

Subgame perfect ϵ -equilibrium in perfect information games

János Flesch*

Abstract

We discuss recent results on the existence of subgame perfect ϵ -equilibrium in perfect information games.

The game. We consider games with perfect information and deterministic transitions. Such games can be given by a directed tree. In this tree, each node is associated with a player, who controls this node. The outgoing arcs at this node represent the actions available to this player at this node. We assume that each node has at least one successor, rather than having terminal nodes.¹ Play of the game starts at the root. At any node that play visits, the controlling player has to choose one of the actions, which brings play to a next node. This induces an infinite path in the tree from the root. Depending on this path, each player receives a payoff.

Note that these payoffs are fairly general. This setup encompasses the case when the actions induce instantaneous rewards which are then aggregated into a payoff, possibly by taking the total discounted sum or the long-term average. It also includes payoff functions considered in the literature of computer science (reachability games, etc.).

Subgame-perfect (ϵ -)equilibrium. For an error-term $\epsilon > 0$, a strategy profile is called a subgame-perfect ϵ -equilibrium, if it induces a Nash ϵ -equilibrium in every subgame, i.e. no player can gain more than ϵ by a unilateral deviation in any subgame.

Goal of the talk. There is an increasing interest and growing literature on the existence of subgame-perfect ϵ -equilibrium. We overview some recent existence results and counter-examples, in pure and in randomized strategies.

*Department of Quantitative Economics, Maastricht University, P.O.Box 616, 6200 MD, The Netherlands. E-mail: j.flesch@maastrichtuniversity.nl.

¹Every tree with finite depth can be transformed into a strategically equivalent tree with infinite depth. Indeed, we can extend a finite tree by simply adding one infinite sequence of arcs to every terminal node. So, instead of termination, play will continue along a unique path in which the players have no further strategic choices.