

PARAMETRIC OPTIMAL CONTROL PROBLEMS

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The problem of dependence of solutions to optimal control problems on a parameter is a subject of intensive studies. The reason for this lies in the fact that while modeling complex control systems perturbations and uncertainties appearing in dynamic models may be modeled by parameters entering the dynamic equations, boundary conditions, state and control constraints. Sensitivity analysis of the solutions depending on parameters allows to evaluate the changes in the solutions caused by “small” perturbations in the parameters. Moreover, studies of dependence of solutions on the parameters form the basis for the methods of constructing solutions of extremal problems by means of path-following methods and are used for constructing feedback controls.

Most of the papers on the subject perform the sensitivity analysis and investigate the dependence of solutions of optimal control problems on a parameter under assumption that the solution of the “unperturbed” system is regular for all values of the parameter. However, in feedback control and in path-following methods there occur situations when it is necessary to know the behavior of solutions in a neighborhood of an irregular (bifurcation) point. Therefore the knowledge of the behavior of solutions in a neighborhood of irregular points is of major importance.

The talk is devoted to the construction of solutions to a family of one parametric optimal control problems with state and control constraints. The main attention is paid to irregular (bifurcation) points. We investigate general case where we do not imply any restrictions on the order of the system and on the number of switching points of the optimal control and on an order of irregularity.

The outline of the talk is the following

- Problem statement
- Solution structure and defining elements
- Properties of solutions to control problems in a neighborhood of regular point.
- Properties of the solutions in a neighborhood of an irregular point.
 - construction of new Lagrange vector
 - construction of new solution structure and defining elements
 - constructing solutions to perturbed control problems
- Generalizations