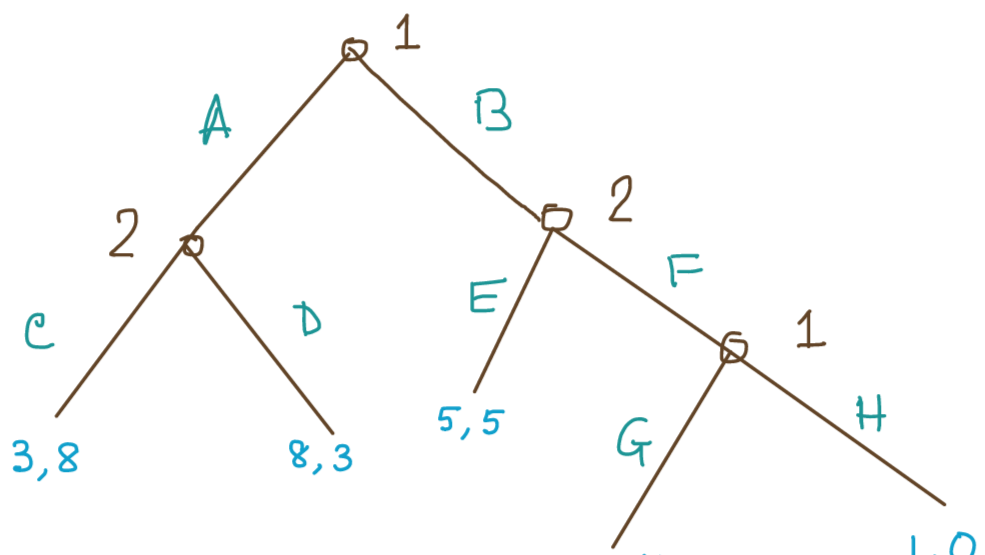
PIEFG to NFG : Equilibrium guarantees are weak in PIEFG



example from MSZ

Strategies of player 1 : AG, AH, BG, BH

Strategies of player 2 : CE, CF, DE, DF

PSNEs : (AG, CF), (AH, CF), (BH, CE)

non-credible threat

Better notion of rational outcome will be that which considers a history and ensures utility maximization

Subgame : game rooted at an intermediate vertex

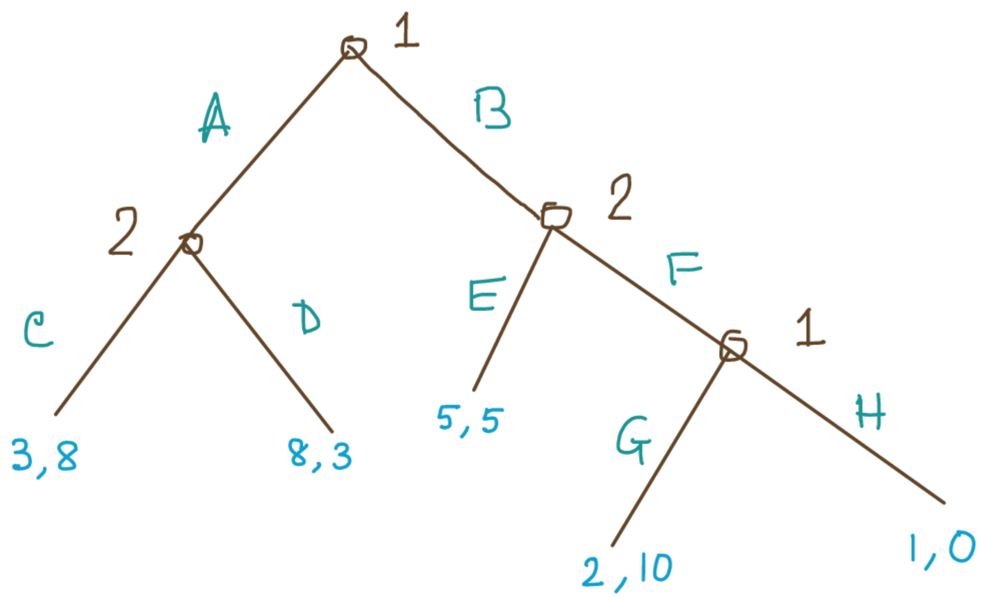
The subgame of a PIEFG G rooted at a history h is the restriction of G to the descendants of h.

The set of subgames of G is the collection of all subgames at some history of G.

Subgame perfection : best response at every subgame

Definition: The subgame perfect Nash equilibrium (SPNE) of an PIEFG G are all strategy profiles $s \in S$ s.t. for any subgame G' of G, the restriction of s to G' is a PSNE of G'.

Example



PSNEs: (AH, CF), (BH, CE), (AG, CF)

Are they all SPNEs? How to compute them?

Algorithm: Backward Induction

function BACK_IND (history h) ...... returns utility and the action

    if $h \in Z$ then

        return $u(h), \emptyset$

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

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

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

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