

# Inference: Wumpus world

$$R_1: \neg P_{1,1}$$

$$R_2: B_{1,1} \Leftrightarrow P_{1,2} \vee P_{2,1}$$

$$R_3: B_{2,1} \Leftrightarrow P_{1,1} \vee P_{2,2} \vee P_{3,1}$$

$$R_4: \neg B_{1,1}$$

$$R_5: B_{2,1}$$

$$KB \models P_{1,2}?$$

$$\begin{array}{l}
 R_2 \quad \underline{B_{1,1} \Leftrightarrow P_{1,2} \vee P_{2,1}} \\
 R_6 \quad \underline{(B_{1,1} \Rightarrow (P_{1,2} \vee P_{2,1})) \wedge ((P_{1,2} \vee P_{2,1}) \Rightarrow B_{1,1})} \\
 \text{Simplification} \quad \underline{(P_{1,2} \vee P_{2,1}) \Rightarrow B_{1,1}} \\
 R_4 \quad \underline{\neg B_{1,1} \quad \neg B_{1,1} \Rightarrow \neg(P_{1,2} \vee P_{2,1})} \quad \text{Contrapositive} \\
 MP \quad \underline{\neg(P_{1,2} \vee P_{2,1})} \\
 DeMorgan \quad \underline{\neg P_{1,2} \wedge \neg P_{2,1}} \\
 \text{Simplification} \quad \neg P_{1,2}
 \end{array}$$

$$KB \models \neg P_{1,2}$$

# Proof by Resolution

- Resolution & Wumpus world:

1,4	2,4	3,4	4,4
1,3 W!	2,3	3,3	4,3
1,2 A S OK	2,2 OK	3,2	4,2
1,1 V OK	2,1 B V OK	3,1 P!	4,1

$$R_1: \neg P_{1,1}$$

$$R_2: B_{1,1} \Leftrightarrow P_{1,2} \vee P_{2,1}$$

$$R_3: B_{2,1} \Leftrightarrow P_{1,1} \vee P_{2,2} \vee P_{3,1}$$

$$R_4: \neg B_{1,1}$$

$$R_5: B_{2,1}$$

$$\neg B_{1,2}$$

$$B_{1,2} \Leftrightarrow P_{1,3} \vee P_{2,2} \vee P_{1,1}$$

$$KB \models P_{3,1}?$$

$$\underline{B_{1,2} \Leftrightarrow P_{1,3} \vee P_{2,2} \vee P_{1,1}}$$

$$\underline{(B_{1,2} \Rightarrow P_{1,3} \vee P_{2,2} \vee P_{1,1}) \wedge (P_{1,3} \vee P_{2,2} \vee P_{1,1} \Rightarrow B_{1,2})}$$

$$\underline{\neg B_{1,2} \quad P_{1,3} \vee P_{2,2} \vee P_{1,1} \Rightarrow B_{1,2}}$$

$$MT \quad \underline{\neg(P_{1,3} \vee P_{2,2} \vee P_{1,1})}$$

$$\underline{\neg P_{1,3} \wedge \neg P_{2,2} \wedge \neg P_{1,1}}$$

$$\neg P_{2,2}$$

$$\underline{B_{2,1} \Leftrightarrow P_{1,1} \vee P_{2,2} \vee P_{3,1}}$$

$$\underline{(B_{2,1} \Rightarrow P_{1,1} \vee P_{2,2} \vee P_{3,1}) \wedge (P_{1,1} \vee P_{2,2} \vee P_{3,1} \Rightarrow B_{2,1})}$$

$$\underline{B_{2,1} \quad B_{2,1} \Rightarrow P_{1,1} \vee P_{2,2} \vee P_{3,1}}$$

$$\underline{P_{1,1} \vee P_{2,2} \vee P_{3,1} \quad \neg P_{2,2}}$$

*Resolution*

$$\underline{P_{1,1} \vee P_{3,1} \quad \neg P_{1,1}}$$

*Resolution*

$$P_{3,1}$$