

PME: WORKED EXAMPLE of JUNCTION TREE ALG.

8/16/09

(1)



$p(b|c)$

	$b=0$	$b=1$
$c=0$	0.1	0.9
$c=1$	0.8	0.2

$p(c)$

$c=0$	0.8
$c=1$	0.2

$p(a|b)$

	$b=0$	$b=1$
$a=0$	0.6	0.3
$a=1$	0.4	0.7

$\psi(a, b) = p(a|b)$        $\psi(b, c) = p(c) p(b|c)$

$\psi(b, c) =$

	$b=0$	$b=1$
$c=0$	0.08	0.72
$c=1$	0.16	0.04

$\phi(b)$  is initialized to  $(1, 1)$

Pass msg from  $(ab)$  to  $(bc)$

$\phi^*(b) = \sum_a \psi(a, b) = (1, 1)$

$\psi^*(b, c) = \frac{\psi(b, c) \phi^*(b)}{\phi(b)} = \psi(b, c) = p(b, c)$

$\therefore p(b) = \sum_c p(b, c) = (0.08 + 0.16, 0.72 + 0.04)$   
 $= (0.24, 0.76)$   
 $\quad \quad \quad b=0 \quad b=1$

NOW CONSIDER  $p(b|a=0, c=1)$

<del><math>\psi(b, c)</math></del>	$b=0$	$b=1$
$\psi(b, c=1)$	0.16	0.04

SLICE OF  $\psi(b, c)$  TABLE  
from previous page

$\phi(b)$  is initialized to (1, 1)

$\psi(a=0, b)$	$b=0$	$b=1$
	0.6	0.3

SLICE of  $\psi(a, b)$  TABLE  
from previous page

Pass msg from  $(ab)$  to  $[b]$

$\phi^*(b) = (0.6, 0.3)$  NO SUMMATION, as the table is sliced

$$\psi^*(b, c=1) = \psi(b, c=1) \frac{\phi^*(b)}{\phi(b)} = (0.16 \times 0.6, 0.04 \times 0.3)$$

$$= (0.096, 0.012)$$

at convergence  $\psi^*(b, c=1) = p(b, a=0, c=1)$

$$\therefore p(b=0 | a=0, c=1) = \frac{0.096}{0.096 + 0.012} = 0.889$$

$$p(b=1 | a=0, c=1) = \frac{0.012}{0.096 + 0.012} = 0.111$$