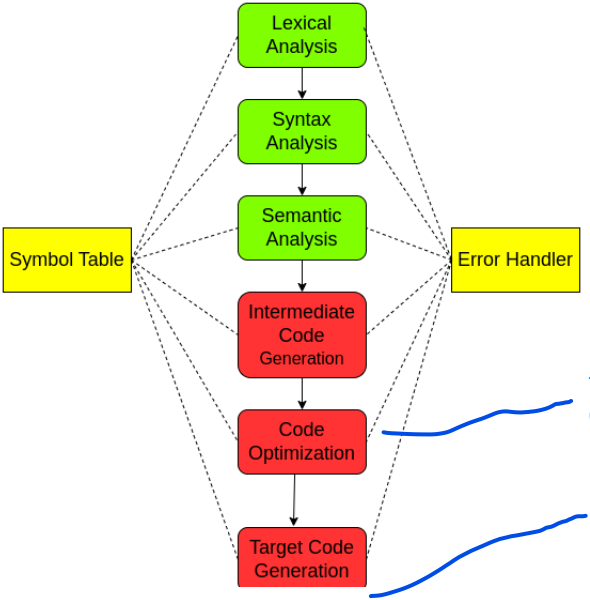

this is machine independent code optimization.

At last, we can have machine dependent code optimization.

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- Source and machine-independent code optimization is possible.
- The optimization phase can be inserted after the front and back end phases have been developed and deployed

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  - Usually requires great ingenuity to design such a test suite

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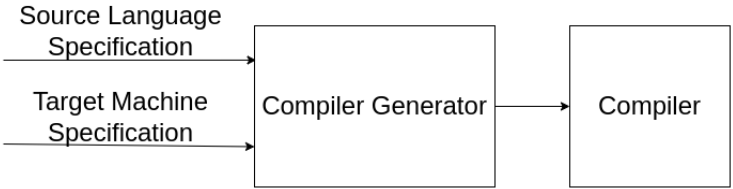

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research proven fact

you don't need to write compilers each time, just change the specifications.

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- Tool development and testing is a one-time effort
- Compiler performance can be improved by improving a tool