

1D/2D Cellular Automata Modeling with Modelica

Victorino Sanz[†] Alfonso Urquia[†] Alberto Leva[‡]

[†] Dpto. Informática y Automática, ETSI Informática, UNED

Juan del Rosal, 16, 28040, Madrid, Spain

{vsanz,aurquia}@dia.uned.es

[‡] Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano

Piazza Leonardo da Vinci 32, 20133 Milano, Italy

leva@elet.polimi.it

Cellular Automata (CA) can be used to describe dynamic phenomena dependent of the spatial coordinates. This approach exhibits two main advantages: CA models are conceptually simple and can be simulated very efficiently. A new Modelica library named *CellularAutomataLib* is presented. It facilitates describing one- and two-dimensional CA in Modelica, and interfacing these CA models with other Modelica models. Simulation performance and large model support have been highest priority in the design of the library. To achieve these goals, the CA internal description is programmed in C and it is consequently hidden to the modeling environment, which is released from the burden of causalizing and manipulating the millions of equations that typically compose CA models. The library architecture and use are discussed in this manuscript. Two examples illustrate the library use: heat diffusion on a chip and spread of an epidemic disease. *CellularAutomataLib* is freely available at <http://www.euclides.dia.uned.es>