UCI conference on "Luce-Raiffa, What is next?"
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Title and Abstract

Evolution of Game Theory into Multi-Person Decision Theory

The title of Luce and Raiffa's *Games and Decisions* hinted that the subtext of their
critique was to reconcile the foundations of individual decision theory with game theory's
reliance on novel technical devices. They saw the familiar apparatus of decision theory
(multi-person decision trees, utilities for outcomes, strategies) but also new concepts
adapted to multi-agent contexts (mixed strategies, minimax, equilibria, vNM-solutions)
but tied to the mathematics of fixed points, and a proliferation of abstract constructions
(axiomatic bargaining solutions, value, characteristic function).

  Their critique anticipated many later developments; e.g., their "game with
misperceptions" [p. 270] anticipated Harsanyi's formalization of games with multiple
types of each player, their analysis of decisions in an extensive-form game [p. 46,68]
anticipated Selten's subgame perfection and sequential equilibrium, their rejection of the
equilibrium of the finitely repeated prisoners' dilemma [p. 98 ff.,112] anticipated
reputational models, their formal assumptions [p. 49 ff.] about knowledge and rationality
anticipated common knowledge in epistemic models – and they argued that criteria for a
"partial order" or selection among Nash equilibria would be desirable.

  In addressing these and other issues they persistently questioned whether game theory
is consonant with decision theory [e.g. §13.5,6]. In my reading I sense perplexity that
common knowledge of the game and of rationality do not imply unique probabilities for
others' strategies (like the way symmetry does for the faces of a coin) and frustration that
the mathematical model might need to be supplemented with "psychological features"
[§5.10].

  In my talk I will focus on subsequent developments that have brought noncooperative
game theory [mainly their §5] closer to its roots in decision theory, dispensed with
technical devices, and purged the foundations of reliance on perturbations of games to get
results. I will emphasize backward induction and forward induction as salient examples,
and report progress toward Kohlberg and Mertens' (1986) agenda to characterize a
refinement of Nash equilibrium in terms of desirable decision-theoretic properties, such
as ordinality, invariance, small worlds, decomposition, player-splitting, continuity, and
admissibility.