



MULTI-START METHODS

多起点方法



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Introduction

Background: Heuristic search procedures that aspire to find global optimal solutions to hard combinatorial optimization problems usually require some type of diversification to overcome local optimality.

Way: Re-start the search from a new solution once a region has been extensively explored.

Implement: Multi-start strategies can be used to guide the construction of new solutions in a long term horizon of the search process.

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Overview

Two phases



Generate solutions

Improve solutions

Initialise $i = 1$

while(Stopping condition is not satisfied)

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Step 1. (Generation)

Construct solution x_i

Step 2. (Search)

Apply a search method to improve x_i

Let x'_i be the solution obtained

if(x'_i improves the best)

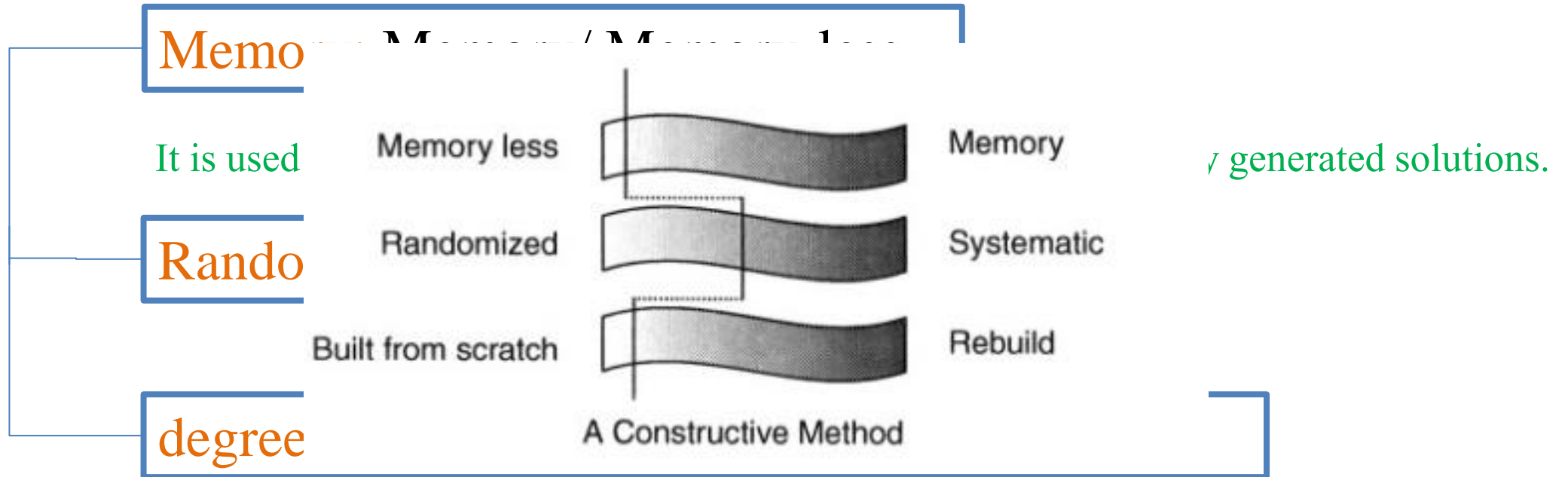
Update the best

$i = i + 1$

}

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CLASSIFICATION



indicates the elements that remain fixed from one generation to another

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Diversity Measures

Compute the distances between each solution and a “center” of the set of solutions P. The sum (or alternatively the average) of these $|P|$ distances provides a measure of the diversity of P.

$$(\textcircled{A}, B, C, D) \quad d_1 = |1 - 3| + |2 - 2| + |3 - 3| + |4 - 4| = 2$$

$$(B, D, C, \textcircled{A}) \quad d_2 = 4$$

$$(C, B, \textcircled{A}, D) \quad d_3 = 2.$$

$$d = 2 + 4 + 2 = 8.$$

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Diversity Measures

The second measure is calculated, for each pair of solutions in P , as the sum of the absolute differences between the positions of each element in both solutions. The sum of these $|P \times P|$ values provides the measure of the diversity of the set P .

(A, B, C, D)	$d'_{12} = 1 - 4 + 2 - 1 + 3 - 3 + 4 - 2 = 6$
(B, D, C, A)	$d'_{13} = 4$
(C, B, A, D)	$d'_{23} = 6$

$$d' = 6 + 4 + 6 = 16.$$

“ The notion of influence

The influence considers the potential and the structure of a solution in the search process.

Glover propose memory functions that classify moves relative to their attractiveness within “distance classes” and other measures of their impact.

If we identify some properties of good solutions we will be able to define evaluators and measures to reflect the “importance” or influence of the solutions.



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conclusions

The objective of this study has been to extend and advance the knowledge associated to implementing multi-start procedures. Unlike other well-known methods, it has not yet become widely implemented and tested as a metaheuristic itself for solving complex optimization problems. We have shown new ideas that have recently emerged within the multi-start area that add a clear potential to this framework which has yet to be fully explored.