IWLS 2022 Programming Contest

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The goal of the contest this year is to synthesize small circuits for completely-specified multi-output Boolean functions represented using truth tables.

The benchmarks provided to the participants include the binary truth tables specified in text files containing strings composed of 0's and 1's. Each line of the file represents one output function. All functions are assumed to depend on the same variables.

A simple solution to the problem could be to read the truth tables into ABC, apply factoring, convert the result into an AIG, and synthesize the resulting AIG (*read_truth -xf* ex00.truth*; collapse; sop; strash; dc2; write* ex00.aig*; print_stats*). For many practical functions, the solution produced by this flow is not efficient. Thus, it is expected that the participants come up with novel break-through methods to solve the problem instead of tweaking and optimizing the baseline ABC flow.

The idea is not to look for a single best method, but find competitive solutions for different benchmarks using a variety of methods, including search and enumeration, new Boolean decomposition algorithms for multi-output functions, putting together new tool flows, or perhaps an approach based on machine learning, which employs black box optimization/hyper-parameter search.

The deliverable is a zip file with AIG files ("ex00.aig", "ex01.aig", etc) generated for each input file ("ex00.truth", "ex01.truth", etc). The results are evaluated as follows:

(1) The AIGs are checked for functional equivalence against the input functions.

For example, AIG "ex00.aig", produced by synthesis, can be checked for equivalence with "ex00.truth" using ABC commands "*read_truth -xf* ex00.truth*; cec -n* ex00.aig".

(2) For all the participants who correctly solved a testcase, the score assigned for this testcase is equal to *100*<cost_of_best_solution>/<cost_of_this_solution>* where a solution cost is determined as the number of two-input AND nodes in the AIG. If a testcase is solved incorrectly or not submitted, the score for the testcase is 0.

For example, if a participant came up with a correct solution containing 53 AIG nodes, while the best solution for this testcase contains 41 AIG nodes, this participant will receive 100*41/53=77.35 points.

The winner of the competition is the participant with the highest average score across all testcases.