Adapting the Chemical Reaction Optimization Algorithm to the Printed Circuit Board Drilling Problem

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Abstract : Chemical Reaction Optimization (CRO) is an optimization metaheuristic inspired by the nature of chemical reactions as a natural process of transforming the substances from unstable to stable states. Starting with some unstable molecules with excessive energy, a sequence of interactions takes the set to a state of minimum energy. Researchers reported successful application of the algorithm in solving some engineering problems, like the quadratic assignment problem, with superior performance when compared with other optimization algorithms. We adapted this optimization algorithm to the Printed Circuit Board Drilling Problem (PCBDP) towards reducing the drilling time and hence improving the PCB manufacturing throughput. Although the PCBDP can be viewed as instance of the popular Traveling Salesman Problem (TSP), it has some characteristics that would require special attention to the transactions that explore the solution landscape. Experimental test results using the standard CROToolBox are not promising for practically sized problems, while it could find optimal solutions for artificial problems and small benchmarks as a proof of concept.