

Optimization Problems for the Functional Differential Equation with General Variable Delays and the Mixed Initial Condition

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For the functional differential equation with delayed arguments

$$\dot{x}(t) = \begin{pmatrix} \dot{p}(t) \\ \dot{z}(t) \end{pmatrix} = f(t, p(\tau_1(t)), \dots, p(\tau_s(t)), z(\sigma_1(t)), \dots, z(\sigma_m(t)), u(\theta_1(t)), \dots, u(\theta_v(t)), t \in [t_0, t_1] \in I = [a, b]$$

with the mixed initial condition

$$\begin{cases} p(t) = \varphi(t), t < t_0, p(t_0) = p_0, \\ z(t) = g(t), t \leq t_0 \end{cases}$$

an optimization problem of element

$$(t_0, t_1, p_0, \phi(\cdot), g(\cdot), u(\cdot)) \in I \times I \times P \times \Phi \times G \times \Omega$$

is investigated in the case of nonlinear boundary conditions and functional.

On the basis of variation formulas of solution [1] and by a scheme given in [2], necessary conditions of optimality are obtained: in the form of linearized maximum principle for control and initial function, in the form of equalities and inequalities for initial and final moments.

References

- [1] L. Alkhazisvili and M. Jordanisvili, *Local variation formulas for solution of delay controlled differential equation with initial condition. Mem. Differential Equations Math. Phys.*, **51** (2010) 17-41.
- [2] G.L. Kharatisvili and T.A. Tadumadze, *Formulas for the variation of a solution and optimal control problems for differential equations with retarded arguments. J. Math. Sci (N.Y)* **140**(2007), No1, 1-175.