Rajshahi University of Engineering and Technology

Course no: CSE-2201

Course title: Sessional based on CSE-2201

Lab report-5

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Problem name: A solution of Greedy knapsack problem for finding the optimal subset of the input data.

Introduction and Description:

The greedy method is the most straightforward design technique we that can be applied to a wide variety of problems. Any subset that satisfies the constraints is called a feasible solution. We need to find a feasible solution that either maximizes or minimizes a given objective function. A feasible solution that is called optimal solution.

Knapsack problem can be solved by greedy method. In this problem. there are n objects and a knapsack or bag. Object i has a weight w_i the knapsack capacity is m. If a fraction x_i, $0 \leq x_i \leq 1$ of object i is placed. Into the knapsack, the it a profit of $p_i x_i$ is earned. The objective is to obtain a filling of the knapsack that maximizes the total profit earned.

Formally, the problem can be stated as,

$$\text{maximize} \sum_{1 \leq i \leq n} p_i x_i \quad \text{——} (1)$$

subject to $\sum_{1 \le i \le n} w_i x_i \le m$ ——— (II)

and $0 \le x_i \le 1, \quad 1 \le i \le n$ ——— (III)

A feasible soln is any set $(x_1, \ldots, x_n)$ satisfying (II) & (III) and An optimal solution is a feasible solution for which equation (I) is maximized.

Algorithm:

```
Algorithm GreedyKnapsack(m, n)
// p[1:n] and w[1:n] contain the profits and weights
// of the n objects ordered such that p[i]/w[i] >= p[i+1]/
                                                  w[i+1]
// m is the knapsack size and x[1:n] is the soln vector.
{
  for i := 1 to n do  x[i] := 0.0;
  u := m;
  for (i := 1 to n do
    {
    if (w[i] > u) then break;
      x[i] := 1.0; u := u - w[i];
    }
    if (i <= n) then x[i] := u/w[i];
    }
}
```

Sample
Input:

1
20
1 2 3
2 4 5
3 5 8
4 3 4
5 9 10

Sample output:

Solution no:	Fractional amount	Total weight	Total profit
1.	{x3=1, x1=1, x4=1, x2=1 x5=0.67}	20	26.66

Conclusion: In greedy method there are many feasible solution but for knapsack problem solution ~~use~~ I try to find out the optimal solution that show the profit is maximized. Finally the code ~~run~~ implemented and run successfully.