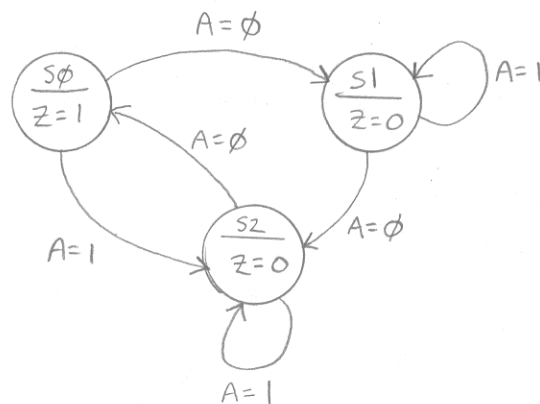


Analysis of Clocked Sequential Circuits

Extend design/analysis techniques for counters to arbitrary finite state machines, where the sequence of states isn't fixed.

- State Graph:
- Circles contain each state
 - Circles contain outputs for each state
 - Arrows indicate transitions between states at active ^{clock} edges
 - Arrow labels indicate input values which initiate transition

Ex:



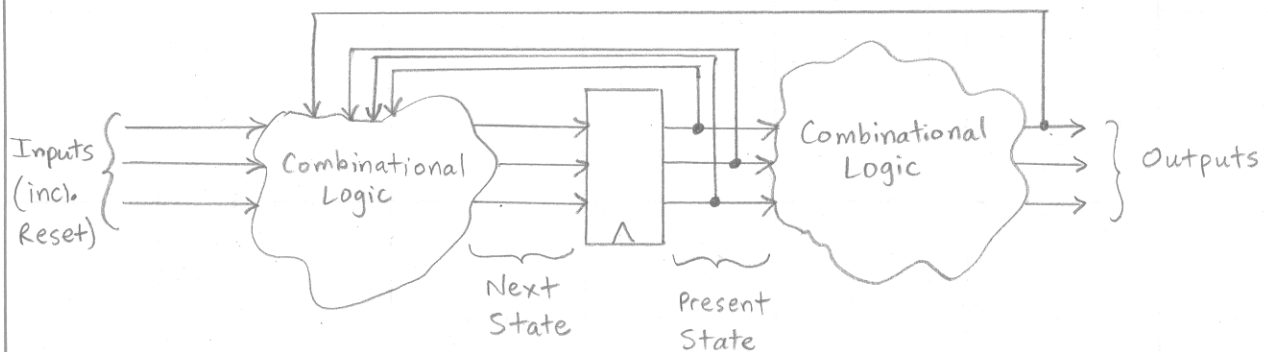
State Table: Write out present state, next state, inputs, and outputs in tabular form.

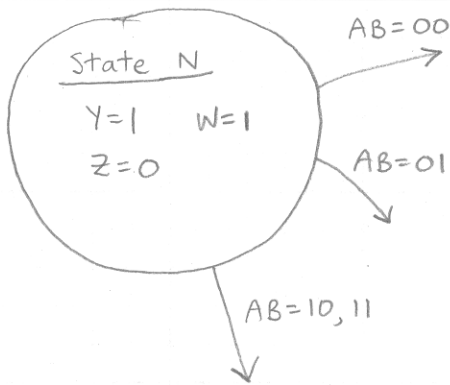
Ex:

Present State	Next State		Present Output (Z)
	A=0	A=1	
S0	S1	S2	1
S1	S2	S1	0
S2	S0	S2	0

Two classes of finite state machine (FSM):

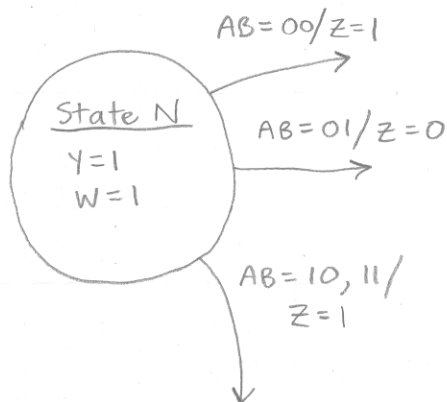
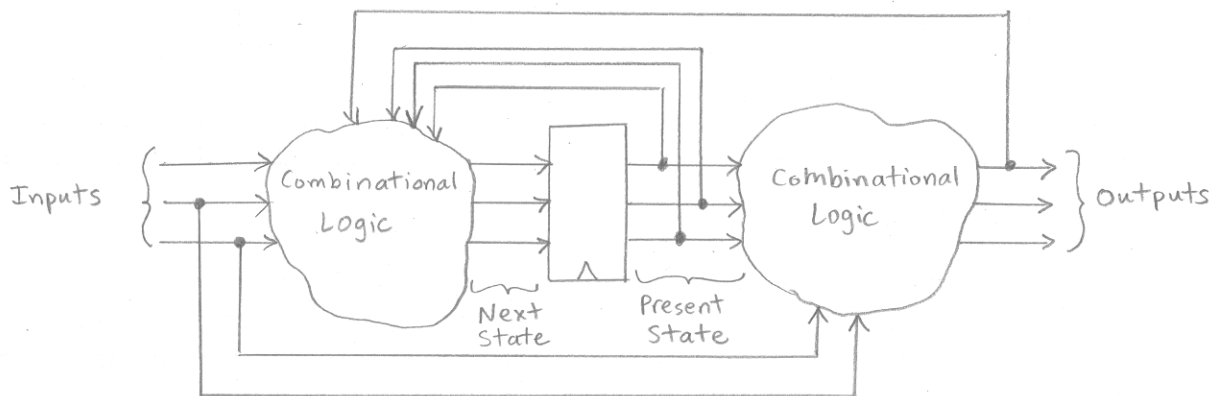
Moore Machine: Outputs are a function of present state only





- Specific outputs associated with each state
- Transitions are a function of the inputs
- Next state a function of inputs and present state

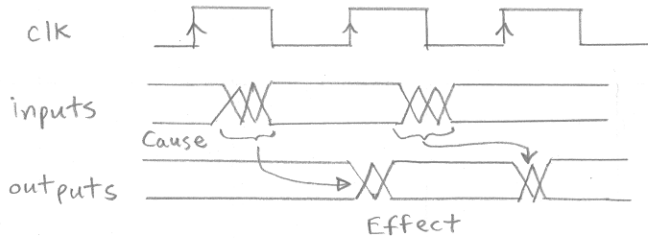
Mealy Machine: Outputs are a function of present state and inputs



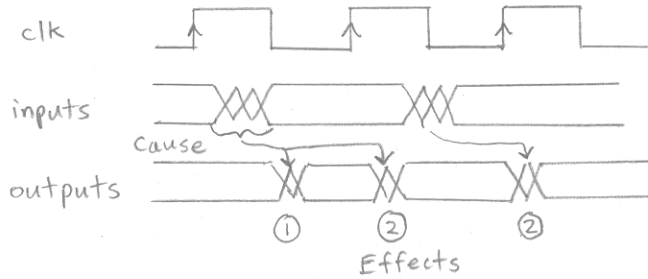
Main difference between Moore and Mealy: timing from input(s) to output(s)

- 1.) Moore: outputs change only on state transitions \Rightarrow no input-related hazards, outputs delayed relative to inputs
- 2.) Mealy: outputs change on input changes and state changes \Rightarrow no one cycle delays, possible input-related glitches.

Ex: Moore



Mealy



- ① inputs directly affect outputs
- ② outputs affected by state changes