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ALGORITHMS FOR SOLVING DISCRETE OPTIMAL CONTROL PROBLEMS WITH VARYING TIME OF STATES' TRANSACTIONS OF DYNAMICAL SYSTEMS

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Abstract. We consider a class of discrete optimal control problems for which the transition time of system's passage from one state to another vary in time. Dynamic programming algorithms for finding optimal solutions of the problems with integral time cost of system's passage by a trajectory are proposed. Some extensions and generalizations of the proposed algorithms for solving control problems on general networks (for example financial applications) are discussed. The results can be used on special energy and financial network (grid) structures.

Keywords. Discrete Optimal Control; Transition-Time Function; Dynamic Programming; Control Problem on Financial Network.

AMS (MOS) subject classification: 90C39; 49L20.

1 Introduction and Problem Formulation

In this paper we study some versions of the classical discrete optimal control problem from [1–4] when the transition time of system's passage from one state to another may vary in time. The main results are concerned with dynamic programming techniques for determining the solution of the considered problems and their variants on networks. The basic problem we will use for an extension and generalization is the following:

Let the discrete dynamical system L with the finite set of states $X \subseteq R^n$ be given. At every discrete moment of time $t = 0, 1, 2, \ldots$ the state of L is $x(t) \in X$. The starting state $x_0 = x(0)$ and the final state x_f are fixed. Assume, that the dynamical system should reach the final state x_f at the time moment $T(x_f)$ such that

$$T_1 \leq T(x_f) \leq T_2$$