Global extremum search algorithms in the optimal control problems

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We consider several families of heuristic algorithms, oriented to the solution of nonconvex optimal control problems.

The method of random multi-start includes four generation algorithms of random admissible controls, algorithms of selection of local extremum and estimation algorithms of volumes of attraction domains. Proposed algorithms are realized in the form of additional program module to software OPTCON-1, which used as a tool for the solution of local problems [1].

Convexication methods, which are rested on the property of concealed convexity of the optimal control problems, are based on the theoretical results of R.Gamkrelidze, B.Morduchovich, A.Tolstonogov and other athours. Convexication method assumes construction of extended problem of large dimension. The optimal value of the cost functional coincides with solution of initial problem. To solve of extended optimal control problem, the local optimization algorithms are used.

Reduction methods to the finite-dimensional extreme problems are based on the technology of a sequential increase in the accuracy of approximation of initial optimal control problem via the problem of mathematical programming.

Methods based on the approximations of attainability set rest on the computational technologies, developed by us for solution of the phase evaluation problems. Using internal approximations of the integral funnel of controlled system, we find sufficiently good approximation , which is refined by the local methods [2].

Developed algorithms served as a basis for the functional filling of software OPTCON-III, oriented to the solution of nonconvex optimal control problems [3-4]. The properties of algorithms are investigated on the collection of test problems, which includes more than 80 model examples from various sources.

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References

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