Exercises on DFA

March 24, 2007

1. Let E be the set $\{0,1\}$, $Bool$ the set $\{True, False\}$. We define the functions f, g, h in $E^* \to Bool$ mutually by the equations

   $f\ (0x) = g\ x, \qquad f\ (1x) = h\ x, \qquad f\ \epsilon = False$

   $g\ (0x) = h\ x, \qquad g\ (1x) = f\ x, \qquad g\ \epsilon = False$

   $h\ (0x) = f\ x, \qquad h\ (1x) = h\ x, \qquad h\ \epsilon = True$

   Show that the language $\{\ x \in E^* \mid f\ x = True\}$ is a *regular* language.

2. Look at the definition of $\hat{\delta}$ in the text book. Notice that this is *not* the same as the one given in the slides. Explain why it does not matter. Do then exercise 2.2.2 and compare it with the proof given in the slides.

3. Exercise 2.2.4. If you know Haskell, give an Haskell program corresponding to each DFA.

4. Exercises 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11

5. If $L \subseteq \Sigma^*$ is a language, we define $Prefix(L)$ to be the set of words that are prefix of a word in L. Show that if L is regular then so is $Prefix(L)$.