

---

# A family of hybrid algorithms for optimization and diagnostics of hydromechanical systems

© V.D. Sulimov, P.M. Shkapov

Bauman Moscow State Technical University, Moscow, 105005, Russia

*Parametric optimization problems for hydromechanical systems with continuous not everywhere differentiable multiextremal criteria both in scalar and in vector statement are considered. Global solutions for individual criterion are determined using new hybrid algorithms that combine the Metropolis algorithm and deterministic methods for local search. The vector optimization algorithms generate a set of non-dominated solutions which constitute Pareto-optimal front approximations. The proposed hybrid algorithms can be applicable for computational diagnostics systems, design optimization, complex dynamic systems control.*

**Keywords:** *global optimization, criterion function, Lipschitz condition, smoothing approximation, Metropolis algorithm, multi-objective optimization, Pareto edge, hybrid algorithm*

**Sulimov V.D.** (b. 1950) graduated from Bauman Moscow Higher Technical School in 1973. Senior Lecturer of the Theoretical Mechanics Department of Bauman Moscow State Technical University. Author of more than 50 publications in the field of dynamic systems, mathematical modeling and optimization. e-mail: [spm@bmstu.ru](mailto:spm@bmstu.ru)

**Shkapov P.M.** (b. 1954) graduated from Bauman Moscow Higher Technical School in 1977. Dr. Sci. (Eng.), Head of the Department of Theoretical Mechanics named after Professor N.E. Zhukovsky at Bauman Moscow State Technical University, a member of the Presidium of the Scientific and Methodological Council on theoretical mechanics at the Ministry of Education and Science of the Russian Federation. Author of more than 100 publications on the dynamics of mechanical and hydro-mechanical systems, mathematical modeling and calculation of cavitation and two-phase flow in piping systems, the optimization and diagnosis of dynamic systems. e-mail: [spm@bmstu.ru](mailto:spm@bmstu.ru)

---