

CSI 35 LECTURE NOTES (Ojakian)

Topic 14: Finite Automata using Graphs

OUTLINE

(References: Rosen: 13.3)

1. Definition: Finite state automata

- (a) Automata consists of the following.
 - i. Alphabet: Finite set of symbols
 - ii. Finite set of states. Includes one start state and some number of final states.
 - iii. Transition Function: Describes the operation of the machine (function from states and alphabet to states).
- (b) DEF: Given an alphabet A , define A^* = the finite words over A (including empty word).
Examples: $A = \{0, 1\}$ or $A = \{1\}$ or $A = \{a, b, \dots, z\}$.
- (c) DEF: Given an automata over alphabet A , and a word $w \in A^*$, we define the “output state” of w .
- (d) DEF: A word is accepted by an automata if its output state is a final state.
- (e) Example: Given an automata, find the output states of some words. Which of these words are accepted?
Use Example 4 and Exercises 16 - 22.
- (f) Note: “accepts” = “recognizes”

2. Convert between: State diagram and state table

- (a) Example 4 (pages 905, 906)

3. What Language?

- (a) DEF: A language over alphabet A is any subset of A^* .
- (b) DEF: Given an automata, it accepts a language if it accepts exactly the words in that language.
- (c) Example 5 (pages 906, 907)
- (d) Example 8 (p. 909, 910). Equivalence.

4. Constructions

Given a language, construct an automata that accepts exactly this language.

- (a) Example 6 (p. 907)
- (b) Example 7 (p. 909)

5. Impossibilities?

- (a) Example 6 (13.4, pages 923, 924). No automata accepts the language:
 $\{0^k 1^k \mid k = 1, 2, \dots\}$

6. Exercises

- (a) What language: 16 - 22
- (b) Construction: 23 - 37
- (c) Construct an automata on alphabet $\{0, 1\}$ which accepts exactly the binary strings which represent an even number.