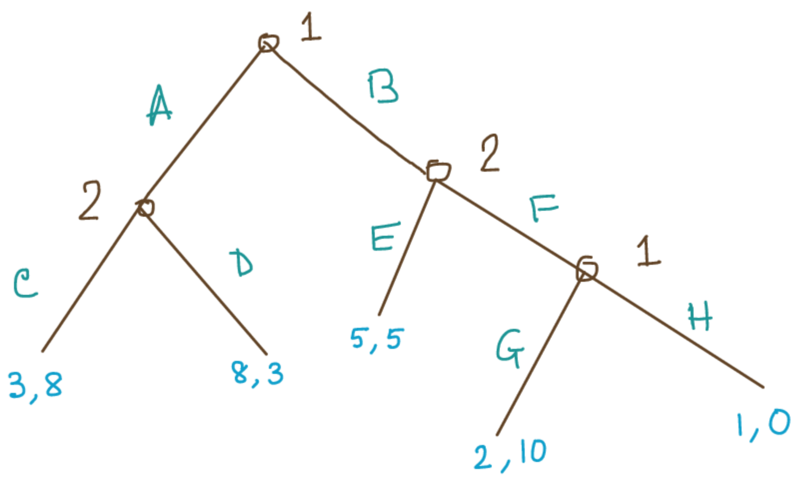
Computational cost of SPNE



function BACK_IND(history h)

  if $h \in Z$ then

    return $u(h), \emptyset$

  $\text{best\_util}_{P(h)} \leftarrow -\infty$

  forall $a \in \mathcal{X}(h)$ do

    $\text{util\_at\_child}_{P(h)} \leftarrow$ BACK_IND((h,a))

    if $\text{util\_at\_child}_{P(h)} > \text{best\_util}_{P(h)}$ then

      $\text{best\_util}_{P(h)} \leftarrow \text{util\_at\_child}_{P(h)}$, $\text{best\_action}_{P(h)} \leftarrow a$

  return $\text{best\_util}_{P(h)}$, $\text{best\_action}_{P(h)}$

The idea of subgame perfection inherently is based on backward induction.

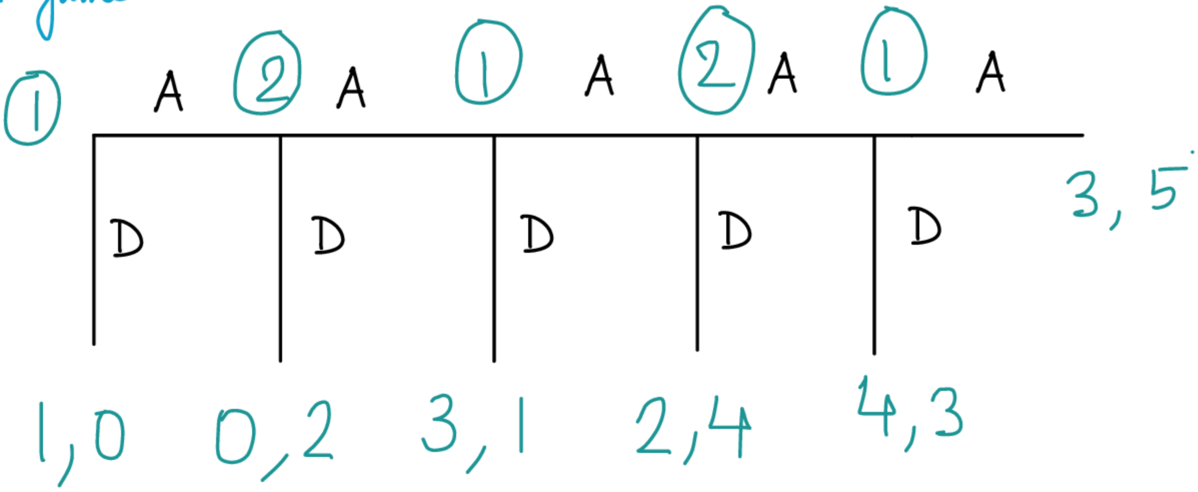
Advantages:

1. SPNE is guaranteed to exist in finite PIEFGs (requires proof)
2. An SPNE is a PSNE ... found a class of games where PSNE is guaranteed to exist.
3. The algorithm to find SPNE is quite simple.

Disadvantage: The whole tree has to be parsed to find the SPNE - which can be computationally expensive (or maybe impossible)
e.g., chess has $\sim 10^{150}$ vertices

Other criticism: about the cognitive limit (of real players)

Centipede game



What is/are the SPNE(s) of this game ?

What is the problem with that prediction ?

This game has been experimented with various populations
- random participants, university students, grandmasters

Most of the subjects (except grandmasters) continue till a few rounds

Reasons claimed : altruism, limited computational capacity of individuals, incentive difference

Criticism of the principle of SPNE

It talks about "what action if the game reached this history"
but the equilibrium in some stage above can show that it "cannot reach that history".

Extension using the idea of player beliefs.