COMBINED POWER OF X-MACHINES AND P SYSTEMS

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An overview of the main interactions between X-machines and P systems is presented. It is shown how new variants of P systems can be obtained by using X-machines as internal structures of these systems. Conversions between these models are discussed and ways to test P systems using X-machine based testing techniques are described. Finally, some flexible methods to implement different P system semantics fragments are briefly discussed.

Key words: design for testing conditions, design patterns, Eilenberg P systems, Finite State Machines, P systems, X-machines.

1. Introduction

The X-machine[3] model was introduced by Eilenberg [6] as a very generic computational mechanism that consists of an underlying finite state machine [18] with functions associated with transitions. This machine is general enough to allow to get well-known state machines as special cases. After more than a decade it was reconsidered by Holcombe [9] as a specification language for dynamic systems with a very compact, but intuitive, notation and an associated diagram. Soon it became apparent that its similarity to finite state machine model will lead to considering other developments for this model. Indeed, soon after the X-machine model was utilised as a formal specification mechanism, it was associated to various testing techniques, initially derived directly from the finite state machine testing approaches. Later developments in the testing area led to specific testing strategies associated with X-machines. A research monograph [10] summarises the research achievements in this field by the end of 1990's. In the last decade this model has been utilised to describe and simulate complex systems and to generate more powerful and effective models, as well as to complement the capabilities of other computational models.

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[3] In 2002, at the WMC3 meeting, professor Solomon Marcus suggested us to use Eilenberg machine instead; as there is a large body of research that is still using the *X*-machine concept, we will refer to both in this paper.