CS3243 Tutorial 6

Eric Han

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Annoucements

1. Assignment 4 scores are now on turnitin, please check.
2. Midterm Examination is 5 October, check annoucements on Luminus.
3. Mark your attendance.

Good thinking question to further understand AC-3 algorithm

From student 1

If you did change the domains of the variables you need to recheck some constraints.

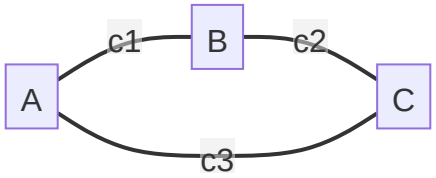


Figure 1: Fully connected situation, may need to check again.

From student 2

Can we consider bidirectional filtering instead of unidirectional filtering?

Previously from T05, Q3

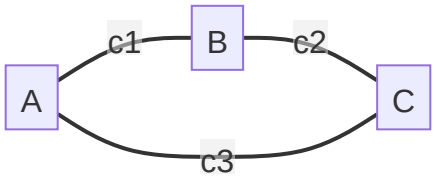


Figure 2: T05,Q3 constraint graph.

Question 3a

$$A = \{1, 2\}, B = \{2, 4\}, C = \{1, 2, 3\}$$

Question 3b

$$(A, B, C) = (1, 2, 1)$$

Question 1

Assignment Question; we will go through this question next week.

Question 2

We have an attacker looking at three targets: t_1, t_2, t_3. A defender must choose which of the two targets it will guard; however, the attacker has an advantage: it can observe what the defender (strategy) is doing before it chooses its move. If an attacker successfully attacks it receives a payoff of 1 and the defender gets a payoff of -1.

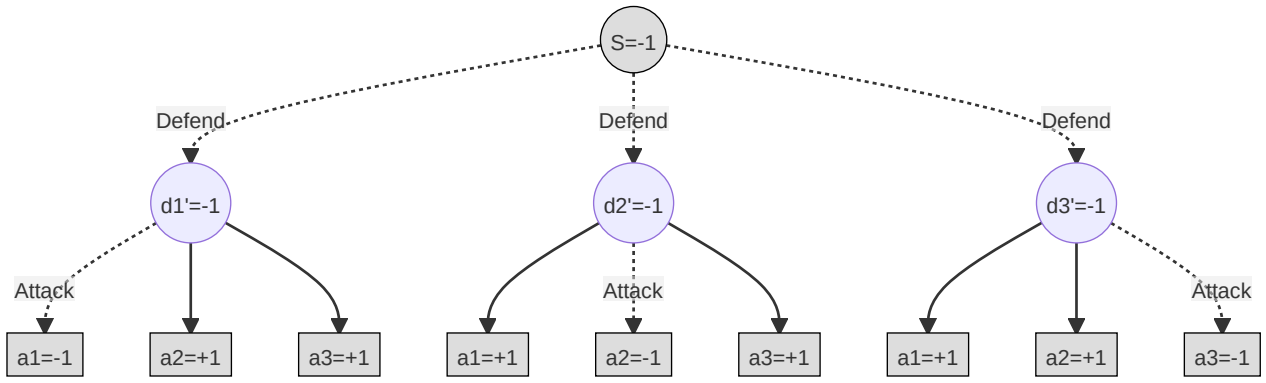
a. Model this problem as a minimax search problem.
b. Draw out the search tree.
c. What is the defender's payoff in this game?

Recap

1. What is the minimax algorithm?
2. Why is it used?
3. What are the ingredients needed to setup?

Answer

1. **Actors**: Min - Attackers, Max - Defenders
2. **Leaf Cost**: -1 if attack successful, $+1$ otherwise



No matter how the attackers choose, the value for the defenders would always be -1. **Question**: How to get around this issue?

Question 3

With the `MINIMAX` algorithm, we know that the value v, computed at the root (i.e, the utility for the MAX player), is a worst-case value. This means that if the opponent MIN does not act optimally, the actual outcome v' for MAX can only be better, and never worse than v. That said, the `MINIMAX` algorithm may not select the optimal move given sub-optimal play from the `MIN` player.

Recap

1. What is the impact of choosing min/max in our computation?
2. When was `MINIMAX` famously used in AI?

. . .

IBM Deep Blue versus Garry Kasparov in Chess.

Limitations of `MINIMAX`:

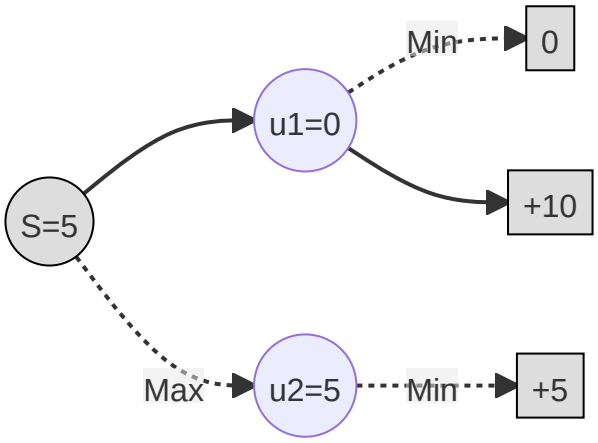


Figure 3: Sub Optimal Example

- Assumes that Min player playes optimally: ie. when it sees 0 and +10 it will choose 0.
- So to avoid the case of Min player choosing 0
- It selects the action that eliminates the option of choosing 0.

Bonus Question - Work for Snack

To help you further your understanding, not compulsory.

Tasks

1. Read and research on DeepBlue:
    1. https://stanford.edu/~cpiech/cs221/apps/deepBlue.html.
    2. And more…
2. Share with us a brief description on how it works.
3. Comment on the use of `MINIMAX` on chess especially in IBM Deep Blue versus Garry Kasparov;
    1. Why do you think it worked so well?
    2. Would it work well on regular chess players?; What are the limitations and how to mitigate them?

Extra time today

Suggested activities

1. Attempt Question 1
    - Feel free to discuss with your friends
2. Chitchat
    - Make some new friends on your table
    - Talk with me to find out more about …
3. Revise for Midterms
    - Feel free to ask me any questions
4. Go for lunch early