A Novel Hybrid Genetic Algorithm and Its Application to Inverse Problems in MEMS

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ABSTRACT

A novel hybrid genetic algorithm (GA) is proposed for global optimum searching of complex object functions. This new GA algorithm includes two hybridization operations. The first one attempts to improve the current best individual produced in each generation using a simple interpolation method. The second one is to ignite a hill-climbing search to move efficiently a randomly selected individual to its local optimum, when the first hybridization operation fails to improve the best fitness value in several consecutive generations. A large number of numerical examples have demonstrated that this new hybrid GA algorithm has an excellent convergence performance. It takes only 4.1% ~ 4.7% number of the function evaluations required by the conventional GA to reach the global optima for all the objective functions tested. Application of the present GA to the identification of the dynamic flow-pressure characteristic parameters in the valve-less micropumps is also presented to demonstrate the excellent performance of the present GA for inverse problems in MEMS.