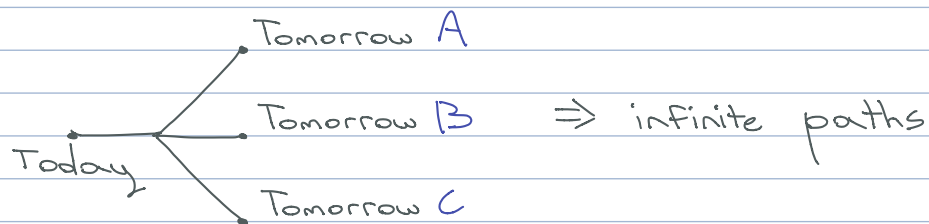


# Linear Temporal Logic

Time is a line (linear-time)



Or time takes branches

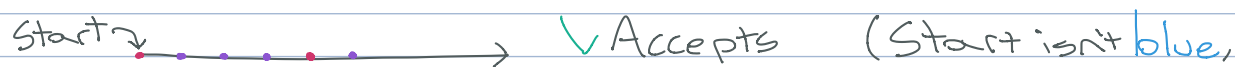


## Operators

- Next - "the next tomorrow"
- Always - All tomorrows
- ◇ Eventually - some tomorrow, or tomorrow of tomorrow and so on...

## Example

○ blue  $\rightarrow$  □ (blue  $\vee$  green)



(Start isn't blue,

so the conditional  
is true.)

□ ◇ blue "for all items, there is eventually a blue after it."



↑  
infinite # of blues  
eventually is 100% blue

□ ◇ blue  $\wedge$  □ ◇ red



↑  
infinite # of blues and reds

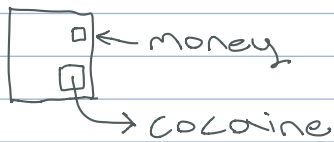
## Problem Example

Given a graph  $G$  where each node has a color; there is a designated start node  $v_0$ , and a LTL formula over the colors, (e.g.,  $\square \Diamond \text{blue}$ ).

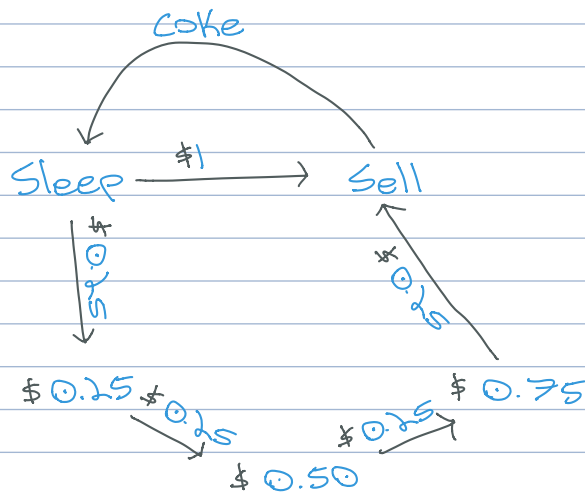
**Question.** Is there a  $\omega$ -Walk from  $v_0$  in  $G$  that satisfies the formula?

## Design with graph

The Coke Machine



⇒ Many flaws and missing features



## Design with LTL



- 4 quarters or \$1