ITT8040 Cellular Automata
Assignment 2

March 20, 2013

Read pages 16–21 of Prof. Kari's notes.

1. Prove the statement from the proof of Proposition 7 on page 19 of the notes: if c_i and e_i are sequences in $S^{\mathbb{Z}^d}$, then there exists a strictly increasing sequence $\{i_n\}_{n \geq 0}$ in $\mathbb{N}$ such that c_{i_n} and e_{i_n} both converge.

2. Find an orphan pattern for elementary cellular automaton rule 52.

3. (Ungraded) Experiment with the SIMP/STEP software. The web page `http://www.cs.ioc.ee/~silvio/simp.html` contains instuction for download and installation.

4. (Bonus) Prove *Hedlund's theorem*: if a function $G : S^{\mathbb{Z}^d} \to S^{\mathbb{Z}^d}$ is continuous (in the sense that $\lim_{n \to \infty} G(c_n) = G(c)$ whenever $\lim_{n \to \infty} c_n = c$) and commutes with *every* translation $\tau_{\vec{r}}$, then it is the global transition function of a cellular automaton. *Hint:* Adapt the proof of Proposition 7.

Soft deadline: **March 27, 2013**
Hard deadline: **April 3, 2013**