CSE 318 Assignment-03: Solving the Max-cut problem by GRASP

Student ID: 1905003, Section: A1

A brief report which summarizes and explains the output of the implemented solution. In this report, it is briefly explained which greedy or semi-greedy techniques or local search operators were implemented.

8/19/2023

Table 1 : Results Obtained from Various Test Graphs

Problem			Constructive Algorithm			Local-1		GRASP-1		
name	|V| or n	|E| or m	Randomized-1	Greedy-1	Semi-greedy-1	No. of Iterations	Best Value	No. of Iterations	Best Value	Known Best Solution
G11	800	1600	460	464	492	2.47	464.4	30	492	627
G13	800	1600	474	468	496	3	477.2	30	496	645
G12	800	1600	452	450	476	3	450	30	476	621
G15	800	4661	2922	2934	2958	3	2934	30	2958	3169
G16	800	4672	2937	2949	2965	3	2949	50	2965	3172
G14	800	4694	2955	2962	2971	3	2962	50	2971	3187
G1	800	19176	11454	11397	11433	15	11397	80	11454	12078
G43	1000	9990	6460	6409		8	6409	80	6460	7027

In this implementation, **the constructive phase of GRASP is implemented using the three heuristics, one at a time**. The values under each column of "Constructive Algorithm" are the best obtained values using that particular heuristic in the constructive phase of GRASP.

The "Best Value" of "Local-1" is obtained by taking the **maximum of the average number of local search iterations for different number of GRASP iterations**. That is, for example, for G11, it is observed that if we vary GRASP iterations like 20, 40, 50, 60, 80 and list average max-cut values of local search algorithm for each of them, the maximum of these average values is 464.4 and the corresponding iteration-count is 2.47, which is put in "No. of Iterations" column.

Next, the "Best Value" of "GRASP-1" is the maximum max-cut value obtained by varying the construction phase algorithm as well as the number of GRASP iterations.

And finally, the column "Known Best Solution" shows the experimentally obtained best max-cut value for each graph.

The `randomized_construction` is implemented using uniform random distribution to put a vertex in either partition.

The value of alpha in `semi_greedy_construction` is varied each time the heuristic function is called from the GRASP method using this line of code:

```
double alpha = rand() / RAND_MAX;
```