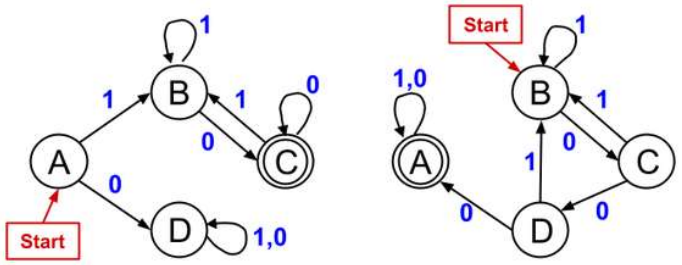
7.4 - Finite state machines

Thursday, July 6, 2023

EXERCISE | 7.4.3: Identifying the set of strings accepted by an FSM.



FSM 1 FSM 2

(a) Give the final state of each FSM after each input string below. That is, start in the start state, process the string, and indicate which state (A, B, C, or D) the FSM is in at the end of the string. Then indicate whether or not the final state is an accepting state.

- 100011
- 0000
- 0010
- 1100

(b) Which one of the following statements below describes the set of strings accepted by FSM 1?

1. The FSM accepts a string x if and only if x contains the pattern "01" somewhere in the string.
2. The FSM accepts a string x if and only if x starts with a 1 and ends with a 0.
3. The FSM accepts a string x if and only if x is all 0's or all 1's (i.e. x only contains one type of character).
4. The FSM accepts a string x if and only if there are at least three consecutive 0's somewhere in x.
5. The FSM accepts a string x if and only if x ends with "000".
6. The FSM accepts a string x if and only if x ends with "00".

(c) Refer to the same set of statements in the previous question and indicate which statement describes the set of strings accepted by FSM 2.

Feedback?

(a)

100011

FSM 1: A→B→C→C→C→B→B, final state is not accepting state

FSM 2: B→B→C→D→A→A→A, final state is accepting state

0000

FSM 1: A→D→D→D→D, final state is not accepting state

FSM 2: B→C→D→A→A, final state is accepting state

0010

FSM 1: A→D→D→D→D, final state is not accepting state

FSM 2: B→C→D→B→C, final state is not accepting state

1100

FSM 1: $A \xrightarrow{1} B \xrightarrow{1} B \xrightarrow{0} C \xrightarrow{0} C$, final state is accepting state

FSM 2: $B \xrightarrow{1} B \xrightarrow{1} B \xrightarrow{0} C \xrightarrow{0} D$, final state is not accepting state

(b) 2. The FSM accepts a string x if & only if x starts with a 1 & ends with a 0.

(c) 4. The FSM accepts a string x if & only if there at least three consecutive 0's somewhere in x.

EXERCISE | 7.4.4: Designing FSMs that accept a given set of strings.

For each property, design an FSM with input alphabet {0, 1} that accepts a string x if and only if the string has the property described.

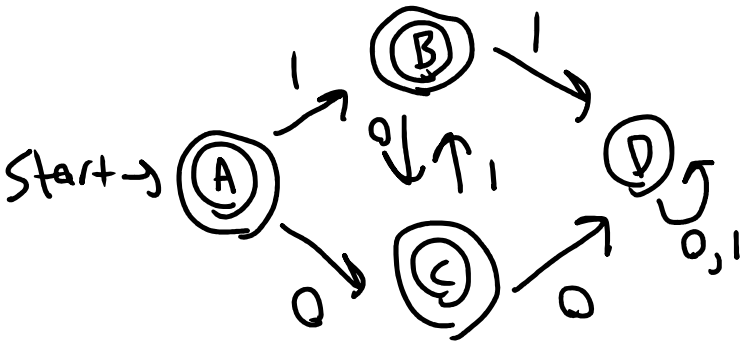
(a) There are no occurrences of "00" or "11" in the string. (The empty string has no occurrences of "00" or "11".)

(b) The number of 1's is a multiple of 3. (Zero is a multiple of 3).

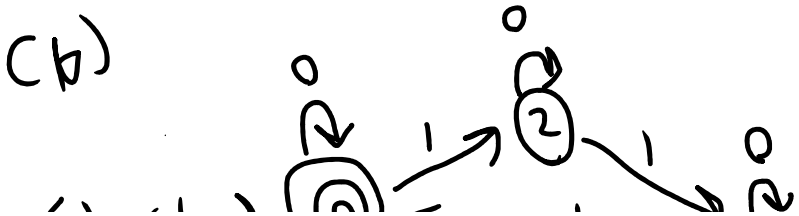
(c) There is at least one 0 and at least one 1.

Feedback?

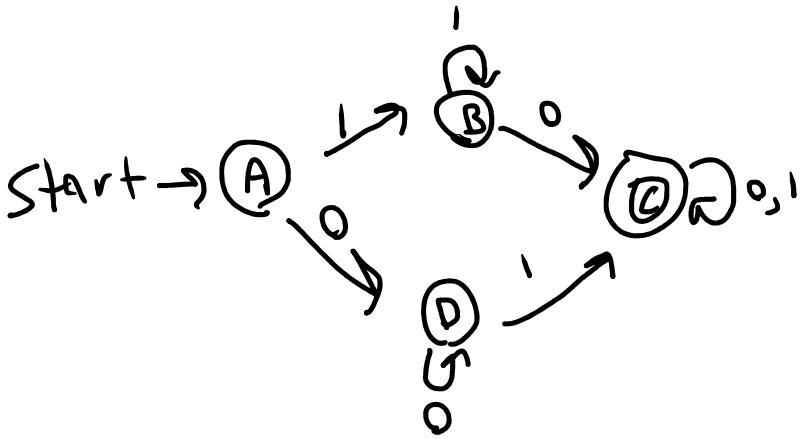
(a)



(b)



(c)



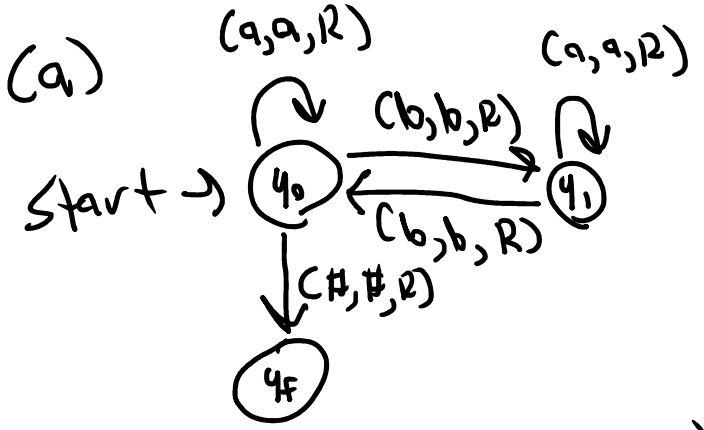
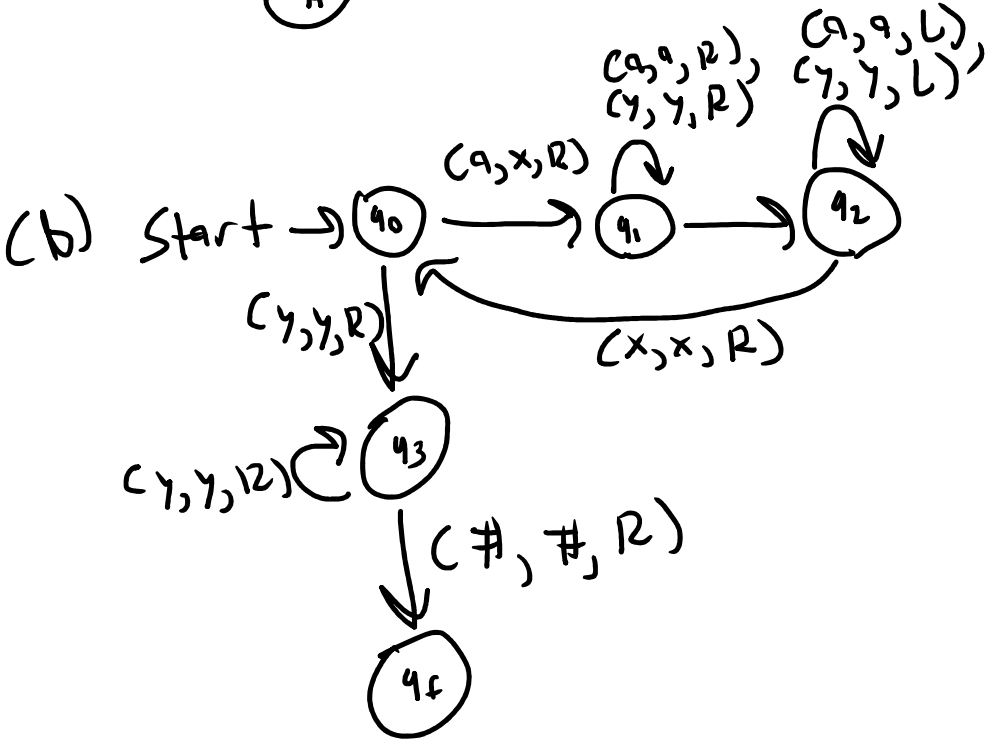
7.5 - Turing machines

Thursday, July 6, 2023 2:50 PM

EXERCISE | 7.5.3: Turing machine design.

Design a Turing machine with input alphabet {a, b} that accepts a string if and only if the string has the property described.

(a) The input string has an even number of b's.

(b) The input string has the same number of a's and b's.

Feedback?