

# ITT8040 Cellular Automata

## Assignment 3

March 27, 2013

Read pages 22–29 of Prof. Kari’s notes.

1. Let  $G$  be the global transition function of the Game of Life. Find a configuration  $c : \mathbb{Z}^2 \rightarrow \{\text{alive, dead}\}$  such that every cell in  $G(c)$  is alive.
2. Consider elementary cellular automaton rule 126, with 0 as the quiescent state. Construct two different finite configurations with the same image.
3. Prove Moore’s inequality (Lemma 9 from the notes): for every  $d, n, r, s > 0$  and for all  $k$  large enough,  $(s^{n^d} - 1)^{k^d} < s^{(kn-2r)^d}$ .
4. (Bonus) Prove Proposition 21: for every *non*-surjective CA there exists a configuration with uncountably many preimages.

Soft deadline: **April 3, 2013**

Hard deadline: **April 10, 2013**