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Cultural Algorithms - A Tabu Search Approach for the Optimization of Engineering Design Problems

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Abstract: Cultural Algorithms and Tabu search algorithms are both powerful tools to solve intricate constrained engineering and large-scale multi-modal optimization problems. In this paper, we introduce a hybrid approach that combines Cultural Algorithms and Tabu search (CA?TS). Here, Tabu Search is used to transform History Knowledge in the Belief Space from a passive knowledge source to an active one. In each generation of the Cultural Algorithm, we calculate the best individual solution and then seek the best new neighbor of that solution in the social network for that population using Tabu search. In order to speed up the convergence process through knowledge dissemination, simple forms of social network topologies were used to describe the connectivity of individual solutions. This can reduce the number of needed generations while maintaining accuracy and increasing the search radius when needed. The integration of the Tabu search algorithm as a local enhancement process enables CA?TS to leap over false peaks and local optima. The proposed hybrid algorithm is applied to a set of complex non-linear constrained engineering optimization design problems. Furthermore, computational results are discussed to show that the algorithm can produce results that are comparable or superior to those of other well-known optimization algorithms from the literature, and can improve the performance and the speed of convergence with a reduced communication cost