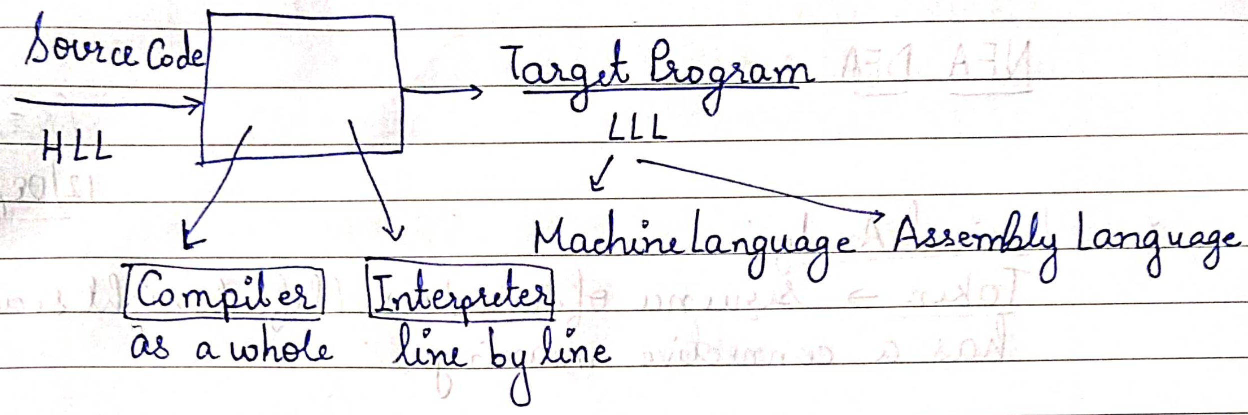
Saathi

11/07/2022

Compiler Design

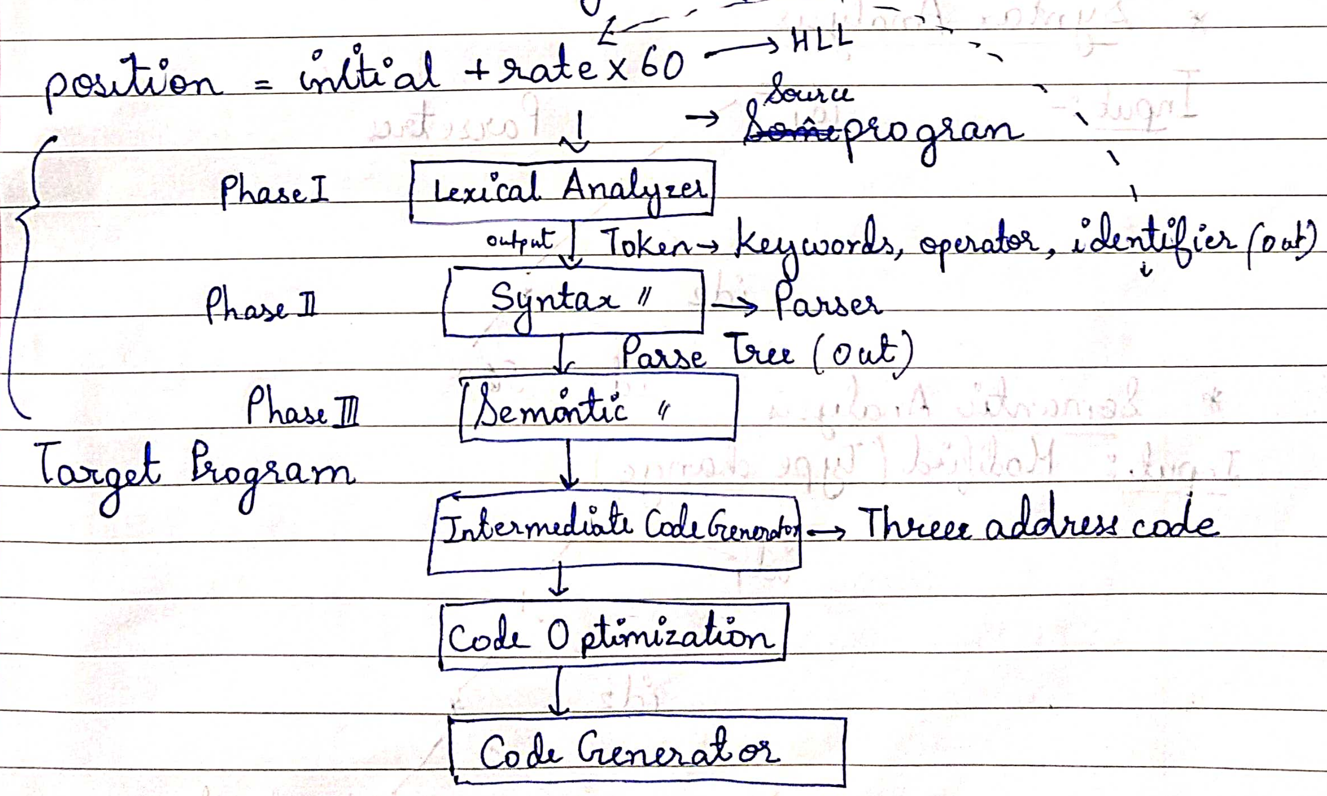
Interpreter



Advantage: Debugging is easier in Interpreter.
Disadvantage: Time consuming → Interpreter.

Assembly Language: converts assembly language to machine level language. (Low level → Low level)

We will learn compiling here (not execution).



position = initial + rate x 60
→ HLL
→ ~~Some~~ Source program
Phase I
Lexical Analyzer
output
Token → keywords, operator, identifier (out)
Phase II
Syntax ״
→ Parser
Parse Tree (out)
Phase III
Semantic ״
Target Program
Intermediate Code Generator → Threee address code
Code Optimization
Code Generator

Compiler Design
Aho, Ullman, Sethi

Compiler
Sridha

NFA DFA

(Q, Σ, δ, F)
12/08/2022

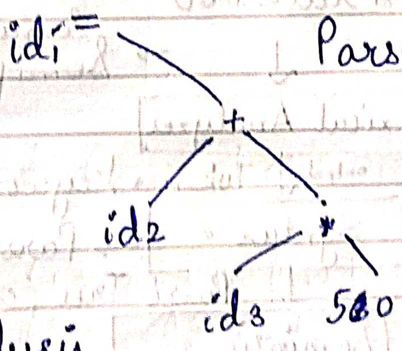
* Lexical Analysis
Token → Sequence of characters (left to right scan) that has a connective meaning.

Inputs: Total = num + num1 * 50
↓ ↓ ↓ ↓ ↓ ↓
id1 id2 op1 id3 op2 50

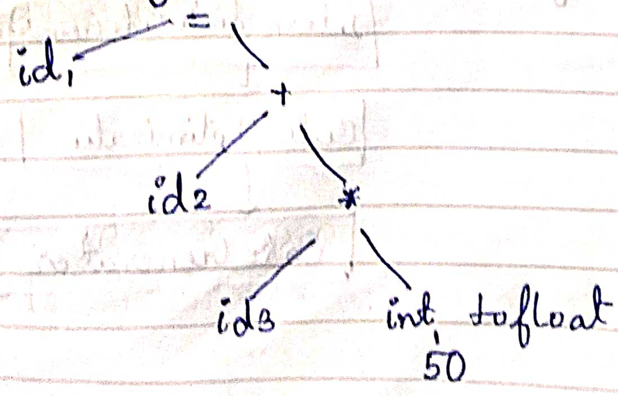
Outputs: id1 = id2 + id3 * 50 (~~be~~ presented in tokens)
(stored in symbol table)

* Syntax Analysis
Input :-

Parsetree



* Semantic Analysis
Input : Modified (Type change)



Date ___/___/______

* Intermediate Code Generator

Using temporary variable store $t_1 = (\text{int to float})\ 50$.

Another temporary variable store, $t_2 = id3 * \cancel{50}\ t_1$

$t_3 = id_2 + t_2$

$id1\ \cancel{t_4} = t_3$

~~MUL id3, t1~~ ~~t2~~
~~ADD id2, t2~~

MUL t2,id 3, ~~t1~~
STORE t2
ADD t3,id2, t2
STORE t3
MOV id1, t3

~~t2~~ x

* Code optimization

$t3 = id\,3 * 50.0$

$id_1 = id_2 + t_3$

Low LL → Binary, Assembly.

MOVF R2, #50
MULF R2, id3
MOVF R1, ~~R3~~ R2
ADDF R1, id2
~~[illegible]~~

Q) Position = Initial + rate * 60

~~[illegible]~~ 1. Lexical Analysis

Input: Position = Initial + rate * 60

$$\begin{tikzcd}[column sep=small]
\text{Position} \arrow[d] & = \arrow[d] & \text{Initial} \arrow[d] & + \arrow[d] & \text{rate} \arrow[d] & {*60} \arrow[d] \\
id1 & op1 & id2 & op2 & id3 & 60
\end{tikzcd}$$

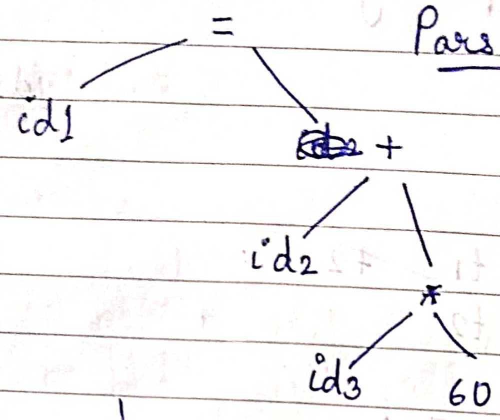
Date ___/___/___ R1

Output: id1 = id2 + id3 * 60 (sent to Syntax Analyzer)

* Syntax Analyzer

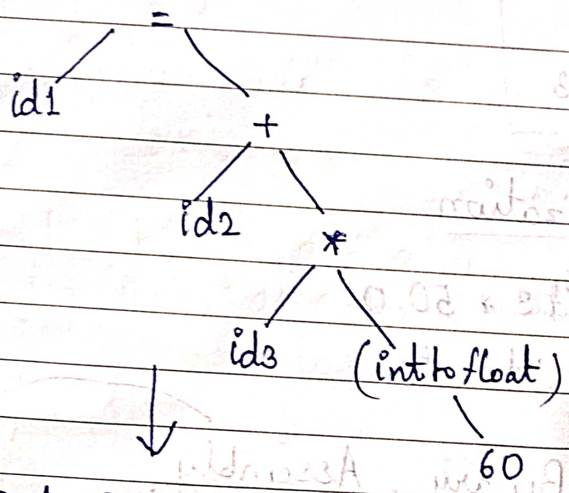
Input:

Parse Tree



* Semantic Analyzer

Input:



* Intermediate Code Generator

t1 = (int to float) 60
t2 = id3 * t1
t3 = id2 + t2
id1 = id2

* Code Optimization

t3 = id3 * 60.0
~~t~~id1 = id2 + t3

Date ____ / ____ / ______

Low LL

```
MOVF  R1  #60
MULF  R1, id3
~~MOVF  R1, R2~~
ADDF  R1, id2
```