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TURNPIKE PROPERTIES OF SOLUTIONS FOR A CLASS OF OPTIMAL CONTROL PROBLEMS WITH APPLICATIONS TO A FOREST MANAGEMENT PROBLEM

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Dedicated to Professor N.U. Ahmed on the occasion of his 75th birthday

Abstract. In this paper we establish turnpike results for a class of discrete-time optimal control problems. These results describe the structure of approximate solutions which is independent of the length of the interval, for all sufficiently large intervals. We also consider an application of our results to a forest management problem.

Keywords. Compact metric space, forest management problem, infinite horizon, overtaking optimal program, turnpike property.

AMS (MOS) subject classification: 49J99.

1 Introduction

In recent years it has become more and more evident that the mathematical control theory is of great importance in studies of numerous applied problems in various areas of research. See, for for example, [1, 2, 28, 36, 37, 44] and the references mentioned therein. The study of the existence and the structure of (approximate) solutions of optimal control problems defined on infinite intervals and on sufficiently large intervals has recently been a rapidly growing area of research [5-9, 11, 12, 14- 17, 20-23, 27, 29, 31-33, 44]. These problems arise in engineering [3, 18], in models of economic growth [13, 21, 25, 34, 35, 38, 44], in infinite discrete models of solid-state physics related to dislocations in one-dimensional crystals [4, 39] and in the theory of thermodynamical equilibrium for materials [10, 19, 24]. In this paper we study a general class of discrete-time optimal control problems with applications in a forest management problem studied in [16, 26, 30, 33, 35, 45, 46]. For this class of discrete-time optimal control problems we establish turnpike results describing the structure of approximate solutions which is independent of the length of the interval, for all sufficiently large intervals.

Let (K, ρ) be a compact metric space and let Ω be a nonempty closed subset of $K \times K$.