South China University of Technology

《Course》Experiment Report

Experiment Title： Experiment 2 The Knapsack Problem Solved by Greedy Algorithm

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Class： CST 2019 International Group： -

Collaborator： -

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| **Description** |
| 【Objective and Requirement】  Objective：  （1）Understand what is the knapsack problem and the 0/1 knapsack problem;  （2）Learn what is the greedy selection strategy and the greedy algorithm;  （3）Learn how to solve some optimal problem with greedy algorithm;  （4）Compare the greedy algorithm with some other algorithms such as: tree search algorithm.  Requirement：   1. The template should be used for all kinds of data type, such as: integer, real, double, etc. in the program; 2. Programs should be made by Object-Oriented Programming (OOP) method; 3. Use Greedy method and Search tree method to solve this problem. 4. And compare the results between the knapsack problem and the 0/1 knapsack problem. 5. Write down the report in which there should be the execution results of the program.   【Environment】  Operating System：Windows |
| **Content** |
| The comparison of the result from the execution Knapsack 0-1 with tree search and Fractional Knapsack with greedy approach ：  Weight is randomize with Items :  (P1, P2, P3, P4, P5, P6)=(25,24,15,18,22,35)  (W1, W2, W3, W4, W5, W6) = (12, 15, 10, 8, 9, 11)    Weight is randomize with Items :  (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10)=( 103, 102, 108, 161,152,112 ,122,113,179,122)  (W1, W2, W3, W4, W5, W6, W7, W8, W9, W10) = (46, 18, 75, 95,96,54,57,47,34,73)    In the [0-1 Knapsack problem](https://www.geeksforgeeks.org/dynamic-programming-set-10-0-1-knapsack-problem/), we are not allowed to break items. We either take the whole item or don’t take it.Time Complexity: O(2n) as there are redundant subproblems. Auxiliary Space is O(1) as no extra data structure has been used for storing values.  In **Fractional Knapsack,** we can break items for maximizing the total value of knapsack. This problem in which we can break an item is also called the fractional knapsack problem.  As main time taking step is sorting, the whole problem can be solved in O(n log n) only.  In this way Maximum profit can be earned via fractional knapsack with the highest value. |
| **Conclusion** |
| I have learnt the problem of knapsack and 0/1 knapsack and tried to solve them using greedy and tree search. |
| **Teacher’s Comments and Score** |
| Comment：  Score：           Signature：                                                 Date： |