Homework 4

To hand in on October 12th at 14:00, during the exercise session or by mail at `marie.fortin@lsv.fr`.

Exercise 1. Let $\Sigma = \{a, b, c\}$. For each of the following LTL formulæ φ, give a Büchi automaton acccepting the language $\{w \in \Sigma^\omega \mid w, 0 \models \varphi\}$ (where a word $w \in \Sigma^\omega$ can be seen as a temporal structure $(\mathbb{N}, <, \lambda)$ in which each letter in Σ stands for a set of atomic propositions).

1. $(\mathsf{G}\,\mathsf{F}\,a) \to (\mathsf{G}\,\mathsf{F}\,b)$
2. $\mathsf{G}(a \to (\neg a\,\mathsf{S}\mathsf{U}\,b))$
3. $\mathsf{G}(\mathsf{X}\,b \to a)$
4. $(\mathsf{G}\,\mathsf{F}\,a) \wedge (\mathsf{F}\,b) \wedge (\mathsf{F}\,c)$

Exercise 2. A Büchi automaton $\mathcal{A} = (Q, \Sigma, I, T, F)$ is *deterministic* if $|I| \leq 1$, and for each state q in Q and symbol a in Σ, $|\{(q, a, q') \in T \mid q' \in Q\}| \leq 1$.

1. Show that the set of languages recognizable by Büchi automata, and the set of languages recognizable by *deterministic* Büchi automata, are closed under intersection.
2. Show that the set of languages recognizable by Büchi automata, and the set of languages recognizable by *deterministic* Büchi automata, are closed under union.