Programming Fundamentals

CS118

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Lecturer

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Room: (Lecturer Room#1 opposite HR department, CS dept Basement)

Objectives of course

1. Getting acquainted with problem understanding, modeling and solving.
2. Understanding the concept of Programming Languages.
3. Two major areas to be covered:
    i. Computation and problem solving
    ii. Implementation in C language.
4. Design and implement algorithms to solve real world problems.

Course outline

- Problem modeling, Basic Flowchart and block diagram, Algorithm analysis
- Data Types, Basic programming with algorithm
- Control structures: if-else, nested-if, switch case,
- Conditional Loops: For, While, do-while, Nested loop,
- Functions, Recursion,
- Introduction to Array(1- dimensional), Multiple subscripted arrays
- String Functions
- Introduction to Structures, structure array and pointer to structures
- File Processing
- File Processing(Binary and Text files),
- Introduction to Pointers, Pointers to array and double pointers.
- Dynamic Memory Allocation, Pointers functions and void pointers
- Revision(structures, Pointers, Arrays)
- Project evaluations

Text books

Name: C How to Program - 7th Edition
Authors: Paul Deitel, Harvey Deitel
Publisher: Pearson

Name: Problem Solving and Program Design in C - 7th Edition
Authors: Maureen Sprankle , Jim Hubbard
Publisher: Prentice Hall

Reference books:

Name: Working with C / Let us C
Author(s): Yashwant Kanetkar
Publisher: BPB Publications

Name: Waite Group's Turbo C - Programming for the PC
Authors: Robert Lafore
Publisher: SAMS

Marks Distribution

- Class Performance: **5 marks**
- Quizzes: **10 marks**
- Assignment: **5 marks**
- Mid-term Exam-1: **10 marks**
- Mid-term Exam-2: **10 marks**
- Project: **10 marks**

Throughout semester

- **Final Examination: 50 marks**

Chapter 1

General Problem solving concepts

Overview

- Problem Solving in Everyday Life
- Types of Problems
- Problem Solving with Computers
- Difficulties with Problem Solving

Problem Solving in Everyday Life

Six Steps of Problem Solving

Identify the problem	Understand the problem	Identify alternative ways to solve the problem.	Select the best way to solve the problem from the list of alternative solutions	List instructions that enable you to solve the problem using the selected solution.	Evaluate the solution

Solving steps

Problem:

Consider the following problem:

"Going to work"

The problem is to go to work

Step 1 : Identifying the problem:

The problem is to reach the workplace at time. The person must do all the necessary jobs before leaving home to go to work, like bathing, dressing, having breakfast, etc.

Step 2 : Understanding the problem:

a. Comments about the problem to aid in understanding it

Going to work is a task that is time bound that is one must reach office on time.

b. Description of the knowledge base

The knowledge base required for a person to do the above given task is that one must know the way to the office. This way should be the shortest and the quickest. A person must also know the time at which it is necessary to reach office and subsequently, he must think at what time he must leave house to reach the office.

The problem is to go to work [Cont.]

Step 3 : Identifying alternative solutions:

Alternative Solutions	Pros	Cons
One can go to work place in a car after one has left home.	Using a car is costly as the cost is proportional to the distance between the house and the workplace.	Time taken is less.
One can use means of public transport like bus or tram to reach the workplace.	It is less costly.	Time taken is more.

Step 4 : Selecting the best solution:

The best solution in all of the given solutions would be to drive to the work place as it would be very quick and the person will not have to walk to the work place.

The problem is to go to work [Cont.]

Step 5 *:* Listing a set of numbered step-by-step instructions to attain a given solutions:

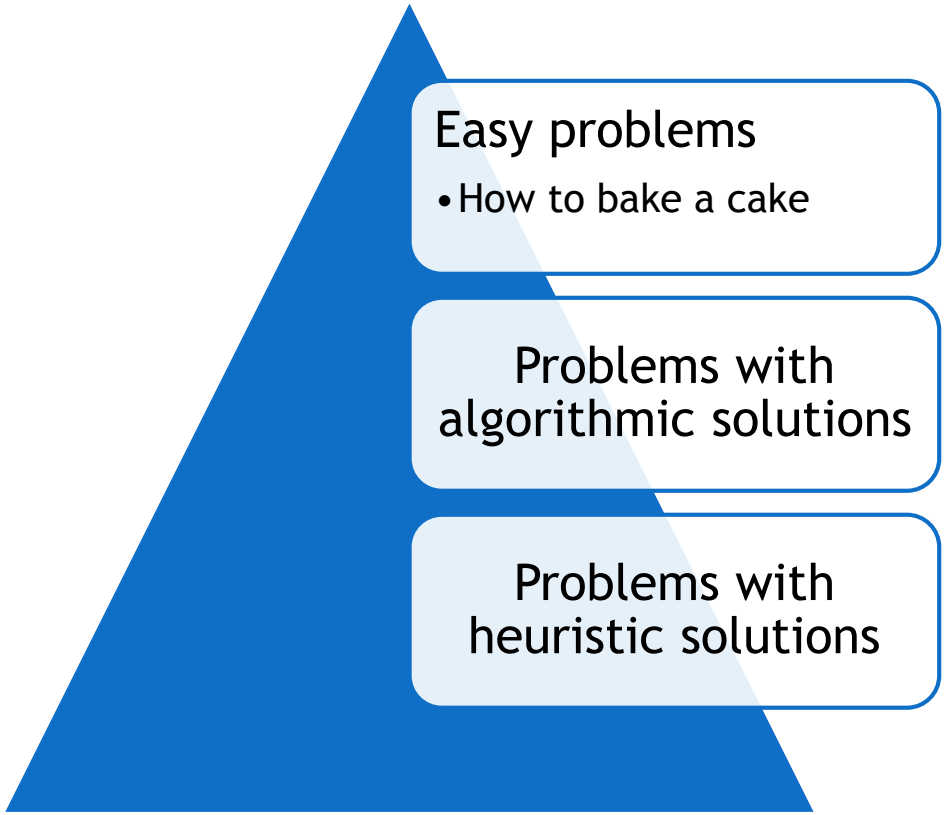
The step-by-step instructions to attain the given solution are given below:

1. Wake up in the morning.
2. Brush your teeth.
3. Take a bath.
4. Dress up.
5. Have breakfast.
6. Leave home to go to work.

Step 6 *:* Testing the solution and check if the solution works or not.

The solution works and the task can be accomplished using the above given steps.

Types of problems



Problems with algorithmic solutions

- Can be solved in a number of steps e.g. balancing a check book.
- Algorithm: A number of steps that may be performed repeatedly to reach some solution

Algorithm for going to the market to purchase a pen

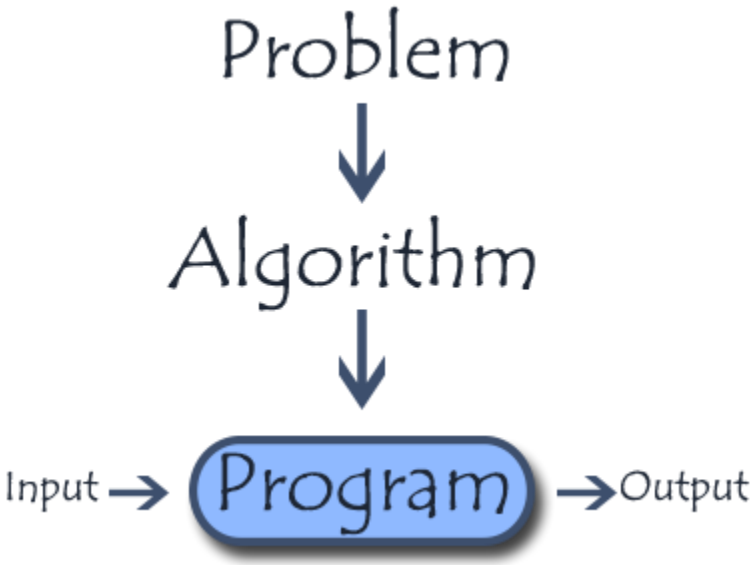
1. Get dressed to go the market.
2. Check your wallet for money.
3. If there is no money in the wallet, replenish it.
4. Go to the shop.
5. Ask for your favorite brand of pen.
6. If pen is not available, go to step 7 else go to step 10
7. Give money to the shopkeeper.
8. Keep the purchased pen safely.
9. Go back home.
10. Ask for any other brand of pen.
11. Go to Step 7.

itself a complete task and separate algorithm can be written for it

Problems with heuristic solutions

- Solutions that cannot be reached through a direct set of steps are called **heuristic solutions**.
- These solutions require reasoning built on knowledge and experience, and a process of trial and error.
- Example: how to buy the best stock or whether to expand the company

Problem solving with computers



Program means the set of instructions that make up the solution after they have been coded into a particular computer language.

Output/Results means the outcome or the completed computer-assisted answer.

Computer Problem solving

- Best for Algorithmic solution
- Calculating the monthly salary for employees
- Not so good for Heuristic solution
- E.g. the problem of how to throw a ball or how to speak English
- Artificial intelligence enables a computer to do things like build its own knowledge bank and speak in a human language.

Difficulties in problem solving

The problem-solving process is not easy.
takes practice and time to perfect

- Poor training
- Afraid to make decisions
- Incorrect problem definition
- Inadequate steps of algorithm

Exercise:

Task of deciding which number is the largest from a group of three numbers

- **Almost anyone can immediately tell which is the largest, but many cannot explain the steps they followed to arrive at it.**