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Exposing Graph Uniformities via Algebraic Specification*

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Abstract. This survey acknowledges an intellectual debt to Bob McNaughton. In 1968 I turned my research focus to the study of structural uniformities in graphs, motivated by the desire to study theoretical aspects of data structures. The approach that I took in this study was influenced heavily by the algebra-based study of structure in finite automata initiated in the mid-1960s by Bob and others. Their successes in using the syntactic monoid of an automaton to study its structure convinced me to base my study on a monoid-theoretic specification of graphs. The study of what I termed *data graphs* occupied me for the next 4–5 years; the insights garnered during that period have served me well since, in a variety of disparate contexts. Indeed, when I began to focus on the study of structural uniformities in the interconnection networks of parallel architectures, in the mid-1980s, it was second nature to me to base this study also on a monoid-theoretic specification of the graphs underlying the interconnection networks. This paper is a brief survey of the highlights of my studies of uniformities in algebraically specified graphs. It is both fitting and pleasureful to dedicate this survey to Bob McNaughton, a wise mentor and a man of vision.

1. Introduction

The Theory of Computation, as it has evolved since the 1930s, has been predominantly a logical and combinatorial theory. Yet, on a number of occasions, Theory has found it fruitful to study algebraic specifications of its logical or combinatorial

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