CSEN 1003: Compilers

Tutorial 1 - Introduction and Regular Languages

2/2/2020 - 5/2/2020

This Instructor

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Today's Plan

1. Administrivia
2. Motivation and Course Plan
3. Regular Languages
4. Recap

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Grading Scheme and Communication Channels

Quizzes (2/3)	25%
Assignments (2/2)	10%
Midterm	25%
Final	40%

- Course Material: http://met.guc.edu.eg/Courses/CourseEdition.aspx?crsEdId=996
- Piazza Course Page: piazza.com/guc.edu.eg/spring2020/csen1003/home

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What Do You Expect We Will Do?

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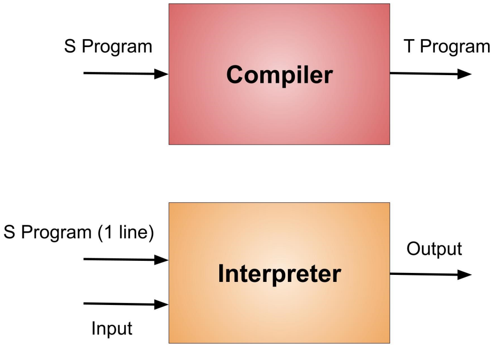
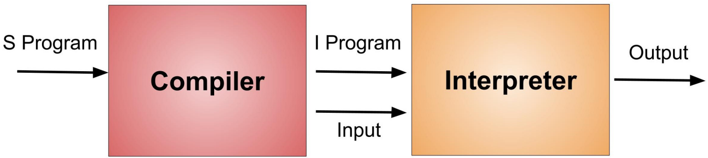
What is a Compiler?

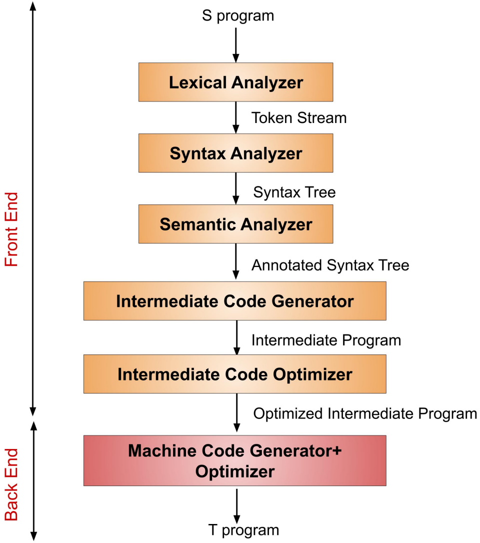
Compilers vs Interpreters



Hybrid Approaches



Overall structure of a Compiler



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2. Studying compilers will involve studying a lot of useful data structures and algorithms.
3. It is a very successful realization of computer science.

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Lexical Analysis and Regular Languages

- The lexical analyzer needs to scan the input to identify valid tokens.
- For programming languages, tokens can be expressed by regular languages.

Regular Expressions - Exercise 1-3

Example

Write a regular expression for each of the following regular languages. The alphabet $\Sigma = \{0, 1\}$.

a $L_1 = \{w \mid w \text{ begins with a 1 and ends with a 0}\}$.

b $L_2 = \{w \mid w \text{ contains the substring 0101}\}$.

c $L_3 = \{w \mid \text{every odd position of } w \text{ is a 1 }\}$

d $L_4 = \{w \mid w \text{ contains at least two 0 and at most one 1}\}$

DFA and NFA Design - Exercise 1-2

Example

Give the DFA and NFA state diagrams recognizing each of the following regular languages. The alphabet $\Sigma = \{0, 1\}$.

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- b $L_2 = \{w \mid w \text{ contains the substring 0101}\}$.
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From Regular Expressions to NFAs - Thomson's Construction

Example

Convert the regular expression you wrote in 1-3 (a) to an NFA.

From Regular Expressions to NFAs to DFAs

Example

Convert the NFA you got to a DFA.

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Points to Take Home!

1. Compilers, Interpreters, and Hybrid Approaches.
2. Stages of Compilation.
3. Recap of Regular Languages.
    - Regular Expressions.
    - From Regular Expressions to NFAs.
    - From NFAs to DFAs.

Next Week: Lexical Analysis!