CS/ECE 374 FALL 2018
Homework 1 Problem 2

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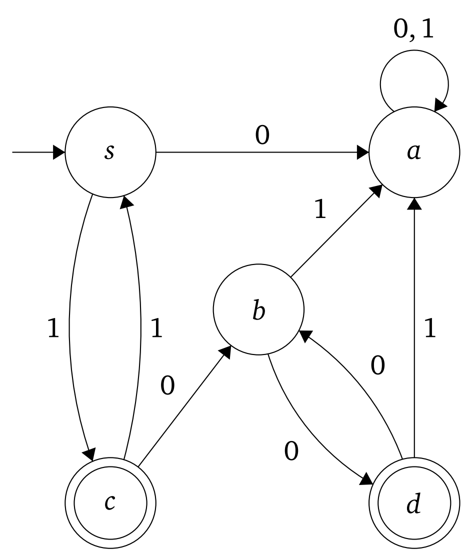
2.Let L be the set of all strings in $\{0, 1\}^*$ that contain an even number of 0s and an odd number of 1s and does not contain the substring 01.

Describe a DFA over the alphabet $\Sigma = \{0, 1\}$ that accepts the language L. Argue that your machine accepts every string in L and nothing else, by explaining what each state in your DFA *means*.

You should be able to create one with five states. You may either draw the DFA or describe it formally, but the states Q, the start state s, the accepting states A, and the transition function δ must be clearly specified.

Solution: The DFA over the alphabet $\Sigma = \{0, 1\}$ that accepts the language L.



s: **The start state.** We've read an even number of 0s and an even number of 1s, and the string does not contain the substring 01.

a: **The failing state.** The string would possibly contain the substring 01 in the future or has already contained the substring 01. If we've read an odd number of 0s and an even number of 1s, we cannot reach the accepting state anymore. Since the accepting state requires the string contains an even number of 0s and an odd number of 1s, we need to read more 0s and 1s. There are two possible arrangements of 0 and 1: 01 and 10. Even though it is 10, the first 1 will combine with the 0 we just read to form the substring 01. Thus this is the failing state.

b: We've read an odd number of 0s and an odd number of 1s, and the string does not contain the substring 01.

c: **The accepting state.** We've read an even number of 0s and an odd number of 1s, and the string does not contain the substring 01.

d: **The accepting state.** We've read an even number of 0s and an odd number of 1s, and the string does not contain the substring 01.

Transition table:

	0	1
s	a	c
a	a	a
b	d	a
c	b	s
d	b	a

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