EECS 592: HW2

Anivksha Busa
02/24/20

Part I

1) R&N 5.12:

Ans

Minimax algorithms don't change for two-player, non-zero sum games. Each player still maximizes their own utility at each node and backs their values up from children to parents.

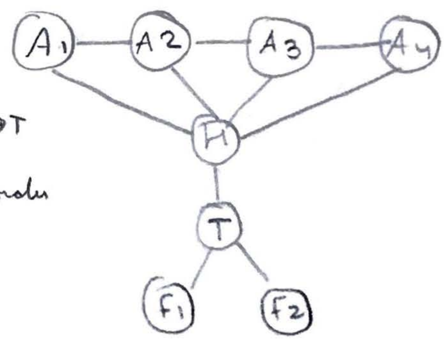
α-β would not be possible for typical non-zero sum games because there is no "competition". Each player would simply focus on increasing their utility. Also, all leaf nodes will have to be checked in order to check optimality for the players, thus no pruning takes place here.

~~Lastly, I imagine that there a possibility to use the α-β pruning for non zero sum games can occur if we model our player goals accordingly (ex: net difference~~

Thus, the same state could be good for both players (without a zero-sum) which means α-β pruning here is ineffective.

2) R&N 6.8:

$A_1, A_2, A_3, A_4, H, T, F_1, F_2 \Rightarrow$



Ans

$\rightarrow A_1 \rightarrow H \rightarrow A_4 \rightarrow F_1 \rightarrow A_2 \rightarrow F_2 \rightarrow A_3 \rightarrow T$

$\Downarrow$

Variable order

$\rightarrow R, G, B \Rightarrow$ Value order

$\therefore$ Move / Conflicts

$\Downarrow$

- $A_1 = R$
- $H \neq R$ (because $A_1 = R$)
  $H = G$
- $A_4 = R$
- $F_1 = R$
- $A_2 \neq R$ (because $A_1 = R$)
  $A_2 \neq G$ (because $H = G$)
  $A_2 = B$
- $F_2 = R$
- $A_3 \neq R$ (because $A_4 = R$)
  $A_3 \neq G$ (because $H = G$)
  $A_3 \neq B$ (because $A_2 = B$)

$\therefore A_2, H, A_4 \rightarrow$ conflict set

$\Downarrow$

backjump to A_2

$\Downarrow$

add H, A_4 to A_2's conflict set

- A_2 has no values now $\therefore$ backtrack $\Rightarrow$ conflict set $= A_1, H, A_4$

$\therefore$ jump back to A_4

$\Downarrow$

Add A_1, H to A_4's conflict set

- $\therefore A_4 \neq G$ (because $H = G$)

  $\therefore A_4 = B$
- $F_1 = R$
- $A_2 \neq R$ (because $A_1 = R$)

  $A_2 \neq G$ (because $H = G$)

  $\therefore A_2 = B$
- $F_2 = R$
- $A_3 = R$
- $T \neq R$ (because $F_1, F_2 = R$)

  $T \neq G$ (because $H = G$)

  $T = B$

$\therefore$ success!!!

3) Logic : How many models for the following?

(a) $\neg A \vee \neg B \vee D$

(b) $(A \wedge C) \vee (B \wedge D)$

(c) $(A \Rightarrow B) \wedge A \wedge C$

(d) $(A \Rightarrow B) \wedge (C \Rightarrow D)$

($\wedge$ = &)

($\vee$ = or)

Ans

(a) is true ~~when~~ for 8 models

(b) is true for 7 models

(c) $(A \to B) \vee C$ gives 8 models $\therefore$ $(A \to B) \vee C \vee A$ also gives 8 models

(d) is true for 9 models

See next pages for truth table

4) R & N 7.14:

(a) Radical $\rightarrow R$

Electable $\rightarrow E$

Conservative $\rightarrow C$

Ans

(i) $(R \land E) \Leftrightarrow C$ $\rightarrow$ No because this implies all C are R

(ii) $R \Rightarrow (E \Leftrightarrow C)$ $\rightarrow$ Yes, because R implies they are E iff C

(iii) $R \Rightarrow ((C \Rightarrow E) \lor \neg E)$ $\rightarrow$ No, because this would always be true

$\Rightarrow \neg R \lor \neg C \lor E \lor \neg E$

(b) Horn form for (a)?

Ans

$C \Rightarrow (R \land E) \equiv (C \Rightarrow R) \land (C \Rightarrow E)$

(i) $(R \land E) \Leftrightarrow C \equiv ((R \land E) \Rightarrow C) \land \overbrace{(C \Rightarrow R) \land (C \Rightarrow E)}$ $\therefore$ Yes

(ii) $R \Rightarrow (E \Leftrightarrow C) \equiv R \Rightarrow ((E \Rightarrow C) \land (C \Rightarrow E))$

$\equiv \neg R \lor ((\neg E \lor C) \land (\neg C \lor E))$

$\equiv (\neg R \lor \neg E \lor C) \land (\neg R \lor \neg C \lor E)$ $\therefore$ Yes

(iii) true $\Rightarrow$ true $\therefore$ yes