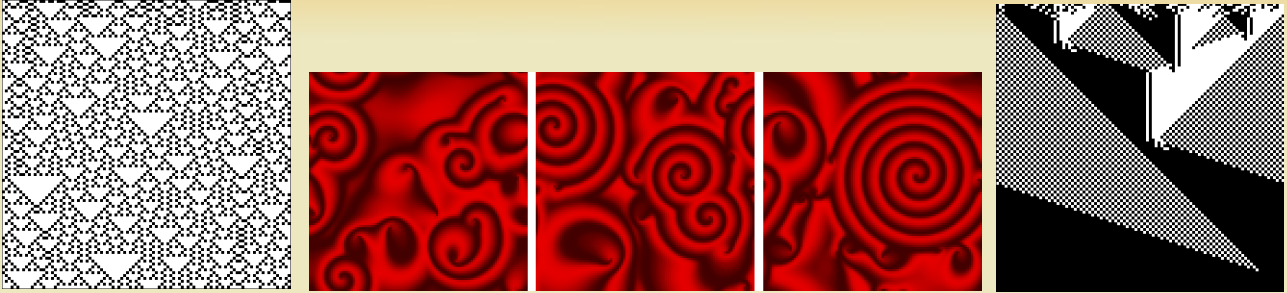


Cellular Automata and Emergence



How simple computer programs can generate complex behavior

Cellular Automata (CA) are simple computer programs capable of generating interesting and often complex patterns and behaviors. Many of these patterns are “emergent”, i.e., they are not programmed into the simple (local) rules of the program, but yet these simple rules give rise to higher-level (global) patterns and coordinated behavior. Such emergent behavior can be widely observed in natural systems, such as spiral wave formation in chemical systems or bacterial colonies, foraging paths in social insects, or synchronous oscillations in the brain. For this reason, CA have become a popular tool for modeling such natural systems and their emergent, complex behavior.

This lecture provides a general introduction to Cellular Automata and some of the complex behaviors they can generate. First, a brief explanation of emergence in natural systems is given. Next, the concept of CA is explained by using simple (visual) examples, without any technical details. Finally, several interesting and colorful cases of emergence and complex behavior in different CA are shown and discussed. This lecture is suitable for a general audience (no particular background knowledge is assumed), and is largely based on visual examples and explanations.

Further information

The duration of this lecture is one hour. Please do not hesitate to contact me for any further information, or if you wish to have this lecture presented somewhere. The information about this and other lectures can also be found online at:

www.WorldWideWanderings.net/Lectures.html

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