chandra's
Date: / / Pg:

Design & Analysis of Algorithms

Introduction

Algorithm is named after a Persian author Abu-Ja'far Mohammed ibn Musa al Khowarizmi (c. 825 A.D) He wrote a textbook on mathematics.

Defn:-

An algorithm is a finite set of instructions that if followed, accomplishes a particular task. In addition, all algorithms must satisfy the following criteria.

1. Input:- Zero or more quantities are externally supplied

2. Output:- Atleast one quantity is produced.

3. Definiteness: Each instruction is clear & unambiguous.

4. Finiteness: If the instructions of an algo. is traced out, then for all cases, the algo terminates after a finite no of steps.

5. Effectiveness: Every instn. must be very basic so that it can be carried out by pen and paper. It must be feasible too.

chandra's
Date: / / Pg:

Note: Algorithms that are definite and effective are also called computational procedures.

Eg: Operating system of a digital computer. The procedure is designed to control execution of jobs, in such a way that when no jobs are available, it does not terminate but continues in a waiting state until a new job is entered.

In algorithms, there are four distinct areas to study

1) How to devise algorithms.
Creating an algo is an art which may never be fully automated. The various design strategies can be used to devise algorithms.

2) How to validate algorithms (Algo. validation)
The algo should compute the correct answer for all possible legal inputs. After showing validity of the method, a pgm can be written. 2nd phase begins now. Referred as program proving or program verification.
A proof of correctness needs to have both stated in two forms
i) as a pgm annotated by a set of assertions (Here expressed in predicate calculus. (about the i/p & o/p var of the pgm)

ii) The second form is called a specification & it may also be expressed in the predicate calculus.

3) How to analyze algorithms -
This field of study is called analysis of algorithms. As an algo is executed, it uses system's cpu to perform operations & its memory (both immediate & auxiliary) to hold the pgm & data.
Analysis of algorithms or performance analysis refers to the task of determining how much computing time & storage an algo requires.

4) How to test a program -
It consists of 2 phases:
debugging & profiling.
Debugging is the process of executing programs on sample data sets to determine if faulty results occur & if so to correct them.

Profiling or performance measurement is the process of executing a correct program on data sets and measuring the time and space it takes to compute the result.