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Mesh Adaptive Direct Search Algorithms

The Mesh Adaptive Direct Search (MADS) class of derivative-free algorithms is effective for industrial strength nonlinear inequality constrained optimization. It has been incorporated into the MATLAB GADS package.

MADS is the direct result of applying nonsmooth analysis to GPS, an earlier class of similar algorithms. This powerful tools of nonsmooth analysis made clear GPS deficiencies glossed over by assuming smoothness. MADS has a satisfying convergence theory based on the Clarke calculus and Rockafeller's notion of a hypertangent cone.

MADS replaced GPS in our NOMAD software presently in use by our industrial collaborators. It is applicable to a wider class of problems than GPS, including yes/no constraints, and in all trials to date, MADS is more reliable and efficient.

This research was done in collaboration with Professor Charles Audet of Ecole Polytechnique de Montréal.