Assignment No. 03

Title of the Assignment :
Write a program to solve a fractional knapsack problem using a greedy method.

Objective of the Assignment :
Students should be able to understand & solve fractional knapsack problems using a greedy method.

Prerequisite :

1. Basic of Python or Java Programming
2. Concept of greedy Method.
3. Fractional knapsack problem.

Contents for Theory :

1. Greedy Method
2. Fractional knapsack problem.
3. Example solved using Fractional knapsack problem.

Theory :

What is greedy Method ?

- A greedy algorithm is an approach for solving a problem by selecting the best option avilable at that moment.

- It works in a top-Down approach.

Advantages of Greedy Approach:

- The algorithm is easier to describe.
- This algorithm can perform better than other algorithm

knapsack Problem :

You are given the following -

- A knapsack with limited weight capacity.
- few items each having some weight & value.

knapsack Problem Variants :

knapsack Problem has the following two variants:

1. Fractional knapsack Problem.
2. 0/1 knapsack problem.

Fractional knapsack problem -

In fractional knapsack problem -

- As the name suggests, items are divisible here.
- We can even put the fraction of any item into

knapsack if taking the complete item is not possible.
- It is solved using the greedy method.

Time Complexity :

- The main time taking step is the sorting of all items in decreasing order of their value/weight ratio.
- If the items are already arranged in the required order, then while loop takes $O(n)$ time.
- The average time complexity of quick sort is $O(n \log n)$.
- Therefore, total time taken including the sort is $O(n \log n)$.

Conclusion :

In this way, we have explored the concept of fractional knapsack using greedy method.

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