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Aerospace design optimization using a steady state real-coded genetic algorithm

Roy Hartfield
Auburn University, USA

This study demonstrates the advantages of using a real coded genetic algorithm (GA) for aerospace engineering design applications. The GA developed for this study runs steady state, meaning that after every function evaluation the worst performer is determined and that worst performer is then thrown out and replaced by a new member that has been evaluated. The new member is produced by mating two successful parents through a crossover routine, and then mutating that new member. To demonstrate the utility of this approach, study three different preliminary design studies were conducted using both a binary and a real coded GA including a Single Stage Solid Propellant Missile Systems Design, a Two Stage Solid Propellant Missile Systems Design and a Single Stage Liquid Propellant Missile Systems Design. This algorithm has been used for other aerospace applications including matching data for an aeroacoustic study, designing nose cones for missiles, designing aircraft wings, and designing solid rocket motor grains geometries. Results for a range of the aerospace applications using the real coded Genetic Algorithm will be presented at the conference. In some cases, a comparative analysis between results obtained using the Real coded GA and other stochastic optimizers will be presented.

Biography

Roy Hartfield, Walt and Virginia Woltosz Professor of Aerospace Engineering in the Department of Aerospace Engineering at Auburn University, received his Ph.D. in Mechanical and Aerospace Engineering from the University of Virginia in 1991. Hartsfield's research areas have included engine development, aerodynamic measurement technology, propulsion, aerodynamics, missile system modeling, optimization, and risk assessment for unmanned aerial vehicles. His research has been sponsored by the Army, NASA, DoD, FAA, USAF, NSF, and private companies. Dr. Hartfield has published 25 referred journal articles and approximately 75 peer reviewed conference papers.

HARTFRJ@auburn.edu