

PROCESS SEMANTICS FOR MEMBRANE SYSTEMS

JETTY KLEIJN

LIACS, Leiden University
P.O. Box 9512, NL-2300 RA Leiden, The Netherlands
e-mail: kleijn@liacs.nl

MACIEJ KOUTNY

School of Computing Science, University of Newcastle
Newcastle upon Tyne, NE1 7RU, United Kingdom
e-mail: maciej.koutny@ncl.ac.uk

and

GRZEGORZ ROZENBERG

LIACS, Leiden University
P.O.Box 9512, NL-2300 RA Leiden, The Netherlands
and
Department of Computer Science, University of Colorado at Boulder
Boulder, CO 80309-0347, USA
e-mail: rozenber@liacs.nl

ABSTRACT

A process model based on Petri nets is proposed to describe the structure of the behaviour of basic membrane systems. In [12], a systematic and structural link has been established between a basic class of membrane systems and Petri nets. To capture the compartmentisation of membrane systems, Place/Transition nets with explicit localities have been introduced. Each locality identifies a distinct set of transitions which may only be executed synchronously, i. e., in a locally maximal concurrent manner. Here, we develop the notion of a process for these nets. The resulting formalism should be of use in the investigation of the ways in which computations of membrane systems can evolve.

Keywords: Membrane systems, Petri nets, localities, GALS, processes, causality

1. Introduction

Membrane systems, also known as *P systems*, have become a prominent new computational model [1, 16, 17, 18]. They are inspired by the way living cells are divided by membranes into compartments where chemical reactions may take place. These reactions transform multisets of objects (molecules) present in the compartments into