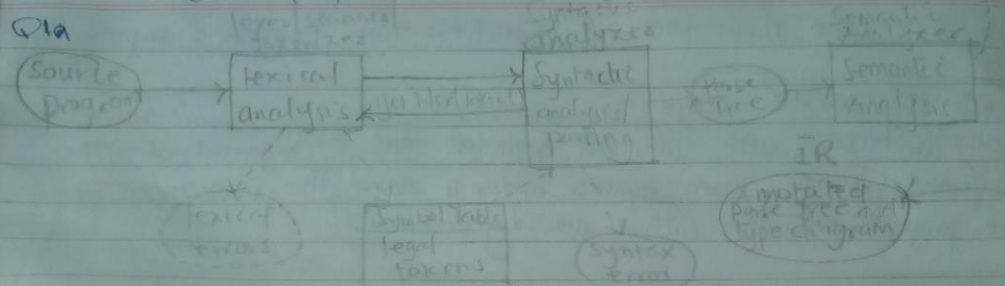


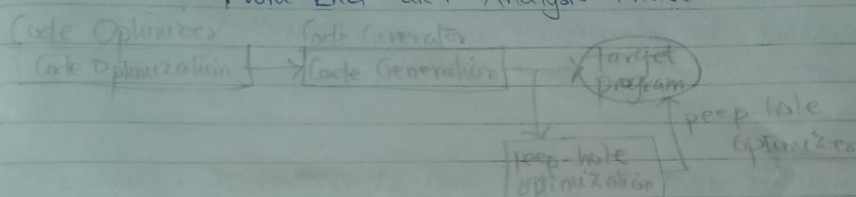
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CSM 484 - Introduction to Compilers



### Front-End aka Analysis Phase



### Back-End aka Synthesis Phase

#### The Compilation Process

#### Lexical Analysis Phase

This is where a sequence of characters are transformed into a sequence of lexical elements. The lexical entities correspond to data types such as integers, floating point numbers, identifiers etc. The source code is scanned and converted into meaningful lexemes.

#### Syntactic Analysis Phase

This phase is also known as parsing. The tokens produced by the lexical analysis is used as input to generate a syntax or parse tree. In the construction of the parse tree, there's verification of the sequence of the lexical elements to ensure their correspondence with the grammar of the language. It produces syntax errors when the grammar is missed or mixed.

#### Semantic Analysis phase

This stage traverses the syntax tree and checks the correctness of the program. The analysis is based on the type of inference.

This phase also keeps track of identifiers, their types and expressions.

#### Code Optimization stage

Here unnecessary code lines are removed and arrangement of the statements in the correct sequence order is done. This is to speed up the program execution without wasting resources.

#### Code Generation stage

Here, the code generator maps the optimized code to the target machine language. The intermediate code is translated into a sequence of re-locatable machine code.

#### The Symbol Table

Is a data structure that maintains and stores identifiers names along with their types. Making it easier for compiler to quickly search identifiers, record and retrieve it.

### 2. What is a translator? Give 3 examples

A translator is a computer program that performs the translation of a written program in a given language into an equivalent in functional program in a different language without losing logical and functional structure of program.

Examples are

Decompilers - Boomerang Decompilers

Interpreter -

Source-to-source compilers - C++ to C++ translators

### 3. What are

#### i) Linker

A linker is a program (computer) that combines object modules to form an executable program.

#### ii) Loader

It is a part of the operating system and is responsible for loading

## programs and libraries

### iii) Preprocessor

It is a program that processes its input data to produce output used as input for another program.

### iv) Assembly language

It is a low-level programming language for a computer in which there is a very strong correspondence between the language and the architecture's machine code instructions.

### v) Machine language

It is the lowest-level programming language that is understood by computers.

## 4. Write short notes on

### a) Tokens

A token is a sequence of characters that can be treated as a unit in the grammar of programming languages.

Examples are

- ✓ Type token (id, num, real, ...)
- ✓ Punctuation tokens (+, void, return, ...)
- ✓ Alphabetic tokens (keywords)

### b) Lexicons

Refers to a group of words used to create a programming language.

Examples

for, foreach, do, if, while

### c) Lexemes

It is a sequence of characters in the source program that is matched by the pattern for a token. It also is a string of characters that is the lowest-level syntactic unit in the programming language.

Ex- are