COMP 8700 - Introduction to AI
Assignment 4

Yameen Ajani (110096721)

November 22, 2022

Question 1

Please refer to **this link** for the video of the implementation of the search algorithms. You can view the source code **here**.

Question 2

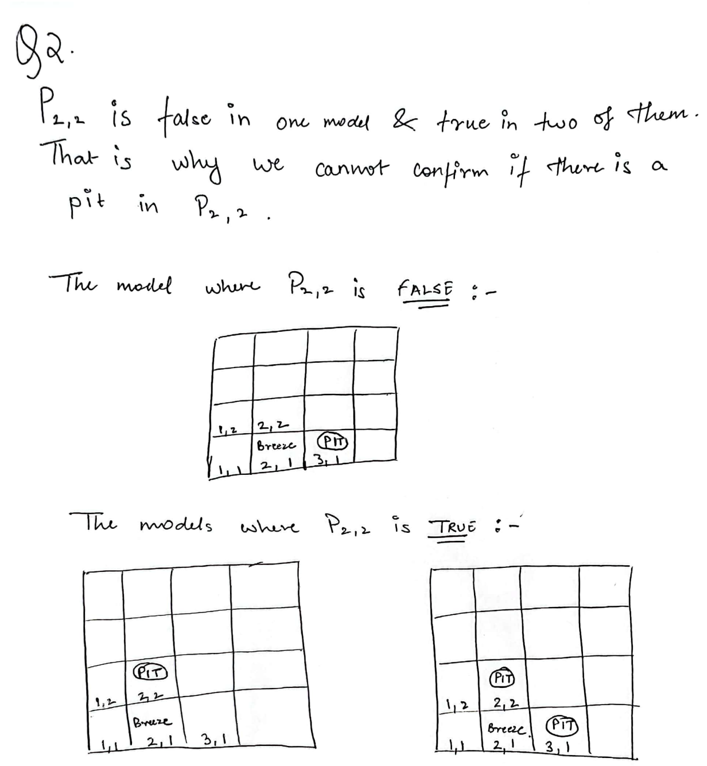

Figure 1: Solution for Q2

Question 3

Q3.

R_{11} :- $\neg B_{1,2}$

R_{12} :- $B_{1,2} \Leftrightarrow (P_{1,1} \vee P_{2,2} \vee P_{1,3})$

Simplifying R_{12}

$$\alpha \Leftrightarrow \beta \equiv (\alpha \Rightarrow \beta) \wedge (\beta \Rightarrow \alpha)$$

$\therefore$ R_{12} :- $(B_{1,2} \Rightarrow (P_{11} \vee P_{22} \vee P_{13}))$
$\wedge ((P_{11} \vee P_{22} \vee P_{13}) \Rightarrow B_{12})$

$$\alpha \wedge \beta \equiv \alpha \quad \underline{\underline{\text{OR}}} \quad \alpha \wedge \beta \equiv \beta$$

$\therefore$ R_{12} :- $(P_{11} \vee P_{22} \vee P_{13}) \Rightarrow B_{12}$

Negating both sides

R_{12} :- $\neg B_{12} \Rightarrow \neg (P_{11} \vee P_{22} \vee P_{13})$

Applying modus ponens with percept R_{11} :- $\neg B_{12}$

we get

R_{12} :- $\neg (P_{11} \vee P_{22} \vee P_{13})$

Applying De Morgan's law.

R_{12} :- $\neg P_{11} \wedge \neg P_{22} \wedge \neg P_{13}$

Figure 2: Solution for Q3 - Part 1

This means that neither of [1, 1], [2, 2]
[1, 3] contains a pit.

Hence proved that no pits in [2, 2] & [1, 3]

Figure 3: Solution for Q3 - Part 2

Question 4

Q4.

R_6 :- $(B_{1,1} \Rightarrow (P_{1,2} \vee P_{2,1})) \wedge ((P_{1,2} \vee P_{2,1}) \Rightarrow B_{1,1})$

~~Eliminating~~ $\Rightarrow$ elimination

$$\alpha \Rightarrow \beta = \neg \alpha \vee \beta$$

$$(\neg B_{1,1} \vee P_{1,2} \vee P_{2,1}) \wedge (\neg (P_{1,2} \vee P_{2,1}) \vee B_{1,1})$$

However, in a CNF the $\neg$ cannot be there in literals.

$$\neg(\alpha \vee \beta) = \neg \alpha \wedge \neg \beta$$

$$(\neg B_{1,1} \vee P_{1,2} \vee P_{2,1}) \wedge ((\neg P_{1,2} \wedge \neg P_{2,1}) \vee B_{1,1})$$

According to the law of Distribuitivity,

$$\alpha \wedge (\beta \vee \gamma) = ((\alpha \wedge \beta) \vee (\alpha \wedge \gamma))$$

Hence,

$$(\neg B_{1,1} \vee P_{1,2} \vee P_{2,1}) \wedge (\neg P_{1,2} \vee B_{1,1}) \wedge (\neg P_{2,1} \vee B_{1,1})$$

is the required CNF

Figure 4: Solution for Q4

Question 5

Please refer to **this link** for the video of the implementation of the search algorithms. You can view the source code **here**.

NOTE - Incase the links are not working, please refer to **https://drive.google.com/drive/folders/1oSiAT8TP2U8X8ACmx7N3Jr6NGyW36GMw?usp=sharing** for the videos of the implementation. You can view the source code at - **https://github.com/yameenajani/COMP-8700**