

# CSE460 Switching Theory

## Lecture 5 : Incomplete Specification, Satisfiability Don't Care

Washington University  
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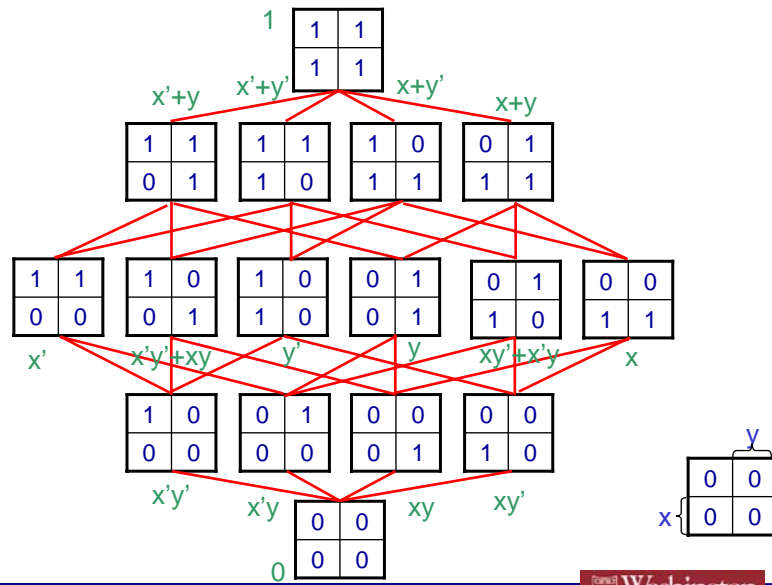
<http://www.arl.wustl.edu/~lockwood/class/coe460/>

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### Don't Care Conditions

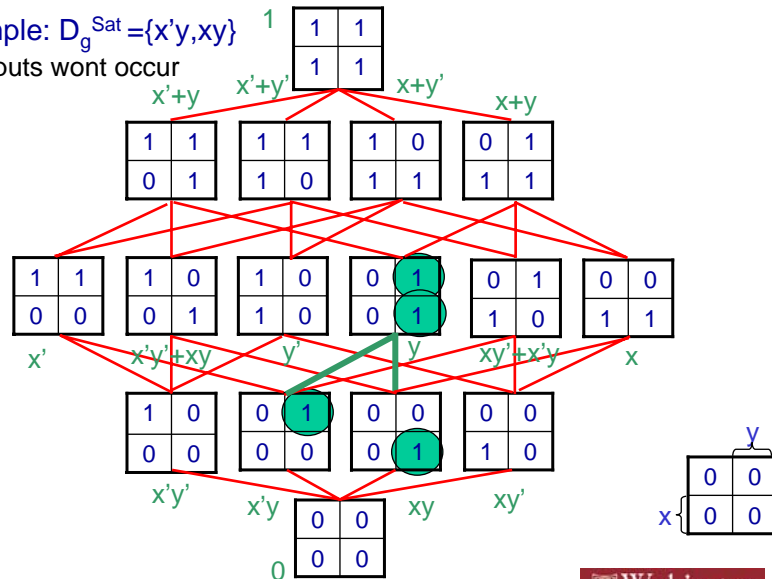
- Interval  $[L,U]$ 
  - $[L,U] = \{ x \in B : L \leq x \leq U \}$
  - Example:  $x=u'$ ;  $y=0$ ;  $g = x \text{ xor } y = x'y + xy'$  (p.104)
- Satisfiability Don't Care :  $D_g^{\text{Sat}}$ 
  - Certain input combinations don't occur
  - Example:  $D_g^{\text{Sat}} = \{ x'y, xy \}$  never occur
- $D_L^{\text{Sat}} = g - D_g^{\text{Sat}} =$  On conditions less Never occurring conditions  
 $= \{ xy', x'y \} - \{ x'y, xy \}$
- $D_U^{\text{Sat}} = g \cup D_g^{\text{Sat}} =$  On conditions  $\cup$  Never occurring conditions  
 $= \{ xy', x'y \} \cup \{ x'y, xy \} = \{ xy' + x'y + xy \} = x + y$

## Satisfiability and Observability



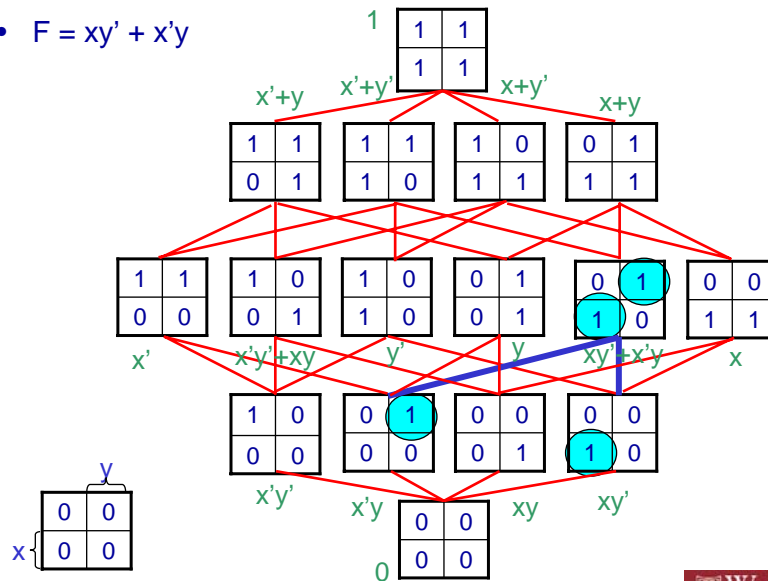
## Satisfiability Don't Care – Example

- Example:  $D_g^{\text{Sat}} = \{x'y, xy\}$   
– Inputs wont occur



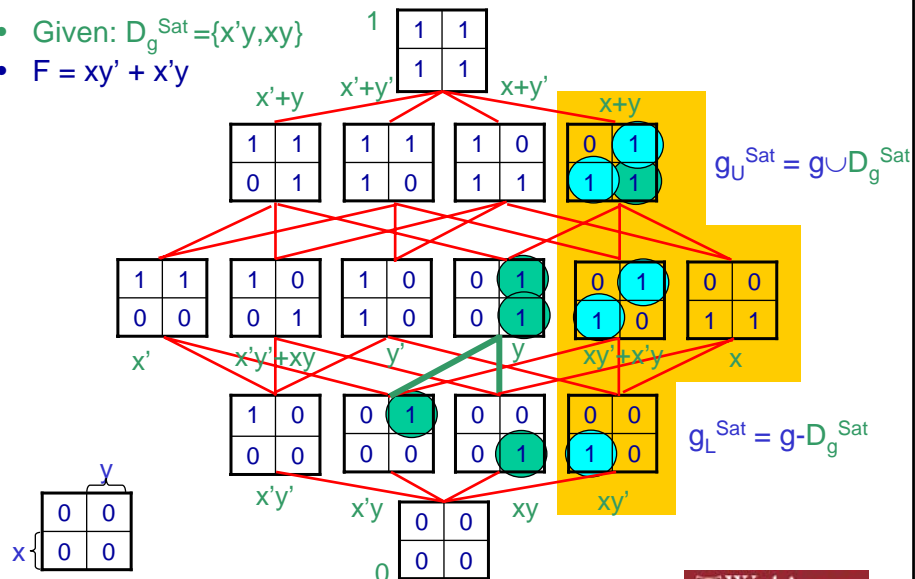
## Satisfiability Don't Care – Example (2)

- $F = xy' + x'y$



## Example:

- Given:  $D_g^{\text{Sat}} = \{x'y, xy\}$
- $F = xy' + x'y$



## Incomplete Specification: Boolean Function

- $ff = (f,d,r)$ 
  - $f = \text{ON-set} : f=1$  for all values of  $ff=1$
  - $d = \text{Don't Care} : d=1$  for all values of  $ff=d$
  - $r = \text{OFF-set} : r=1$  for all values where  $ff=0$
- Relationships of  $ff$  to Interval  $I=[L,U]$ 
  - $f = L$
  - $r = U'$
  - $d = U-L = UL' = (f+r)'$
  - $L = f$
  - $U = f+d$

## Examples

- Given Interval  $I=[0,x+y+z']$  for  $B=\{0,1\}$ , find  $ff=(f,r,d)$ 
  - $L = 0$  (given)
  - $U = x+y+z'$  (given)
  - $f = L = 0$
  - $r = U' = x'y'z$
  - $d = UL' = x + y + z'$