

## Problem Set 9

1. Consider a  $\omega$ -automaton  $(Q, \Sigma, \delta, q_0, Acc)$ , and let  $\mathcal{G} \subseteq 2^Q$  be a set of good states. An  $\omega$ -word  $\alpha$  is said to be accepted iff there is a run  $\rho$  of  $\alpha$  such that  $Inf(\rho) \in \mathcal{G}$ .  $\delta : Q \times \Sigma \rightarrow 2^Q$  is the transition function.
  - Construct a deterministic  $\omega$ -automata with this acceptance condition that captures the language “Finitely many  $b$ ’s”.
  - Show that  $\omega$ -automata with this acceptance condition captures  $\omega$ -regular languages.
  - How do you complement a deterministic  $\omega$ -automata with this acceptance condition?
2. Prove or disprove : A finite set of infinite words is  $\omega$ -regular.
3. Give an example of a language accepted by an NBA, but which cannot be written in LTL.
4. Show that a language  $L$  is omega-regular iff it is of the form  $\bigcup_{i=1}^n U_i V_i^\omega$  where  $U_i, V_i$  are regular.
5. Exercises 5.24, 5.23, 5.17, 5.13, 4.7, 4.14, 4.15, 4.16, 4.21, 4.23, 4.24, 4.25 from Baier-Katoen.