



CS 101 Introduction to Computing

Semester – 2014 -15 / II Semester

Units – 2 – 0 – 2 – 3

Pre-requisite – None

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Lecture # 2, Section 1, Slide # 2.1.1

Pioneers of Computer Science



Contributions of Pioneers - I

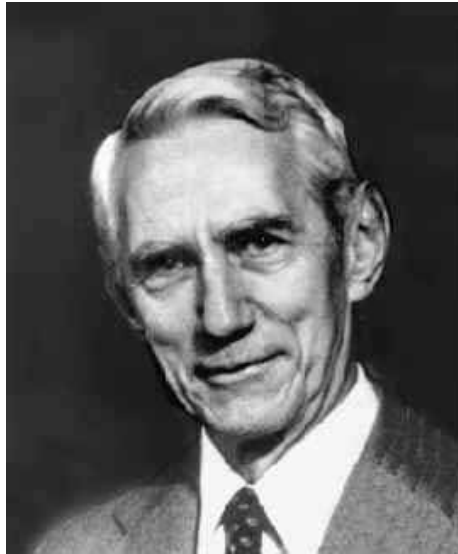
- A general purpose, programmable machine can be built – a computer
- Any information which can be represented logically by symbols can be processed using programmable machines
- A sequence of instructions can be developed to solve a problem
- Whether a machine can think? – AI

Contributions of Pioneers - II

- Turing Machine – Logical Computing Machine is a theoretical model of a consistent framework for a finite state machine
- Hilbert, Goedel, and Von Neumann complimented the foundation laid out by Turing
- Cryptographical algorithms were useful in illustrating the concepts

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Pioneers of Computers



Contributions of Pioneers - III

- Claude Shannon developed the Boolean operations and their equivalent electromechanical circuits
- Von Neumann laid the foundation of design of the first major computer
- John Atanasoff built a major computer using vacuum tubes and other electrical devices



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Pioneers of Computer Programming



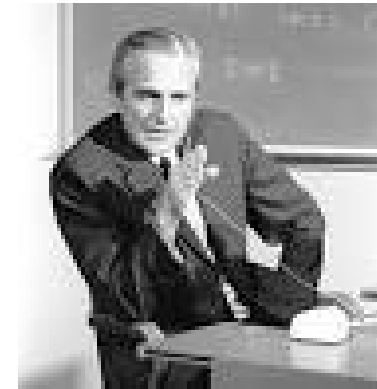
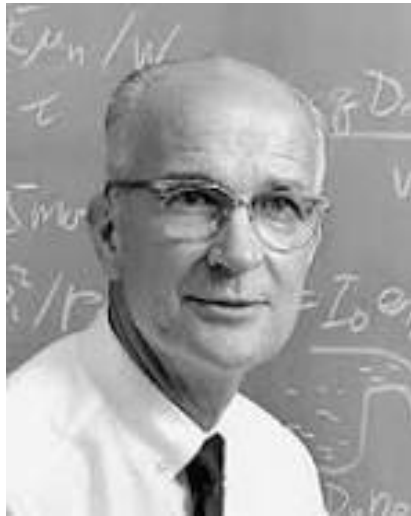
Contributions of Pioneers - IV

- Grace Hopper did the programming of Mark I computer at Harvard
- Jean Jennings Bartik developed the concept of subroutines
- Betty Snyder Holberton developed the concept of flowcharts and diagrams for writings the programs



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Pioneers of Computer Hardware



Contributions of Pioneers - V

- William Shockley won the Nobel Prize for inventing the transistors
- Doug Engelbert invented the mouse which has been a key input device besides the keyboard
- Alan Kay built the first table-top computer at Xerox Park using the modern printed circuit boards and microchips



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Pioneers of Personal

Computers



Contributions of Pioneers - V

- Steven Jobs invented the human machine interface with menus and icons
- Steve Wazniak developed the man – machine hardware interface such as pen and associated software
- Bill Gates developed the Windows software for PCs.....



Tipping Points of CS

- Bits and Atoms – Discrete Nature
- Information – Music, Graphics, Alphabets, Numerals, Symbols
- Concept of Algorithm
- Machine execution of algorithm
- Data Structures
- Data packets – Transmission, Distribution and Assembly
- Central, Distributed, Mobile Computing

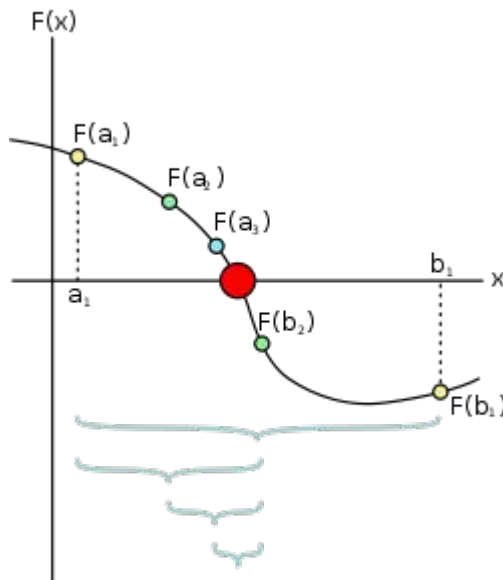


Strategies of Problem-solving

- Divide and Conquer Approach
- Iterative Methods
- Recursive Technique
- Hill Climbing Methods
- Parallel Algorithms
- Methods of Induction
- Logical Reasoning Technique

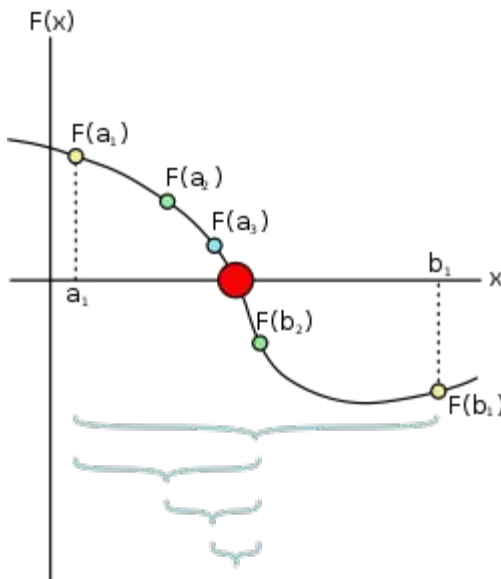


Divide and Conquer Approach



- Divide the search domain and see if be resolved
- Example : Bisection method; also called as Binary Search
- In binary search, the numbers are in an ordered fashion

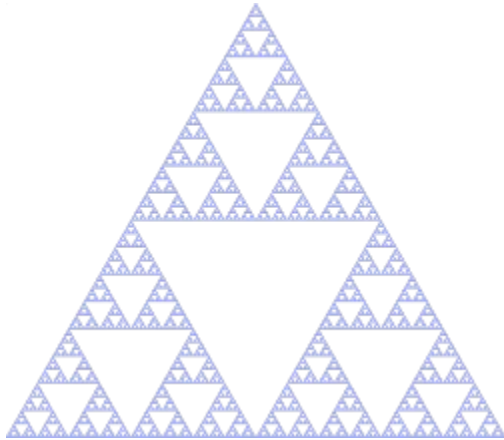
Iterative Methods



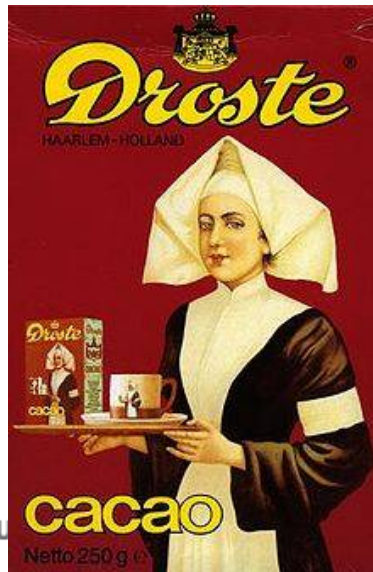
- Iterative methods generate a sequence of solutions which are gradually improving
- An iterative method should have a terminating criteria
- Rate of convergence is important
- Some iterative methods are using for finding the root of an equation
- Iterative methods are also used for solving a set of linear equations



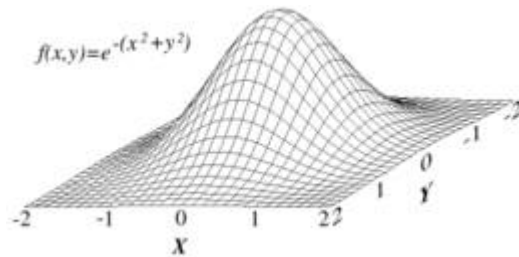
Recursive Techniques



- A problem can be solved by breaking it down to a sub-problem
- This process goes on till a termination situation arises
- For the terminal situation, an explicit answer is available
- Factorial of n is an example



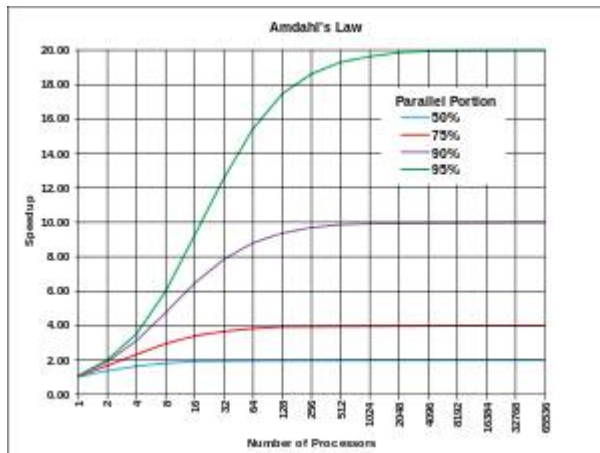
Hill Climbing Methods



- Also known as steepest gradient methods
- Locally find the best possible direction of search and the maximum distance along that direction
- These methods are used for finding the local optimal solution



Parallel Algorithms



- Large problems are divided into number of smaller problems; each small problem is solved in parallel
- Many problems of HPC are dealt with in parallel fashion
- Example: Find all the prime numbers between 1 and 100000 can be dealt with in parallel fashion

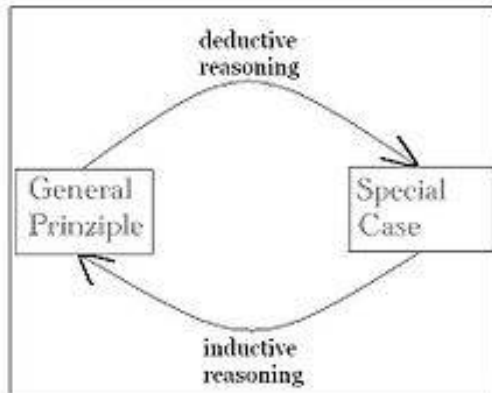


Methods of Induction



- Mathematical induction is a method of mathematical proof. The first step is to prove for the base case. The second step is to invoke the induction that implies that the statement is true for the next case.
- Example: Sum of natural numbers from 0 to n .
- Structural induction can be extended to other math models

Logical Reasoning Techniques



- Induction and abduction are the forms of logical reasoning. It has three elements: Deductive reasoning, Inductive reasoning and abductive reasoning.
- When it rains, things outside get wet.
- Mathematical logic and Philosophical logic



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