COS126 Regular Expressions, DFAs (Chapter 5)

Part 1

Consider the regular expression `((C|D|M|N|P|T)A)*`

- Is PAPA matched by this RE? Is MAMAN? Is NAPA? Is TAMPA? NAPA is, but MAMAN and TAMPA are not

- Name two contries that are matched by this RE. PANAMA and CANADA

Part 2 — RElay Race

Write regular expressions for the following languages:

1. all binary strings `(0|1)*`

2. all non-empty binary strings `(0|1)(0|1)*`

3. all binary strings beginning and ending with 1 `1|1(0|1)*1`

4. all binary strings ending with 00 (divisible by 4) `(0|1)*00`

5. all binary strings with at least three 1s `0*10*10*1(0|1)*`, `(0|1)*1(0|1)*1(0|1)*1(0|1)*`, etc

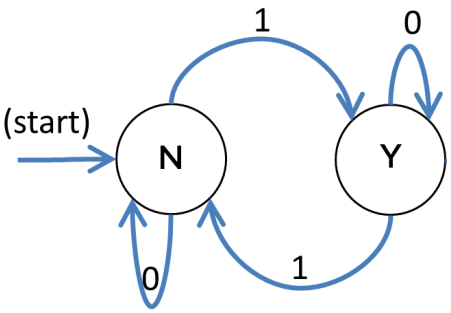
Part 3

Given an English-language description of the language defined by the RE `(0*10*10*)*`? All binary strings with both a positive and even number of 1s

Bonus

Hard bonus: is it possible to define a RE for all binary integers divisible by 3? Yes

Part 4



- Is 01101 accepted by this DFA? Is 11? 01101 is, 11 is not

- Given an English-language description of the language that this DFA recognizes. All binary strings with an odd number of 1s

- (Optional) Give a regular expression that defines the same language. 0*10*(0*10*10*)* (other formulations possible)

Part 5

Draw DFAs that recognize each of these languages from Part 2: see next page

1. all binary strings

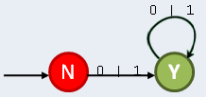
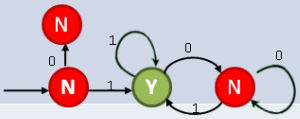
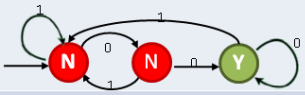
2. all non-empty binary strings

3. all binary strings beginning and ending with 1

4. all binary strings ending with 00 (divisible by 4)

5. all binary strings with at least three 1s

Recommended RE/DFA exercises from the exam archive: Fall 2011, Exam 2, question 4. Spring 2013, Exam 2, question 4.

Language	Regular Expression	DFA
All binary strings	`(0|1)*`	
All binary strings except empty string	`(0|1)(0|1)*`	
Begins with 1, ends with 1	`1	1(0|1)*1`	
Ends with 00	`(0|1)*00`	
Contains at least three 1s	`(0|1)*1(0|1)*1(0|1)*1(0|1)*`