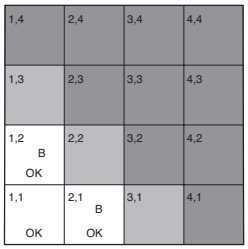
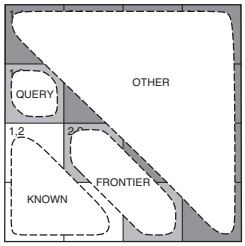
Details of the wumpus world calculations





We know the following facts (evidence): $b = \neg b_{1,1} \wedge b_{1,2} \wedge b_{2,1} \quad known = \neg p_{1,1} \wedge \neg p_{1,2} \wedge \neg p_{2,1}$

$\mathbb{P}(P_{1,3}|$ known, b) = α' $\mathbb{P}(P_{1,3})$ $\sum_{frontier}$ $\mathbb{P}($ b $|$ known, $P_{1,3}$, frontier) P(frontier)

First, compute with $P_{1,3}$ = true:

Compute the sum over the frontier:

P(b $|$ known, $P_{1,3}$, $P_{2,2}$, $P_{3,1}$) P($P_{2,2}$, $P_{3,1}$)	= 1 × 0.2 × 0.2	= 0.04
P(b $|$ known, $P_{1,3}$, $\neg P_{2,2}$, $P_{3,1}$) P($\neg P_{2,2}$, $P_{3,1}$)	= 1 × 0.8 × 0.2	= 0.16
P(b $|$ known, $P_{1,3}$, $P_{2,2}$, $\neg P_{3,1}$) P($P_{2,2}$, $\neg P_{3,1}$)	= 1 × 0.2 × 0.8	= 0.16
P(b $|$ known, $P_{1,3}$, $\neg P_{2,2}$, $\neg P_{3,1}$) P($\neg P_{2,2}$, $\neg P_{3,1}$)	= 0 × 0.8 × 0.8	= 0.00

The sum is: 0.04 + 0.16 + 0.16 + 0.00 = 0.36. P($P_{1,3}$) = 0.2, therefore:

P($P_{1,3}$) $\sum_{frontier}$ P(b $|$ known, $P_{1,3}$, frontier) P(frontier) = 0.2 × 0.36 = **0.072**.

Then, compute with $P_{1,3}$ = false:

Compute the sum over the frontier:

P(b $|$ known, $\neg P_{1,3}$, $P_{2,2}$, $P_{3,1}$) P($P_{2,2}$, $P_{3,1}$)	= 1 × 0.2 × 0.2	= 0.04
P(b $|$ known, $\neg P_{1,3}$, $\neg P_{2,2}$, $P_{3,1}$) P($\neg P_{2,2}$, $P_{3,1}$)	= 0 × 0.8 × 0.2	= 0.00
P(b $|$ known, $\neg P_{1,3}$, $P_{2,2}$, $\neg P_{3,1}$) P($P_{2,2}$, $\neg P_{3,1}$)	= 1 × 0.2 × 0.8	= 0.16
P(b $|$ known, $\neg P_{1,3}$, $\neg P_{2,2}$, $\neg P_{3,1}$) P($\neg P_{2,2}$, $\neg P_{3,1}$)	= 0 × 0.8 × 0.8	= 0.00

The sum is: 0.04 + 0.00 + 0.16 + 0.00 = 0.20. P($\neg P_{1,3}$) = 0.8, therefore:

P($P_{1,3}$) $\sum_{frontier}$ P(b $|$ known, $P_{1,3}$, frontier) P(frontier) = 0.8 × 0.20 = **0.16**.

$\mathbb{P}$ ($P_{1,3}|$ known, b) = $\alpha' <$ **0.072**, **0.16** $> = < \frac{0.072}{0.072+0.16}$, $\frac{0.16}{0.072+0.16} > = < 0.31, 0.69 >$

P($P_{1,3}|$ known, b) = 0.31 (= P($P_{3,1}|$ known, b) by symmetry)