Why Forward Induction Leads to the Backward Induction Outcome: A New Proof for Battigalli's Theorem

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Battigalli (1997) has shown that in dynamic games with perfect information and without relevant ties, the forward induction concept of extensive-form rationalizability yields the backward induction outcome. In this paper we provide a new proof for this remarkable result, based on four steps. We first show that extensive-form rationalizability can be characterized by the iterated application of a special reduction operator, the strong belief reduction operator. We next prove that this operator satisfies a mild version of monotonicity, which we call monotonicity on reachable histories. This property is used to show that for this operator, every possible order of elimination leads to the same set of outcomes. We finally show that backward induction yields a possible order of elimination for the strong belief reduction operator. These four properties together imply Battigalli's theorem.

J. Lang (Ed.): TARK 2017
EPTCS ??, 2017, pp. 3–3, doi:10.4204/EPTCS.??.2