

NAME

qbsolv - minimize the objective function represented by a QUBO

SYNOPSIS

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qbsolv -i <input_file.qubo> [-o <output_file> [-w]] [-m] [-T  
<target_value>] [-a <algorithm>] [-t <num_seconds>] [-n  
<num_repeats>] [-S <subproblem_size>] [r <seed>] [-v  
<verbosity_level>] [-q] [-V] [-h]
```

DESCRIPTION

qbsolv executes the quadratic unconstrained binary optimization (QUBO) problem in the specified file. It provides bit-vector results that minimize or, optionally, maximize the value of the objective function represented by the QUBO problem. **qbsolv** typically executes in a hybrid fashion on a classical CPU and a quantum processing unit (QPU).

The problem must be in the QUBO(5) file format and is not limited to the size (number of variables), connectivity pattern, or numerical precision of the D-Wave system on which it will be executed.

OPTIONS

-i <input_file.qubo>

Name of the file (relative or absolute pathname) containing the input QUBO. The ".qubo" extension is by convention.

-o <output_file>

Optional. Name of the file (relative or absolute pathname) to which qbsolv will write results. If no file is specified, results are written to standard output.

-a algorithm

Optional. This optional argument chooses nuances of the outer loop algorithm. The default is o. 'o' for original qbsolv method. Submatrix based upon change in energy. 'p' for path relinking. Submatrix based upon differences of solutions

-w

Optional, in which case **-o** must also be specified. Prints the input QUBO matrix and the output result in .csv format to the specified output file.

-m

Optional. Specifies that **qbsolv** is to return the maximum value of the objective function instead of the minimum (default).

-T <target_value>

Optional. Target value of the objective function, expressed as an integer or floating-point number. When target value is reached, **qbsolv** stops the optimization process. Usually beneficial to specify only when the optimal value of the objective function has been analytically derived.

-t <num_seconds>

Optional. Number of seconds of elapsed CPU time consumed by the classically executing portion of **qbsolv** after which it stops the optimization process. The value may be specified as an integer or floating-point value. The elapsed CPU time is only checked after completion of the main loop, so the actual stop time may be more than the value. If options **-T** or **-n** are also specified, those limits may (depending on their values) stop **qbsolv** execution before the timeout is reached. The default value is 2,592,000.0 seconds (30 days).

-n <num_repeats>

Optional. Number of times that **qbsolv** is to repeat the main loop of the algorithm after a new optimal value is found. This value must be a positive integer. The default value is 40.

-r <seed>

Optional. Used to reset the seed for the random number generation

-S <subproblem_size>

This optional argument indicates the size of the subproblems into which the **QUBO** will be decomposed. A **"-S 0"** or **"-S"** argument not present indicates to use the size specified in the embedding file found in the workspace set up by DW. If a DW environment has not been established, the value will default to (47) and will use the tabu solver for subproblem solutions. If a value is specified, **qbsolv** uses that value to create subproblem and solve with the tabu solver. The ability to establish a DW environment is

dependent upon the proper installation of qOp tools on your system.

-v <verbosity_level>

Optional. Level of verbosity of the output. Values are as follows:

- **0** (default) outputs the number of bits in the solution, the solution itself, and the energy of the solution.
- **1** outputs the same information as above for multiple solutions, if found.
- **2** outputs more detailed information at each step of the algorithm.

-q

Optional. Prints the format of an arbitrary QUBO file and exits without running the program.

-v

Optional. Prints the version number of the **qbsolv** program and exits without running the program.

-h

Optional. Prints the help message for **qbsolv** and exits without running the program.

BUGS

Report any bugs to dwsupport@dwavesys.com.

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SEE ALSO

qubo(5)