CSE-318
Artificial Intelligence
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GRASP is a randomized multistart iterative method for computing good quality solutions of combinatorial optimization problems. Each GRASP iteration is usually made up of a construction phase, where a feasible solution is constructed, and a local search phase which starts at the constructed solution and applies iterative improvement until a locally optimal solution is found. Here we first construct partition in different method and apply local search for find locally optimal solution.

Semi-Greedy :
For semi-greedy, at first take alpha between 0 to 1. One edge is taken from the top (1-alpha) portion. Remaining $|V|$ - 2 vertices are examined one by one to find out the placement of which vertex to either one of the two partitions so that the weight of the partial cut constructed so far becomes maximum. When alpha is lower it includes more access of edges and vertices corresponding to their restricted list, which gives better approximation as we do not know which vertex has to choose for which partition in advance will be better.

Greedy :
Greedy is a variant of semi-greedy with alpha = 1. The higher value of alpha gives us a better split in the construction phase. Since alpha's highest value is 1 in the construction phase , greedy gives the best answer most of the time.

Randomized :
Initially, both partitions are empty. A vertex either puts it in set-1 or set-2 randomly with 50-50 probability. Since it is a complete random process the outcome reflects that. For test cases with only positive weighted edges, the answer is at least somewhat close to the answers obtained by other methods. But test cases that include negative weighted edges, error margin is much larger because when negative edges is selected, the wrong partition subtracts value from the final answer since adding negative to the answer reduces it.

Local Search:
The Local Search algorithm iteratively explores the neighborhood of the current solution, making moves that improve the number of cut edges. We will do it by adding a vertice in each partition and comparing which partition it is better. It continues until no further improvement is possible within a predefined number of iterations. We are stuck

in a local optima in this algo.Iteration does not require much if partition contrasts with larger alpha.

Summary:

In this experimental comparison of max-cut heuristic algorithms, we found that higher alpha constructs better partitions and gives us comparatively higher value max cut. So generally, greedy Algo gives better results than semi greedy. Semi greedy gives better results than randomized algorithms. In local search we need much iteration in randomized algorithms than greedy and semi greedy.