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ON AN ADAPTIVE HARMONY SEARCH ALGORITHM

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Abstract. *This paper is concerned with the adaptive harmony search (AHS) algorithms for solving optimization problems. AHS employs adaptive method to adjust two important parameters, pitch adjusting rate (PAR) and bandwidth (bw). The proposed AHS algorithm is tested numerically and contrasted with improved harmony search (IHS) algorithm, particle swarm optimization (PSO) and simulated annealing (SA). Our simulation results reveal that AHS is superior to IHS, PSO, and SA in terms of robustness and efficiency. Finally, an engineering optimization problem is solved. And the result obtained using AHS algorithm is better than those reported previously in the literature.*
Keywords: Adaptive harmony search algorithm, Global optimization, Adaptive algorithm, Optimization problem

1. **Introduction.** Over the last four decades, a large number of algorithms have been developed to solve various engineering optimization problems. Hu et al. [1] solved the vehicle routing problems with heuristic transformation based simulation optimization algorithm. And Tan et al. [2] proposed an efficient global optimization approach for rough set based dimensionality reduction. Recently, Geem et al. [3] developed a new harmony search (HS) algorithm. In HS, the harmony in music is analogous to the optimization solution vector, and the musician's improvisations are analogous to local and global search schemes in optimization techniques. The HS algorithm does not require initial values for the decision variables. Furthermore, instead of a gradient search, the HS algorithm uses a stochastic random search that is based on the harmony memory considering rate and the pitch adjusting rate (PAR) so that any derivative information is unnecessary. Compared to earlier meta-heuristic optimization algorithms, the HS algorithm imposes fewer mathematical requirements.

The important of HS algorithm as a powerful tool for engineering optimization has been widely shown in the last few years. The various engineering optimization problems including the traveling salesman problem [3], optimization of river flood model [4], optimum design of water distribution network [5], optimum design of truss structures [6] and pressure vessel [7], and generalized orienteering problem [8] are solved.

HS is good at identifying the high performance regions of the solution space at a reasonable time, and it uses fixed value for both PAR and bw in fine-tuning of optimized solution vectors. However, HS is not efficient in performing local search for applications.