Converting extensive-form games to normal-form (plus philosophy)

Homework #4

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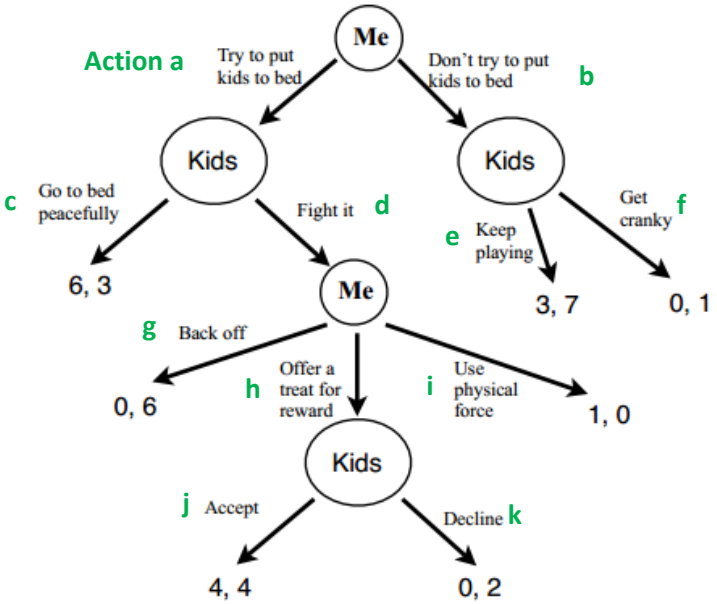
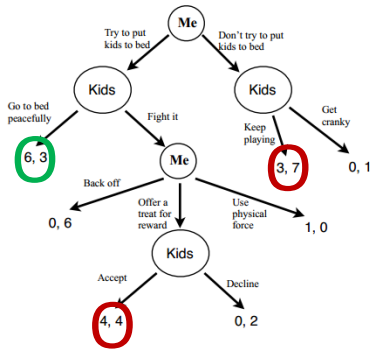
1.



Me \ Kids	cej	cek	cfj	cfk	dej	dek	dfj	dfk
ag	6,3	6,3	6,3	6,3	0,6	0,6	0,6	0,6
ah	6,3	6,3	6,3	6,3	4,4	0,2	4,4	0,2
ai	6,3	6,3	6,3	6,3	1,0	1,0	1,0	1,0
bg	3,7	3,7	0,1	0,1	3,7	3,7	0,1	0,1
bh	3,7	3,7	0,1	0,1	3,7	3,7	0,1	0,1
bi	3,7	3,7	0,1	0,1	3,7	3,7	0,1	0,1

Pure Nash equilibria: (ai, cej), (ai, cek), (ai,cfj), (ai, cfk), (ah,dej), (ah, dfj), (bg,dek), (bh, dek), (bi,dek)

Sub-game perfect: (ah,dej), (ah, dfj), (bg,dek), (bh, dek), (bi,dek)



If I was me, I would try to put the kids to bed and then offer a treat for reward. This way my lowest possible payoff is 0, but that is the same in other cases too. However, in this case, the payoff can get as high 6, if the kids instantly accept to go to bed, or it will be 4 if they accept my reward. If I would have chosen not to act and not to try to put them to bed, the lowest possible payoff is still 0, however, if they keep playing the highest is only 3. Therefore I would prefer the to act as: *a*->*h* (if necessary).

If I was the kids, I would fight it and accept the reward or keep playing (strategy dej). This way, my lowest possible payoff is 0 if they have decided to use physical force, but I can get as high as 7! Also, the payoff is 3 times 7 out of the 6 possibilities, one 6 and once 4. Therefore, this seems to offer the most payoff with the lowest risk. One can argue that ce strategies (either cej or cek) offer a guaranteed reward of at least 3, but I would accept the risk and try for the higher (4 and 6) payoffs.

2.

One can argue that an agent should consider using mixed strategies In both one-shot and repeated matrix games mixed strategies can lead to either an overall higher payoff or a lower total risk or both. Mixed strategies are very useful in order to account for the choice uncertainty of the other player's actions. If we do not know what the other player's actions are, using a mixed strategy we can create a scenario in which we will have a best response *regardless* of what the opponent does.

Playing a mixed strategy in one-shot game is often due to the lack of information about the other player's action, what often happens in high-capital or innovative industries for example.

In a repeated game, a mixed strategy can often lead to a higher payoff having known the other player's move history. A mixed strategy can take this into account, while a pure strategy cannot.

Also, using mixed strategies have a disadvantage, since they are based on probabilities are designed for risk-hedging. This might prevent the player from using a pure strategy with a certain, but lower return while going for the higher but more uncertain one.

Overall, because mixed strategies with probabilities 1 include pure strategies within themselves too, I think it always useful to consider using mixed strategies.