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MUTIDIMENSIONAL SHIFTS AND FINITE MATRICES

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Abstract. Let X be a multi-dimensional subshift of finite type generated by a finite set of finite forbidden blocks. We give an algorithm for generating the elements of the shift space using a sequence of finite matrices (of increasing order). We prove that the sequence generated yields precisely the elements of the shift space X and hence characterizes the elements of the shift space X. In the process, we prove that elements of d-dimensional shift of finite type can be characterized by a sequence of finite matrices.

1. Introduction

Symbolic dynamics have been used in recent times to approximate the behavior of various physical and natural processes occurring around us. The subject has found applications not only in various branches of sciences and engineering but has also been used to study topological dynamics and ergodic theory. The simpler structure and easier visualization of the topic makes it attractive and has gained the attention of several researchers across the globe. Consequently, qualitative analysis in the subject has gained attention and many interesting results have been obtained. Such studies have not only enriched the literature but has also provided greater insight into the theory of ergodic theory and dynamical systems. While Jacques Hadamard applied the theory of symbolic dynamics to study the geodesic flows on surfaces of negative curvature [4], Claude Shennon used symbolic dynamics to develop the mathematical theory of communication systems [2]. In recent times, the topic has found applications in areas like data storage, data transmission, control networks and modelling of gene networks[3, 7, 11]. In recent times, multidimensional symbolic dynamics

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