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MULTIOBJECTIVE OPTIMIZATION OF VEHICLE SUSPENSION FOR ROAD IRREGULARITIES BY MOQPSO

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Abstract: This paper describes a study on optimization of a half-car suspension model using a novel Multi-Objective Optimization based on Quantum Particle Swarm Algorithm (MOQPSO). Features like diversity, convergence, and spread of solutions are desirable characteristics in obtaining the Pareto front when performing Multi-Objective Optimization. The novelty of the algorithm relies on the main advantages of the Quantum Particle Swarm metaheuristic that allows robustness, speed, and accuracy of the solutions. Leader particles, an external archive for Pareto front and cluster avoidance by a tolerance distance are implemented in the proposed algorithm. The algorithm is used in the multiobjective optimization of a vehicle suspension and compared with a traditional algorithm (NSGA-II). It is used simple sinusoidal bumps and road profile irregularities, which are generated following ISO 8606 recommendations based on a model with spectral densities. Seat acceleration, suspension working-space, and ground reaction forces are the multiobjective functions. Suspension stiffness, damping, seat position are the assumed design variables. Comparisons with other authors are presented and similar results are obtained. Some remarks are reported related to the extreme solutions found on the Pareto front.