

# CS 3100 – Models of Computation – Fall 2010

August 26, 2010

Notes 2, Handed out: August 26, 2010 during Lecture 2

- Review Ch1Slides.pdf
- Do you follow these?
  - Tape, 'tape head', accepting state, rejecting state
  - State
  - Transition
  - Alphabet
    - \* What is the alphabet for Morse Code?
    - \* How do you recognize “SOS”
    - \* Recall S = ... O = --- and of course E = .
    - \* So how do you tell apart from S and three Es?
    - \* So what is really the alphabet?!
- Writing practice: Write these mathematically
  - Empty string
  - Empty set
  - Set containing empty string

- Set containing empty set
- Set containing an empty string and an empty set (now, why would you do that?!)
  - String containing an empty set (Groan! Can you do this?)
- Union of set  $\{a\}$  and itself
- The result of inserting  $a$  and  $b$  into  $\{a\}$
- So can you model a tic-tac-toe game as an FA (a DFA)?
  - Symbols
  - Alphabet
  - States
  - Transitions
  - Transition table
  - Accept states
- Repeat above exercise for Chess and then your favorite card game
- Discuss Homework 1
- Finish-up on the problem

$$L_{any3hastwo1s} = \{all\ strings\ over\ \{0,1\} \mid block\_condition\}$$

where

*block\_condition* = every block of three consecutive symbols has at least two 1s

- Approaches to DFA construction
  - Premature optimization is bad
  - Later you'll be using tools to build and optimize (minimize)
  - Later you'll be using NFA to arrive at a DFA ("FA") faster
  - Some DFA WILL be exponential no matter what!
  - That said, some tricks do work ofte

TAKE A 5-MIN BREAK AT 11:25AM

- Got terrible automaton without optimization
- Used minimization tool to get better machine
- Then said "aha, look back is bad" ; keep state = "seen so far"
- That worked well!
- Need something better!
  - Consider "Nth last symbol must be a 0"  $\Rightarrow$  FA has size  $2^N$
  - Reverse of this guy is great and small!
  - ORDER IN WHICH YOU FEED INFO TO A DFA MAKES ALL THE DIFFERENCE!!!!
  - Error-correcting DFA
  - Error-free case for 01001
  - All one-bit errors over 01001  $\Rightarrow$  Groan! DFA is UGLY
  - NFA will make BOTH THESE problems simpler than baby-food

– regular expressions – your door-way to tell a computer what NFA you want !!

- How I used regular expressions to process your email using `sed`
- History of Alan Turing <http://www.turing.org.uk/turing/>
- DFA for predicting the onset of Epileptic seizures! See paper `DFA-to-predict-epileptic-seizures.pdf` in class dir.

USING SED

See contents of

`SED-USAGE.txt` and `unids.txt`