



# Foundations of Computing I

\* All slides are a combined effort between of the course

## Strings over $\{0, 1, 2\}^*$

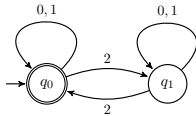
**M<sub>1</sub>:** Strings with an even number of 2's *Re-do these from last time*

**M<sub>2</sub>:** Strings where the sum of digits mod 3 is 0

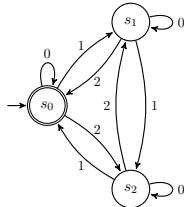
*Admin's Monday Office Hours moved to CSE 674 for the quarter.*

## Strings over $\{0, 1, 2\}^*$

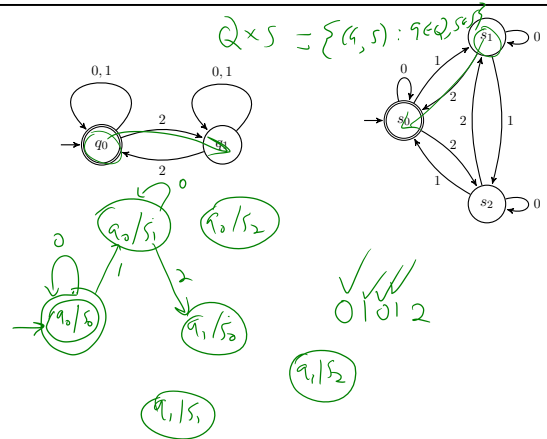
**M<sub>1</sub>:** Strings with an even number of 2's



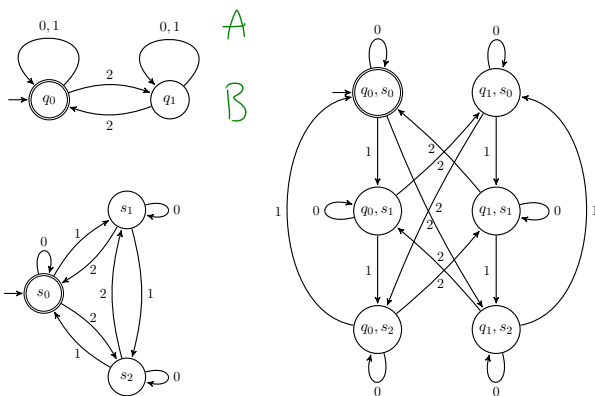
**M<sub>2</sub>:** Strings where the sum of digits mod 3 is 0



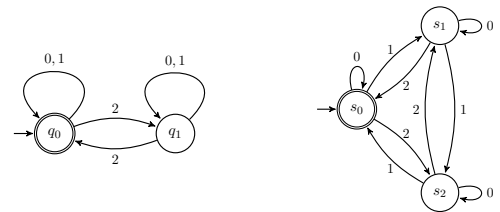
## Strings with an even number of 2's AND a mod 3 sum of 0



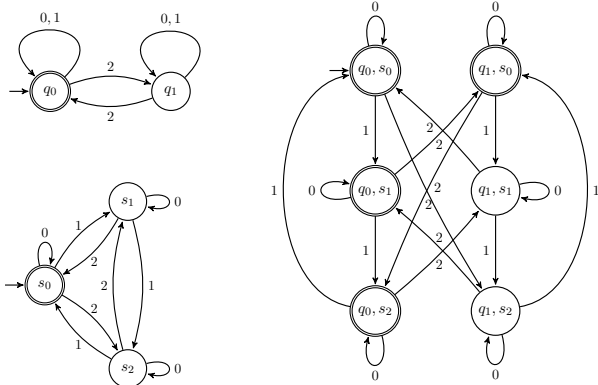
## Strings with an even number of 2's AND a mod 3 sum of 0



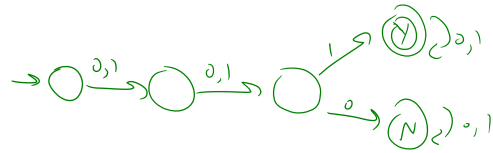
## Strings with an even number of 2's OR a mod 3 sum of 0



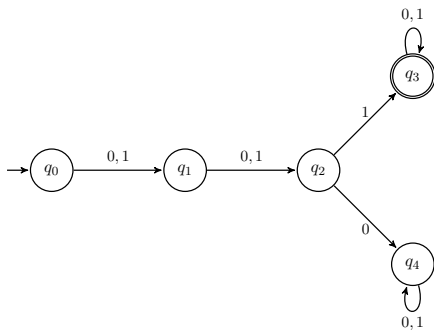
**Strings with an even number of 2's OR a mod 3 sum of 0**



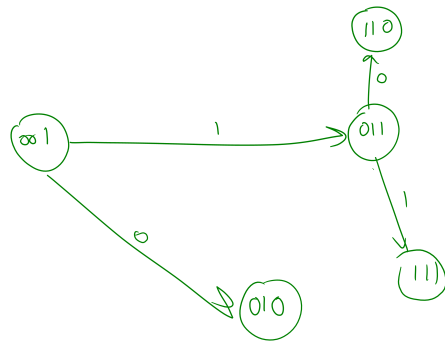
**FSM that accepts binary strings with a 1 three positions from the start**



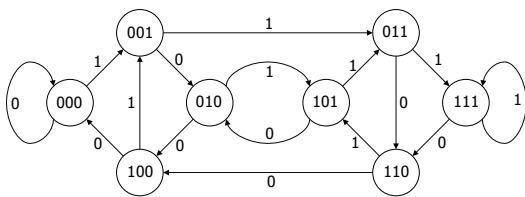
**FSM that accepts binary strings with a 1 three positions from the start**



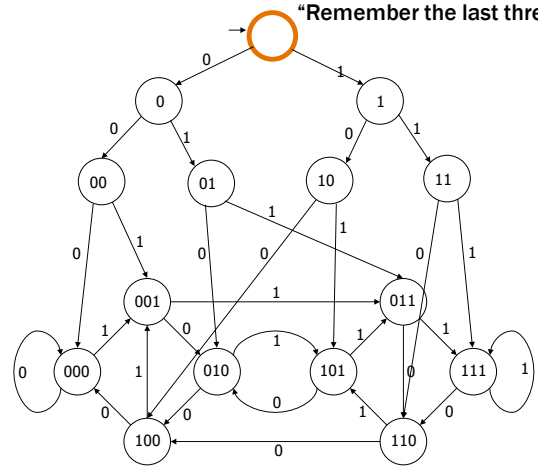
**3 bit shift register "Remember the last three bits"**



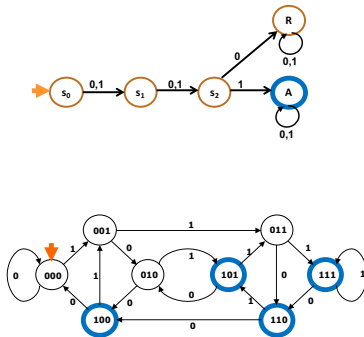
**3 bit shift register "Remember the last three bits"**



**"Remember the last three bits"**



## The beginning versus the end



## CSE 311: Foundations of Computing

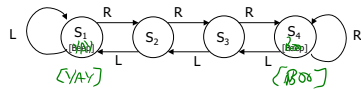
### Lecture 22: Finite State Machines with Output



## State Machines with Output

State	Input		Output
	L	R	
s <sub>1</sub>	s <sub>1</sub>	s <sub>2</sub>	Beep
s <sub>2</sub>	s <sub>1</sub>	s <sub>3</sub>	
s <sub>3</sub>	s <sub>2</sub>	s <sub>4</sub>	
s <sub>4</sub>	s <sub>3</sub>	s <sub>4</sub>	Beep

"Tug-of-war"



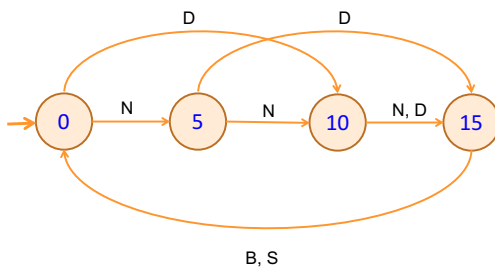
## Vending Machine



Enter 15 cents in dimes or nickels  
Press S or B for a candy bar

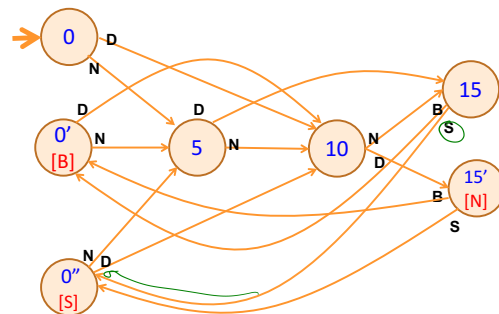


## Vending Machine, v0.1



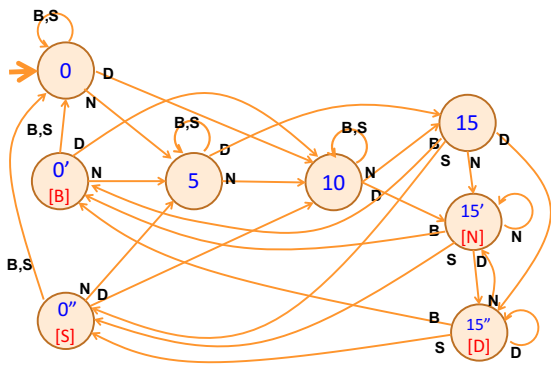
Basic transitions on N (nickel), D (dime), B (butterfinger), S (snickers)

## Vending Machine, v0.2



Adding output to states: N – Nickel, S – Snickers, B – Butterfinger

## Vending Machine, v1.0



Adding additional "unexpected" transitions