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

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Table : 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;