ON THE SLIDING REGIMES IN THE PROCESSES, DESCRIBED BY THE THIRD ORDER NONLINEAR EQUATION

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At the solution of many optimal control problems frequently arises such situation: lengthways minimizing sequences the quality criterion converges to its minimum, the sequence of admissible control converges to the function, which are not being admissible control, and the sequence of the solutions of the equation, describing process, converges to the function which does not corresponding to any admissible control.

In such cases is said, that the minimum is reached on a sliding regime.

In the given work some properties of the sliding regimes in the minimization problem for the functional

$$I(u) = \int_Q \Phi(x,t,z,z_x,z_t,u)dxdt$$

is investigated on solutions of the system

$$\beta z_{tt} + z_t - \varepsilon \frac{\partial^2}{\partial x \partial t} F_1(z_x) - \frac{\partial}{\partial t} F(z_x) = f_1(x,t,u), \quad (x,t) \in Q = (0,1)\times(0,T), \tag{1}$$

$$z(0,t) = z(1,t) = 0, \quad z(x,0) = z_0(x), \quad z_t(x,0) = z_1(x), \tag{2}$$

where T is given number, β, ε are positive constants, $u(x,t) = (u_1(x,t),...,u_r(x,t))$ is vector of the control functions, which are measurable on Q vector functions with values from $U \subset R^r$. A class of such functions $u(x,t)$ we denote by σ_U. Alongside with this problem we consider the problem of the minimization of the functional

$$I(z,\mu) = \int_Q \langle \Phi(x,t,z,z_x,z_t,u), \mu_{x,t} \rangle dxdt, \quad \langle \cdot, \mu_{x,t} \rangle = \int_{R^r} (\cdot) d\mu_{x,t}$$

on the solutions of the equation

$$\beta z_{tt} + z_t - \varepsilon \frac{\partial^2}{\partial x \partial t} F_1(z_x) - \frac{\partial}{\partial x} F(z_x) = \langle f_1(x,t,u), \mu_{x,t} \rangle, \ (x,t) \in Q = (0,1)\times(0,T) \tag{3}$$

satisfying the conditions (2), where as the generalized control are taken weakly measurable and finite set of probability Rodon measures $\mu_{x,t}$ [1], concentrated on U. A class of such $\mu_{x,t}$ we denote by Ω_U.

The conditions providing existence of regular solutions of systems (1), (2) and (3), (2) are imposed on the functions $F_1(s), F(s), f_1(x,t,u)$, belonging to $W(Q)$ [2].

Sets of the solutions of these systems we denote by G_0 and G accordingly.

Each element of the set $G \setminus G_0$ we call a generalized regime, and a pair $(z, \mu_{x,t}) \in (G \setminus G_0) \times \Omega_U \setminus \sigma_U)$, in which $z(x,t)$ corresponds to $\mu_{x,t}$ - a sliding regime.

In this work using the results [3] on weakly compactness in the sense of convergence on one-dimensional sections in work the following theorems are proved.

Theorem 1. Set G is weakly closed in the sense of convergence in $W(Q)$ and weakly convergence over one-dimensional sections of corresponding sequence of the generalized control.

Theorem 2. Weak closure of the set G_0 in space $W(Q)$ coincides with G.

References

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