Algorithms Design and Analysis [ETCS-301]

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Greedy Algorithm

- Used for optimization
- Always makes the choice that looks best at the moment
- makes a locally optimal choice in the hope that this choice will lead to a globally optimal solution
- Greedy algorithms do not always yield optimal solutions that means it can not be used for every problem
- If a problem can be solved using greedy that can also be solved using dynamic programming but not vice versa.
- Greedy algorithms are more faster than dynamic programming
- By nature dynamic programming follows bottom up and greedy follows top down approach

Elements of the greedy strategy I

Steps involved in greedy strategy:

1. Determine the optimal substructure of the problem.
2. Develop a recursive solution.
3. Show that if we make the greedy choice, then only one subproblem remains.
4. Prove that it is always safe to make the greedy choice.
5. Develop a recursive algorithm that implements the greedy strategy.
6. Convert the recursive algorithm to an iterative algorithm.

Elements of the greedy strategy II

More generally, we design greedy algorithms according to the following sequence of steps:

1. Design the optimization problem by selecting one as a choice and rest with the subproblem to solve
2. Prove that there is always an optimal solution to the original problem with greedy choice, and greedy choice is always safe.
3. Demonstrate optimal substructure by showing that if we combine an optimal solution of the the subproblem with main problem , we get an optimal solution to the original problem.

Elements of the greedy strategy III

Two key ingredients of greedy approach:

1. Optimal substructure: an optimal solution to the problem contains within it optimal solutions to subproblems. This property is a key ingredient of assessing the applicability of dynamic programming as well as greedy algorithms
2. Greedy-choice property: we can assemble a globally optimal solution by making locally optimal (greedy) choices.

Thank you

Please send your feedback or any queries to akyadav1@amity.edu, akyadav@akyadav.in or contact me on +91 9911375598