

BOOK REVIEW

Investigation of Optimal Processes with Delay in the Presence of Constraints

M.Dj.Mardanov (Baku, "Elm"-2009.- 192 p.p., ISBN 978-9952-453-48-5. In Russian)

Reviewed by R.Gabasov*

Optimality conditions of controls occupied and continue to occupy the central place in classical and nonclassical calculus of variations. The peak of this process took place in the 60's and 70's of the last century. Now general mathematical methods have been developed enough to obtain optimality conditions (Mordukhovich V. Sh. Variation Analysis and Differentiation. Parts 1, 2., Springer Verlag. Berlin, 2006.)

In the considered monograph optimality conditions of the first and second order for controls are investigated to the processes described by ordinary differential equations with retarded argument. A sufficiently simple method is used by the author based on finite-dimensional approximations of the original problem and penalty functions.

In Chapter 1, the first order optimality conditions are studied. First (§1) the suggested method is demonstrated on ordinary systems. Then (§2) systems with delay are considered. The case of measurable control actions considered in §3. Next (§4) the relationship between the regularity of constraints and nondegeneracy of the maximum principle is discussed. The maximum principle for systems with delays in the class of generalized control actions is proved in §5. Systems of neutral type and generalized control actions are given in §6.

Chapter 2 is devoted to second order optimality conditions. Here the necessary conditions of optimality to systems with delay (§1), the necessary conditions of optimality of the Legendre - Clebsch type are considered (§2). In §3 sufficient conditions for optimality are studied. Necessary conditions for singular control actions are investigated in §4. In conclusion (§5) the second order necessary conditions of optimality (in classical sense) of generalized control actions are given.

Thus, in the book "Investigation of optimal processes with delays in the presence of constraints" by M. Dj. Mardanov a sufficiently wide class of problems of mathematical theory of optimal control is discussed. Optimal processes with delay are investigated, the first and second order optimality conditions to systems with constraints described by differential equations with delays are obtained.

The monograph may be useful in forming special courses on additional chapters of mathematical theory of optimal processes at Universities.

* Professor of Department of Optimal Control Methods of the Belarusian State University, Minsk, Republic of Belarus.