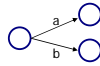


Lecture 5 - Supplement FSM Properties

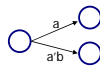
Common Pitfalls Regarding Transition Properties

- Only one condition should be true
 - For all transitions leaving a state
 - Else, which one?

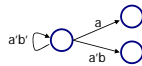


if $ab=11$ which transition do we take?

- One condition must be true
 - For all transitions leaving a state
 - Else, where go?



if $ab=00$ which transition do we take?



How can we be sure we haven't forgotten anything?

Verifying Correct Transition Properties

- Verify using Boolean algebra
- Only one condition true
 - AND of each *condition pair* of transitions leaving a state
 - Should equal 0 → proves pair can never simultaneously be true
- One condition true
 - OR of all conditions of transitions leaving a state
 - should equal 1 → proves at least one condition must be true

Verifying Correct Transition Properties

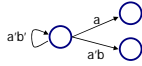
Example 1

- Prove only one condition true
 - AND of each *condition pair* of transitions leaving a state
 - Should equal 0 → proves pair can never simultaneously be true



$$\begin{aligned} a * a'b \\ = (a * a') * b \\ = 0 * b \\ = 0 \end{aligned}$$

OK!



$$\begin{aligned} a * a'b \\ = (a * a') * b \\ = 0 * b \\ = 0 \end{aligned}$$

OK!

$$\begin{aligned} a * a'b' \\ = (a * a') * b' \\ = 0 * b' \\ = 0 \end{aligned}$$

OK!

$$\begin{aligned} a'b * a'b' \\ = a' * (b * b') \\ = a' * 0 \\ = 0 \end{aligned}$$

OK!

Verifying Correct Transition Properties

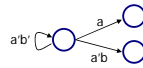
Example 2

- One condition true
 - OR of all conditions of transitions leaving a state
 - should equal 1 → proves at least one condition must be true



$$\begin{aligned} a + a'b \\ = a'(1+b) + a'b \\ = a + ab + a'b \\ = a + (a+a')b \\ = a + b \end{aligned}$$

Fails! Might not be 1 (i.e., a=0, b=0)



$$\begin{aligned} a + a'b + a'b' \\ = ab + ab' + a'b + a'b' \\ = (ab + a'b) + (ab' + a'b') \\ = b(a + a') + b'(a + a') \\ = b(1) + b'(1) \\ = b + b' \\ = 1 \end{aligned}$$

OK!
