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Syntheses of Optimal Controls

Norimasa NOMURA*

The optimal control theory of a system described by a linear differential equation had been formulated using the maximum principle by L. S. Pontryagin. This result makes it possible to find optimal control functions in terms of a solution of the system's adjoint differential equation. But, if one wishes actually to compute the optimal control by use of this principle, one meets a great difficulty, because initial values of the adjoint equation are unknown. Then the method of reverse integration has been used by many researchers until now, in order to find the optimal control. This method, however, has serious drawbacks in the engineering sense, because it is basically a trial and error method with no guarantee of convergence and restricted to autonomous system. Therefore, L. W. Neustadt's method for computing the initial values of the adjoint equation is more powerful than the other methods, because of its rigorous mathematical basis and its wide applicability. In this paper the problem is restricted to a minimum time problem and we compute the initial values of the adjoint equation using Neustadt's method. This research was made chiefly by an electronic computer, UNIVAC III and TOSBAC-3400. The following investigations are made : (1) Syntheses of optimal control in the most well known oscillatory system was dealt with, (2) Syntheses of a time-variant system (Mathieu's equation) was also dealt with. In both cases the solutions converge by several iterations.

*野 村 典 正