



# Russian Academy of Sciences Program Systems Institute

## Control Processes Research Center

Director of the Center: Doctor Vladimir I. Gurman. The staff of the Center consists of 12 researchers, including one Academician of RAS, 3 Doctors of science, and 3 Candidates of science.

### DIRECTIONS OF RESEARCH

#### Extension Principle and degenerate optimal control problems

On the basis of the extension principle, a series of new non-traditional optimal control methods were proposed which proved effective for theoretically complicated degenerate problems with turnpike solutions

#### Geometric Control Theory

Differential-geometric methods are applied to controllability and optimal control problems: global controllability of invariant systems on Lie groups and homogeneous spaces, optimal control and path-planning problems of sub-Riemannian geometry. Results obtained are systematically presented in books

#### Control of oscillations

Oscillation processes described by the wave equation with boundary conditions of the first, second, third kind, and of mixed type, are studied.

The problem on control of oscillations in a multi-link elastic system under restricted control resource was studied. Research is oriented towards applications to large space constructions

#### Algorithms and program tools for modeling and control

New iterative first- and second-order algorithms for search and locally optimal synthesis of control, based on sufficient local optimality conditions and local representation of attainable sets, and a scheme for successive improvement of a model, with wide adaptation possibilities to applications, were developed.

New methods for approximate synthesis of optimal control are developed on the basis of approximation of Bellman equation and trajectory reconstruction of Krotov-Bellman function.

New iterative first- and second-order algorithms for search A concept and experimental version of an intellectual system for control optimization were developed and accompanied by the corresponding program complex and tutorial for design and application of multi-method procedures of optimal control search.

A web site devoted to the project with description of intelligent multi-method system, algorithms, and test problems, was developed(<http://www.botik.ru/~cprc/ISOU/>).

#### Regional research on the basis of Pereslavl region

1) Analysis of innovation activity at large enterprises of the region, including innovations of ecological and management innovations.

2) Analysis of impact of innovation activity on economics and environment of a region.

3) Development of mathematical socio-ecologic-economic model of a region with regard for innovation processes, application of the model to investigation of optimal strategies and sustainable development scenarios.

#### ADDRESS

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