Compiler Construction

Finite State Machines with Output
• Mealy Machine
•Moore Machine

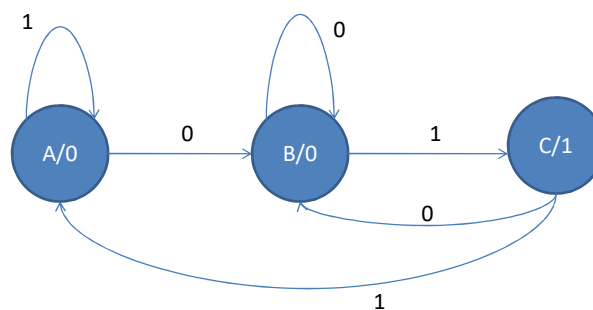# Mealy Machine & Moore Machine

- Finite automata are like computers in that they receive input and process the input by changing states. The only output that we have seen finite automata produce so far is a yes/no at the end of processing.

- We will now look at two models of finite automata that produce more output than a yes/no.
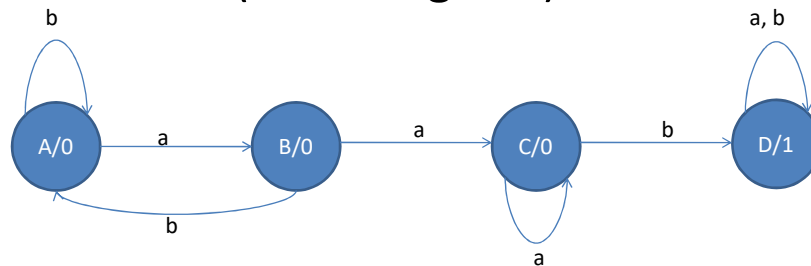
Moore Machine

- Basically a Moore machine is just a FA with two extras.

    1. It has TWO alphabets, an input and output alphabet.
    2. It has an output letter associated with each state. The machine writes the appropriate output letter as it enters each state.
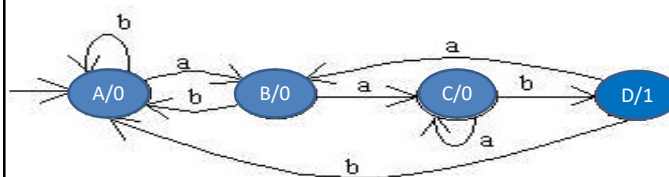


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Input:    abab
Output:   10010
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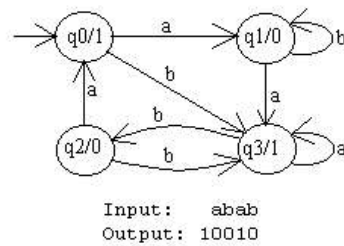
Moore Machine
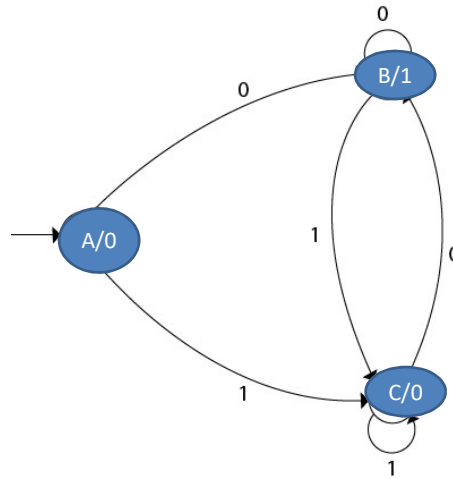# (Count 01)

Moore Machine
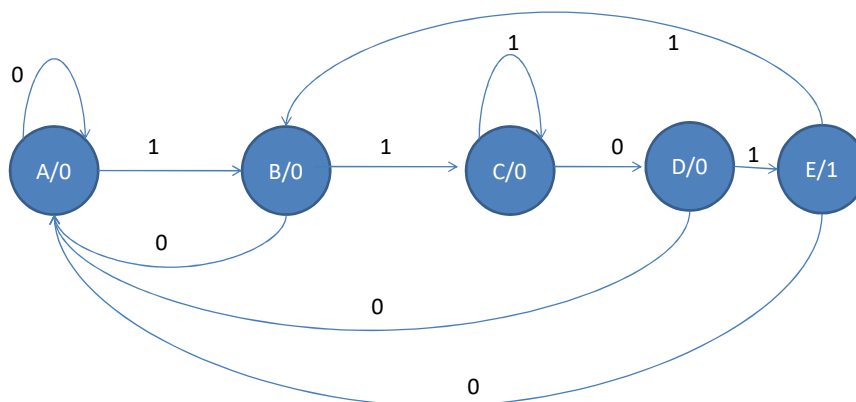## (Substring aab)

Moore Machine

This machine might be considered as a "counting" machine.

The output produced by the machine contains a 1 for each occurrence of the substring **aab** found in the input string.
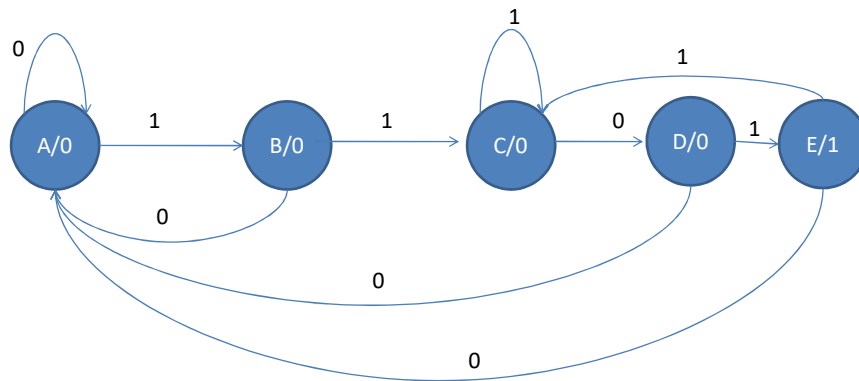
Moore Machine
(1's complement of Binary Number)

Moore Machine
(Count the occurrence of 1101(Non-Overlapping))

Input: 011011101
State   AABCDEBCDE
Output: 0000010001

Moore Machine
(Count the occurrence of 1101(Overlapping))

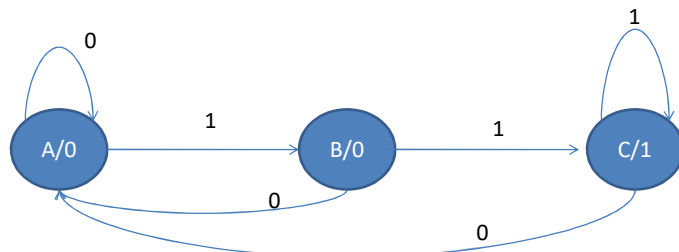**Input:**   01101101
State   AABCDECDE
Output: 000001001

Moore Machine

- Replaces the first 1 with 0 from every substring starting with 1

Input	Result
0 1 1 1 0 0 1	0 0 1 1 0 0 0
0 0 0 1 0 0 1 1 1 0	0 0 0 0 0 0 0 1 1 0
1 1 1 0 1 0 1 1 0	0 1 1 0 0 0 0 1 0

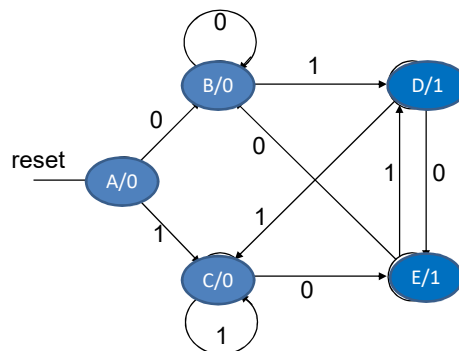# Moore Machine

- Replaces the first 1 with 0 from every substring starting with 1
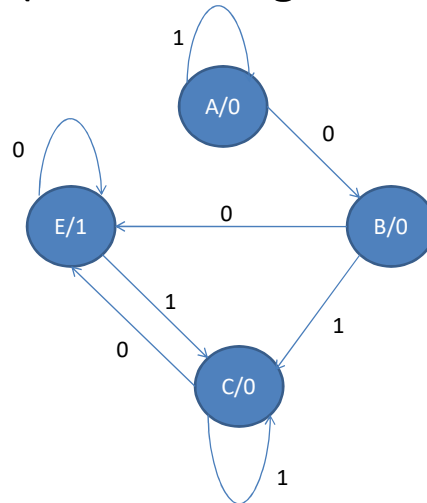

Input	Result
0 1 1 1 0 0 1	0 0 1 1 0 0 0
0 0 0 1 0 0 1 1 1 0	0 0 0 0 0 0 0 1 1 0
1 1 1 0 1 0 1 1 0	0 1 1 0 0 0 0 1 0

Moore Machine
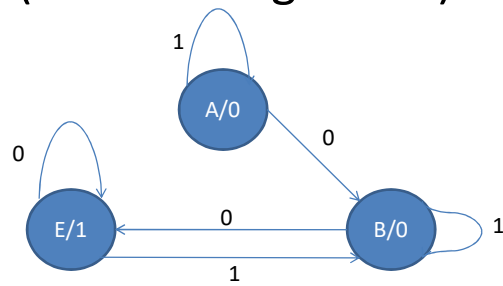# (Count strings 01 or 10)

Input: 00**011011**11**10010**0
State   ABBB**DCED**CCC**EB**D**E**B
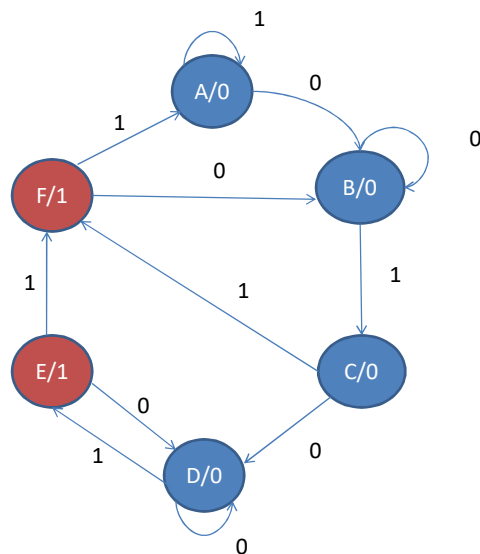**Output:** 00001011000010110

Moore Machine
(Count strings 01*0)

Moore Machine
(Count strings 01*0)

Moore Machine
(Count strings 010*1)

Moore Machines

• 2's Complement of a given binary number

• Count occurrences of pattern 'baaa'

• Count occurrences of pattern ab*ab