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Preface

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This volume contains a collection of articles that present different mathematical approaches to languages. Languages can be natural or formal/artificial. In both cases, we can define a language as a set of sentences, where a sentence is a finite string of symbols over an alphabet. Therefore, languages, natural or artificial, are particular cases of symbol systems. The manipulation of symbols is the stem of formal language theory. The theory of formal languages mainly originated from *mathematics* and *linguistics*. From the area of mathematics, A. Thue and E. Post introduced the formal notion of a rewriting system, while A. Turing introduced the general idea of finding models of computing where the power of a model could be described by the complexity of the language it generates/accepts. From linguistics, the study of grammars and the grammatical structure of a language were initiated by N. Chomsky in the 1950s. Chomsky introduced his grammar hierarchy as a tool for modeling and investigating syntax of natural languages. After 1964, formal language theory developed as a separate branch with specific problems, techniques and results and since then it has had an important role in the field of computer science; in fact it is considered as the stem of theoretical computer science.

Taking into account the achievements of the theory of formal languages, its initial linguistic motivation and its important role in computation, it is not possible to do without this research area in the study of computing languages,

either formal or natural. Being part of what is called theoretical computer science, nobody doubts about the adequacy of formal language theory in the field of programming languages. What is maybe not so obvious is that all those devices can be very useful in the description, analysis and processing of natural languages.

We live within an information society in which there is a need of having a linguistic technology to deal with information. Language technologies can enrich our computation environment with many of the natural functions characteristic of human language. Language technologies demand formal models that are able to capture the general structure of language and that, at the same time, are efficient from the computational point of view. Formal language theory can offer language technologies the mathematical tools they need for the definition of formal mechanisms for dealing with natural languages. Therefore, the application of formal languages to the description of natural language can throw up interesting results in the field of natural language research, both by reformulating the way of describing and explaining natural language and by providing formal models for linguistic manipulation that can be useful for machine translation, natural language generation, human-computer interfaces and all the areas in the field of artificial intelligence that imply the processing of natural language.

The articles included in this volume are extended and improved versions of works that have been previously presented and discussed at the weekly seminars organized by the Research Group on Mathematical Linguistics (GRLMC) in the Universitat Rovira i Virgili (Tarragona, Spain).

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