On the cost of sequentialisation of Automata networks

Florian Bridoux[*1]

[1]Laboratoire dínformatique Fondamentale de Marseille (LIF) – Aix Marseille Université : UMR7279,
Ecole Centrale de Marseille : UMR7279, Centre National de la Recherche Scientifique : UMR7279 –
Parc Scientifique et Technologique de Luminy 163, avenue de Luminy F-13288 Marseille Cedex 9, France

Résumé

diaporama An automata network (AN) can be seen as a directed graph where each node
has a state in an alphabet A and an update function which will change this state depending
on the values of the incoming neighbors of the node. We call update schedule a sequence of
updates. In particular, if we update all nodes at once, it is the parallel update schedule and
if we update all node one at a time, it is a sequential one.
We will say that a scheduled AN of size m simulates another one of size
n< =m if, with their respective sequences of updates, they compute the
same function with their n first nodes.
In this presentation, we will study the cost of sequentialisation of a
parallel AN. This cost is the minimum number of additional automata required for any sequential AN with the same alphabet to simulate the parallel AN. We will introduce the
concept of a confusion graph to prove that this cost is always less than n/2+log(n). Furthermore, we will prove that in the worst case, the cost is above n/3 if the alphabet size is
at least 2 and above n/2 - log(n) if the alphabet size is at least 4.
Finally, we will show that this number can be bounded using the pathwidth of the interaction
graph.

[*]Intervenant