ALGORITHMIC PROBLEM SOLVING

Algorithmic problem solving is solving problem that require the formulation of an algorithm for the solution.

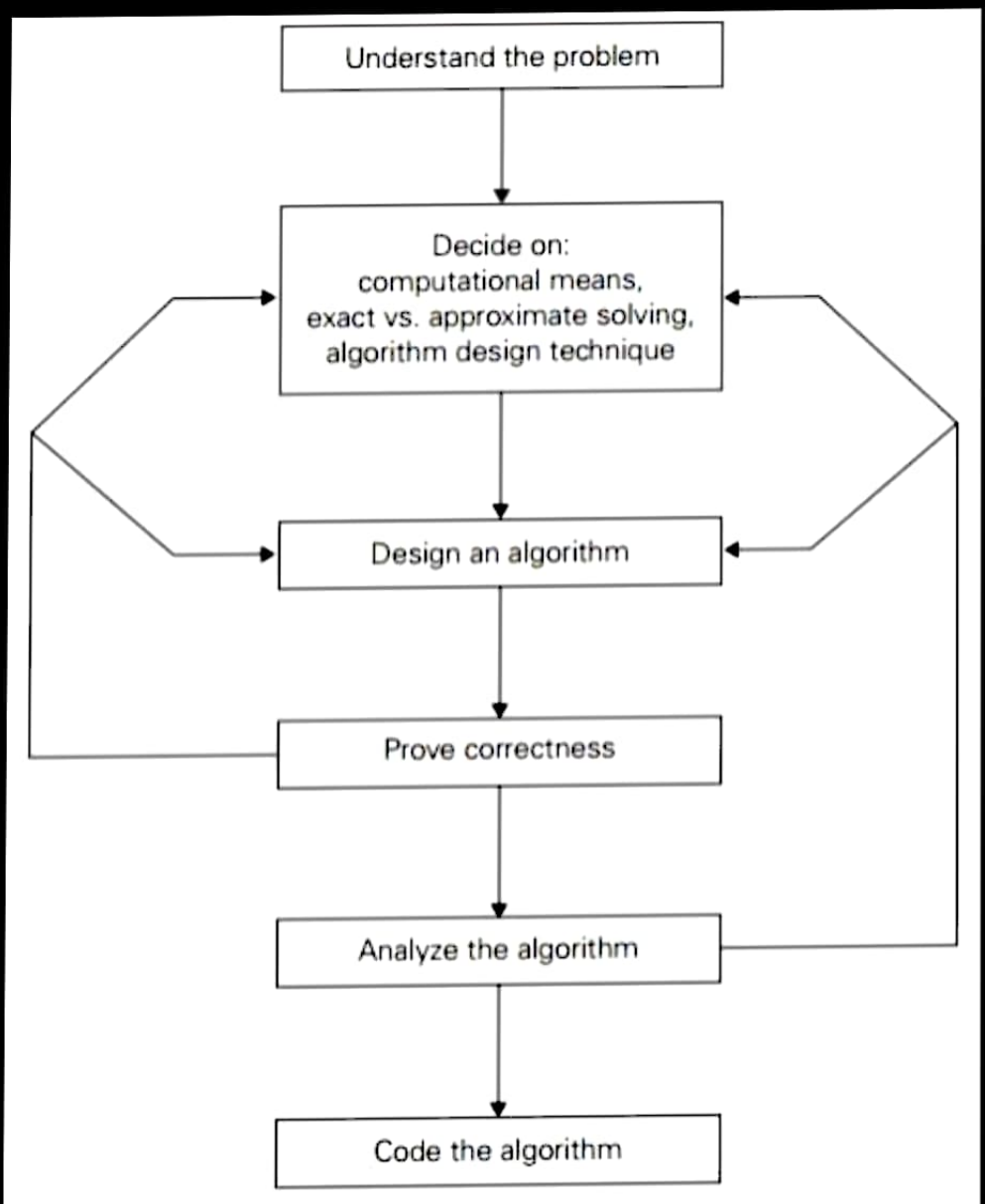

FIGURE 1.2 Algorithm design and analysis process.

Understanding the Problem

- It is the process of finding the input of the problem that the algorithm solves.
- It is very important to specify exactly the set of inputs the algorithm needs to handle.

Ascertaining the Capabilities of the Computational Device

- If the instructions are executed one after another, it is called sequential algorithm.
- If the instructions are executed concurrently, it is called parallel algorithm.

Choosing between Exact and Approximate Problem Solving

❖ The next principal decision is to choose between solving the problem exactly or solving it approximately.

❖Based on this, the algorithms are classified as exact *algorithm* and *approximation algorithm. Example: exact is addition of two numbers, approximation is solving linear equation*

Deciding a data structure:

❖ Data structure plays a vital role in designing and analysis the algorithms.

❖ Some of the algorithm design techniques also depend on the structuring data specifying a problem's instance

❖ Algorithm+ Data structure=programs.

Algorithm Design Techniques

❖ An ***algorithm design technique*** (or "strategy" or "paradigm") is a general approach to solving problems algorithmically that is applicable to a variety of problems from different areas of computing.

Methods of Specifying an Algorithm

❖ ***Pseudocode, flowchart, programming language***

Proving an Algorithm's Correctness

❖ Once an algorithm has beer specified, you have to prove its ***correctness***. That is, you have to prove that the algorithm yields a required result for every legitimate input in a finite amount of time.

❖ A common technique for proving correctness is to use mathematical induction because an algorithm's iterations provide a natural sequence of steps needed for such proofs.

Analysing an Algorithm

Efficiency.

Time efficiency, indicating how fast the algorithm runs,

Space efficiency, indicating how much extra memory it uses.