NAME

qbsolv – minimize the objective function represented by a QUBO

SYNOPSIS

qbsolv -i <input_file.qubo> [-o <output_file> [-w]] [-m] [-T <target_value>] [-a <algorithm>] [-t <num_seconds>] [-n <num_repeats>] [-S <subproblem_size>] [-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.

-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.

-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 <u>dwsupport@dwavesys.com</u>.

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SEE ALSO

qubo(5)