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Metaheuristic and Optimization - Assignment 2 Report

GWSAT:

GWSAT is a combination of GSAT and WalkSAT. Whether to select GSAT or WalkSAT for variable selection depends on the walk probability (wp). If the generated random number is less than the walk probability (wp) then variable to flip is selected using WalkSAT, otherwise GSAT is used.

The code for GWSAT has been implemented and can be found with the submitted file (Doshi_R00183334_GWSAT.py). Initially, GWSAT was evaluated on the basic configuration specified in the assignment document. This algorithm was evaluated on 3 different instances; ie uf20-01.cnf, uf20-02.cnf and uf50-01.cnf. The first 2 configuration files have 91 clauses and 20 variables each and the latter one have 218 clauses and 50 variables.

Note: *For each execution we are changing the random seed to bring more randomness in our solutions.*

instance name	Executions	Iterations	Restarts	wp	Valid Solutions	CPU runtime (seconds)
uf20-01.cnf	30	1000	10	0.4	30	0.76
uf20-02.cnf	30	1000	10	0.4	30	0.47
uf50-01.cnf	30	1000	10	0.4	19	141.42

The above table showcase the results of baseline evaluation as specified in the assignment. As we can observe that for all the instances we ran 30 executions and for each execution step we have 10 restarts and for each restart we have 1000 iterations. This means that in each restart maximum of 1000 variables can flipped. The column "total successful" indicates that how many executions provided valid solutions. So for uf20-01 and uf20-02, we got valid solution in all the execution steps and for uf50-01 we got only 19 valid solutions. But the runtime for all the instances are different. As we can see instance name **"uf20-02.cnf"** gave 30 valid solutions in just 0.47 seconds. On the other hand, uf20-21.cnf took around 0.76 seconds to generate 30 valid solutions. As the instance "uf50-01.cnf" is larger than the other 2 gave the same number of valid solutions in 141.42 seconds.