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2/21/22

CECS 451 Assignment 1

1. Imagine that, one of the friends wants to avoid the other. The problem then becomes a two-player pursuit–evasion game. We assume now that the players take turns moving. The game ends only when the players are on the same node; the terminal payoff to the pursuer is minus the total move taken. An example is shown in Figure 1.
    a. (2 points) What is the terminal payoff at the node (1)? **- 4**
    b. (2 points) What are the positions of the two players at the node (2) and (2)'s children? **Node (2) will be at *be* and its children will be at *bd.***
    c. (3 points) Can we assume the terminal payoff at the node (2) is less than −4? Answer yes or no, then explain your answers.
    Yes, we can assume it's less than -4 because we can still expand it since Max(P) expects the least amount of moves and when I expanded it I got that the node cc was equal to -2.
    d. (3 points) Assume the terminal payoff at the node (4) is less than −4. Do we need to expand the node (5) and (6)? *Answer yes or no, then explain your answers.*
    No, because we already found the max payoff so nodes (5) and (6) won't have to be explored.

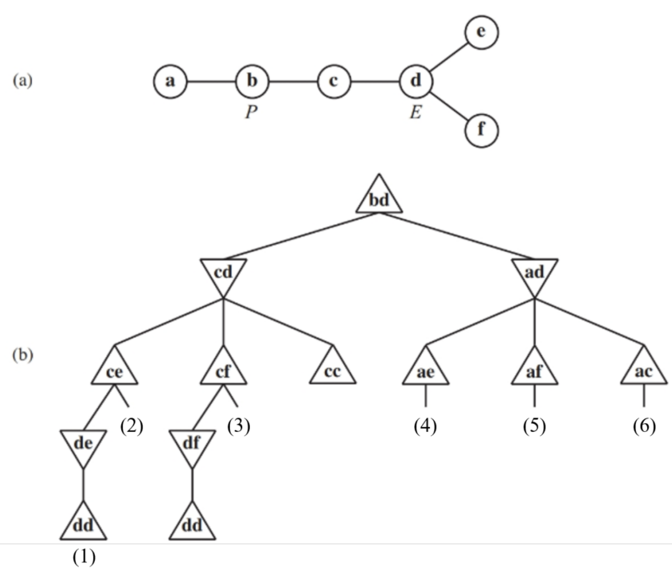


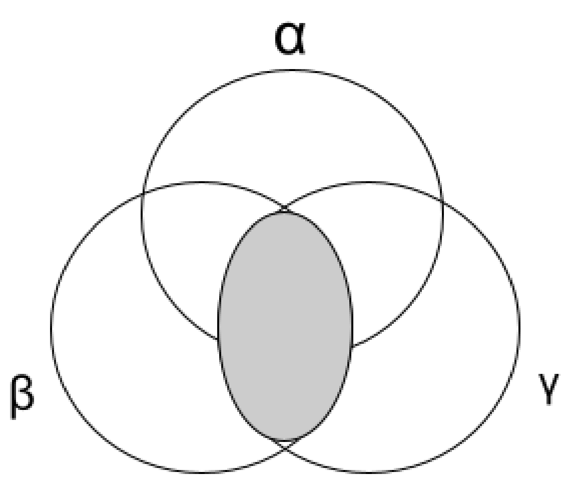
Figure 1: (a) A map where the cost of every edge is 1. Initially the pursuer P is at node b and the evader E is at node d. (b) A partial game tree for this map. Each node is labeled with the P, E positions. P moves first.

2. True or False?
    a. (2 points) $(A \land B) \models (A \Leftrightarrow B)$ ***True***
    b. (2 points) $(C \lor (\neg A \land \neg B)) \equiv ((A \Rightarrow C) \land (B \Rightarrow C))$ ***True***
    c. (2 points) $(A \lor B) \land (\neg C \lor \neg D \lor E) \models (A \lor B)$ ***True***
    d. (2 points) $(A \lor B) \land \neg(A \Rightarrow B)$ is satisfiable. ***True***

3. Prove using Venn diagram, or find a counterexample to the following assertion:

$$\alpha \models (\beta \land \gamma) \text{ then } \alpha \models \beta \text{ and } \alpha \models \gamma$$

Venn Diagram:



Therefore, if $\alpha \models (\beta \land \gamma)$ then $\alpha \models \beta$ and $\alpha \models \gamma$

Counterexample:

γ = valid and β = invalid.

With conjunction ($\lor$) instead of conjunction ($\land$) at least one our statements will have a final condition of true. Therefore, our final condition will also be valid.Therefore, if $\alpha \models (\beta \land \gamma)$ then $\alpha \models \beta$ and $\alpha \models \gamma$ is **true**.