
Lab 10 - Greedy Algorithms

Theory

A greedy algorithm tries to make a locally optimal choice at each stage with the hope of finding a global optimum. This method applies to problems where from a set, say A, a subset, say B, must be selected, subject to some constraints. Once an element was selected, it is included in the final solution. Once excluded, it will never be examined again. This is the reason for which it has been called "greedy". The choice made by a greedy algorithm may depend on choices made so far, but not on future choices or all the solutions to the subproblem. It iteratively makes one greedy choice after another, reducing each given problem into a smaller one. In other words, a greedy algorithm never reconsiders its choices. This is what is called the greedy choice property. The method finds a single solution to the given problem. [1]

In general, greedy algorithms have five components: [1]

1. A candidate set, from which a solution is created
2. A selection function, which chooses the best candidate to be added to the solution
3. A feasibility function, used to determine if a candidate can be used to contribute to a solution
4. An objective function, which assigns a value to a solution, or a partial solution, and
5. A solution function, which will indicate when we have discovered a complete solution

Two variations of the method are generally used. The steps of variant one: [1]

1. Start with an empty B set.
2. Select an unselected element from set A. If there are no more unselected elements then stop.
3. If adding it to set B leads to a solution then add it to B. Else continue with step 2

The steps of variant two: [1]

1. Set the order used for taking elements of set A.
2. Select one current element from set A. If there are no more elements to take, then stop.
3. If including the current element into set B can lead to a possible solution, then add it to set B. Otherwise continue with step 2

Problems

1. a

Note: Leave a comment with the text PB1, PB2.A.II, ... PB10 above every function that implements the respective lab task. (upper case text, no space between the text and the problem number)

References

- [1] Marius Joldoş. *DSA Laboratory Guide 8: Greedy Algorithms*.