Department of Computer Science and Engineering
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Lecture Notes
Python for Computational Problem Solving
UE23CS151A

Lecture #9
Process of Computational Problem Solving and Translation Models

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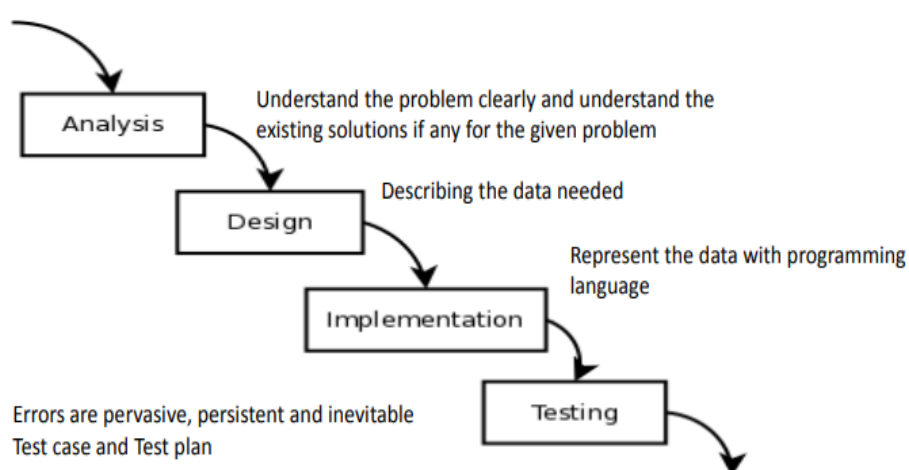
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Process of Computational Problem Solving

Computational problem solving does not simply involve the act of computer programming. It is a process, with programming being only one of the steps. Before a program is written, a design for the program must be developed. And before a design can be developed, the problem to be solved must be well understood. Once written, the program must be thoroughly tested.

Phases involved in the process of Computational Problem Solving

Analysis — Understand the problem clearly and understand the existing solutions if any for the given problem

Design — Describing the data needed

Implementation — Represent the data with programming language

Testing — Errors are pervasive, persistent and inevitable Test case and Test plan

Problem Analysis:

In this phase, it is must to understand the fundamental computational issues involved. Good to know what constitutes a solution. For some problems, there is only one solution. For others, there may be a number (or infinite number) of solutions. Thus, a problem may be stated as finding,

- A solution
- An approximate solution
- A best solution
- All solutions

Design:

Divide the problem into smaller sub-problems or tasks. Identify the main components or steps needed to solve the problem. Create a high-level plan or algorithm for solving each sub-problem. **Choose appropriate data structure.**

Implementation:

Involves putting the project **plan into action. Decision regarding the paradigms of the programming language** is finalized in this phase.

Testing:

The focus is on **investigation and discovery**. During the testing phase, the team finds out whether their **code is working according to customer requirements**. **Error is the state or condition of being wrong in conduct or judgement**. Errors are always **pervasive, persistent and inevitable.**

Pervasive: Error can spread over if there is error in the beginning itself

Persistent: Errors are continuous in any application

Inevitable: Unavoidable

Translation Models:

Translation models describe **the mathematical relationship between two or more languages.** A translator is a programming language processor that converts a **computer program from one language to another.** It can translate a high-level language program into a machine language program that the central processing unit (CPU) can understand. There are many Translators. Let us deal with Compiler and Interpreter in detail.

Compiler: Converts entire high-level language programs to machine language at once
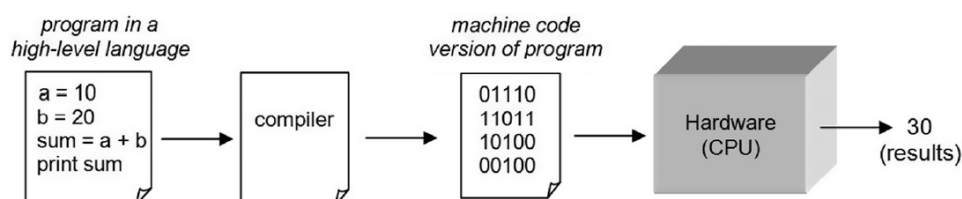
Interpreter: Converts high-level language to machine language line by line and execute instructions in place of CPU.
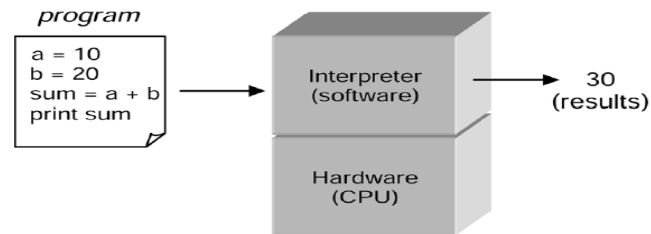
Note: Python has Hybrid model of Interpreter and Compiler. We will discuss few examples on this as and when we cover different constructs in python.

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