A hybrid evolutionary algorithm for multimodal functions with application to the drug therapy of cancer

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Abstract : We present an optimal control strategy for nonlinear systems with application to the drug therapy of cancer. The tumor growth model is represented by a system of equations from population dynamics, which is based on the competition between normal cells and tumor cells. Heuristic optimization provides a robust and efficient approach for solving complex real-world problems. The focus of this research is on a hybrid method combining two heuristic optimization techniques, Genetic algorithms (GA) and particle swarm optimization (PSO), for the global optimization of multimodal functions. Denoted as GA-PSO, this hybrid technique incorporates concepts from GA and PSO and creates individuals in a new generation not only by crossover and mutation operations as found in GA but also by mechanisms of PSO.The proposed algorithm is tested on some standard constrained optimization functions. Satisfactory results obtained in the tests show that hybrid GA-PSO approach can effectively balance searching ability of global exploitation and local exploration and is superior to PSO and GA in the solution of complex optimization problems.

Keywords : Ma Optimal Control, Mathematical Modelling, Particle Swarm Optimization, Genetic Algorithm, Constrained Optimization

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