CCIS 4100: in-class exercise on expectimax

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Complete the following either on your own or in small groups.

Expectimax for Street fighter II

Figure 1: Ryu (left) v. Ken in Street Fighter 2. (I am old.)

Recall that in street fighter, health is a scalar: one losses when this reaches 0. We assume the score at any node is (Ryu's health) - (Ken's health) – so Ryu is the *max* agent and Ken the *min*. Thus at depth 0, $s = 0$. Again assume an unblocked punch (P) costs 10 points in health to the recipient. Last class we ended up with a game tree that looked something like:

Previously, we explored *minimax* for SFII, under the typical assumption there in which our opponent was playing optimally. We have filled out internal node scores in Figur e2 under this assumption. However, this is not always a reasonable assumption – human players, for instance, tend not to act in an entirely deterministic manner.

Assume you're playing as Ryu, so you want to maximize the score. Under minimax, we saw last time that the optimal first move for you (Ryu) was a toss-up; blocking or punching were the same assuming optimal play.

1. Now assume that Ken chooses to *Block* or *Punch* according to some known probability. For concreteness, assume that the probability of Punch is

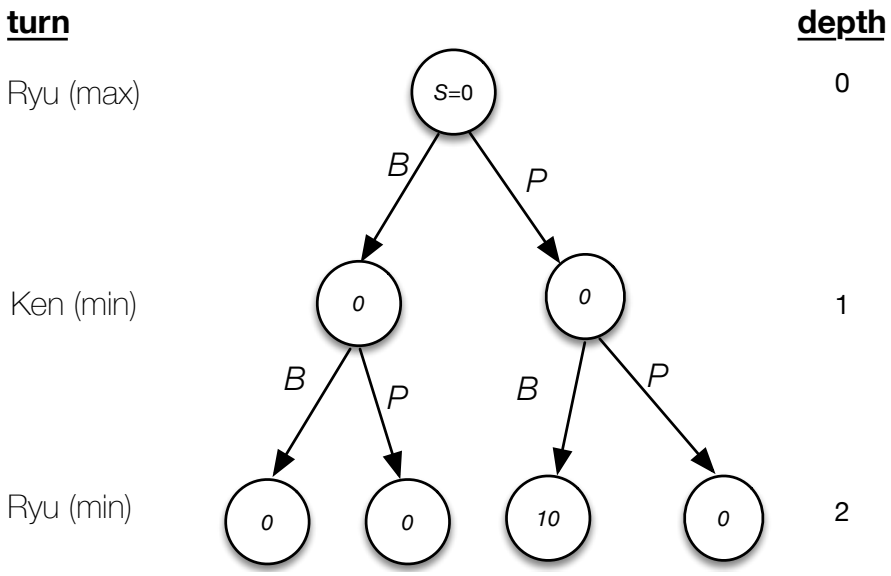

Figure 2: Game tree (depth=2) for SFII.

p=0.8. Under this assumption, re-calculate the scores for the internal nodes in the game-tree. What is the optimal strategy for Ryu now?

2. Assuming a fixed, known probability of actions is a bit simplistic. Assume instead that we believe Ken is operating stochastically, following some distribution. What is the appropriate distribution here (i.e., how would you model this)? Assume you have access to video recordings of previous matches that Ken has been involved in. How might you estimate the parameters of your model?

3. (Bonus; to think about). What are the shortcomings (if any!) of the model of Ken you've suggested in the preceding question? How might you address these?