TRUDY INSTITUTA MATEMATIKI I MEKHANIKI UrO RAN

Vol. 22 No. 2 **2016**

MSC: 49K20

DOI: 10.21538/0134-4889-2016-22-2-163-176

ON THE PROPERTY OF EQUAL RATIOS IN THE PROBLEM OF BOUNDARY VECTOR CONTROL OF ELASTIC VIBRATIONS DESCRIBED BY FREDHOLM INTEGRO-DIFFERENTIAL EQUATIONS

Received January 20, 2016

A. K. Kerimbekov, E. F. Abdyldaeva

We study the nonlinear problem of optimal control of elastic vibrations described by Fredholm integro-differential equations in the case where the control is performed by boundary sources. In the study we use the notion of generalized solution of the boundary value problem for a control process. Optimality conditions in the form of systems of equalities and inequalities are obtained from the maximum principle for systems with distributed parameters. It is found that the optimality conditions in the form of equalities have the property of equal ratios. This circumstance allowed us to simplify the construction procedures both for the optimal vector control and for the complete solution of the nonlinear optimization problem. We also simplified the optimality conditions in the form of inequalities and found the components of the optimal vector control by solving only one scalar nonlinear integral equation. An algorithm is developed for the construction of solutions of the system of nonlinear integral equations and of the nonlinear optimization problem.

Keywords: generalized solution, optimal control, functional, maximum principle, system of nonlinear integral equations, property of equal ratios.

A.K. Kerimbekov, Dr. Phys.-Math. Sci., Prof., Kyrgyz-Russian Slavic University named after B.N. Yeltsin, The Kyrgyz Republic, Bishkek, 720000, e-mail: akl7@rambler.ru .

E.F. Abdyldaeva, Cand. Sci. (Phys.-Math.), associate Professor, Institute of Theoretical and Applied Mathematics of National Academy of Sciences of the Kyrgyz Republic, Bishkek, 720070; Kyrgyz-Turkish University "Manas", the Kyrgyz Republic, Bishkek, 720044, e-mail: efa_69@mail.ru .

Cite this article as:
A. K. Kerimbekov, E. F. Abdyldaeva. On the property of equal ratios in the problem of boundary vector control of elastic vibrations described by Fredholm integro-differential equations, *Trudy Inst. Mat. Mekh. UrO RAN*, 2016, vol. 22, no. 2, pp. 163–176.