



Bangladesh University of
Engineering and Technology

ASSIGNMENT-3

Solving the Max-cut problem by GRASP

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Semi-Greedy Method in GRASP (Greedy Randomized Adaptive Search Procedure) for Max-Cut:

The Semi-Greedy method is an essential component of the GRASP algorithm, which is designed to find high-quality solutions to combinatorial optimization problems. The goal of GRASP is to iteratively improve solutions by combining constructive and local search phases. The Semi-Greedy method is used in the constructive phase to generate initial solutions based on a balance between greedy and random choices. The role of local search in the GRASP algorithm is to refine and improve the quality of solutions generated by the constructive phase by iteratively exploring the neighborhood of a solution. So, basically the solution got by semi greedy approach is improved by local search.

Randomized Approach:

The result of this algorithm is a random partitioning of the graph's vertices into two sets, X and Y. The randomness ensures that different runs of the algorithm can lead to different partitions. Since the partitioning is done with equal probabilities for each vertex, there is no specific strategy or heuristics guiding the placement of vertices into partitions. The algorithm aims to create a balanced partitioning by giving each vertex an equal chance of being in either set.

Greedy Approach:

The pure greedy approach for the Max-Cut problem is a simple heuristic that aims to find a partition of the graph's vertices into two sets, X and Y, by considering the edges with the highest weights. The pure greedy approach aims to maximize the cut weight by initially selecting vertices connected by the highest weight edge and then placing the remaining vertices in a way that maximizes the weights of the cut edges. However, this approach is not guaranteed to find the optimal solution, and it may get stuck in local optima. But pure greedy approach is simple and computationally efficient

OUTPUT Generation:

Problem			Constructive algorithm			Local search		GRASP		Known best solution or upper bound
						Simple local or local-1		GRASP-1		
Name	V or n	E or m	Simple Randomized or Randomized-1	Simple Greedy or Greedy-1	Semi-greedy-1	No. of iterations	Best value	No. of iterations	Best value	
G1	800	19176	9597	11307	11122	6	11367	100	11487	12078
G2	800	19176	9580	11243	11114	7	11178	100	11488	12084
G3	800	19176	9584	11217	11133	7	11447	100	11482	12077
G11	800	1600	18	494	431	2	456	50	523	627
G12	800	1600	-3	486	422	2	445	100	502	621
G15	800	4661	2327	2893	2912	2	2946	100	2971	3169
G16	800	4672	2335	2902	2916	2	2949	100	2973	3172
G22	2000	19990	10035	12841	12639	6	12881	20	12997	14123
G43	1000	9990	4983	6384	6297	5	6424	20	6517	7027
G45	1000	9990	4976	6407	6292	5	6500	50	6514	7020
G49	3000	6000	3005	6000	6000	1	6000	10	6000	6000
G14	800	4694	2338	2920	2933	2	2963	50	2993	3187
G24	2000	19990	10015	12769	12646	6	12901	10	13035	14131
G18	800	4694	50	811	790	4	840	10	875	906
G50	3000	6000	3025	5880	5851	1	5853	10	5874	5988