

Problem Set 3 by Madison Shoraka

(Out Mon 10/07/2024, Due Mon 10/14/2024)

Problem 1

Consider the elementary cellular automata rule 110:

current pattern	111	110	101	100	011	010	001	000
new state for center cell	0	1	1	0	1	1	1	0

1. Construct the global system state graph for a 4 cell lattice with periodic boundary conditions. After construction, write its corresponding adjacency matrix.
2. Construct another global system state graph but this time for a 5 cell lattice with periodic boundary conditions. Again write its corresponding adjacency matrix.
3. Compute the average in-degree of each graph. What does this number in relation to the size of the system tell you about the graphs' general structures?
4. Compare and contrast the 4 cell and 5 cell graph shapes: are they forests/trees or do they contain cycles. Are the graphs connected?
5. Note the cycles of each graph and state any attracting vertices if they exist.
6. What do you think would happen if you increased the number of lattice cells to 6?

Instructions

Email your solutions (i.e., a scan or typed version of your pen-and-paper part; and programming codes in a way that they can be run by someone else) to madison.shoraka@temple.edu with the email subject **Math 8200. Homework 3** and all the submitted filenames starting with your family name.