Title: Solving Endgames in Large Imperfect-Information Games such as Poker

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Abstract: Endgames have a distinctive role for players. At the late stage of games, many aspects are finally clearly defined, deeming exhaustive analysis tractable. Specialised endgame handling is rewarding for games with perfect information (e.g., Chess databases pre-computed for entire classes of endings, or dividing Go board into separate independent subgames).

An appealing idea would be to extend this approach to imperfect-information games such as the famous Poker: play the early parts of the game, and once the subgame becomes feasible, calculate an ending solution. However, the problem is much more complex for imperfect information.

Subgames need to be generalized to account for *information sets*. Unfortunately, such a generalization cannot be solved straightaway, as it does not generally preserve optimality. As a consequence, we may end up with a far more exploitable strategy.

There are currently three techniques to deal with this challenge:

(a) disregard the problem entirely;

(b) use a decomposition technique, which sadly retains only the same quality;

(c) or formalize improvements of strategies into a so-called *subgame margin*, for which we construct a "gadget" game that optimizes for the subgame margin.

The last approach is our own result presented at the Thirtieth AAAI Conference on Artificial Intelligence in 2016.

We experimentally compare the three solutions using a top participant of the AAAI-14 Computer Poker Competition, the leading playground for agents in imperfect-information setting.

Keywords: algorithmic game theory, imperfect-information games, Nash equilibrium, subgame, endgame, counterfactual regret minimization, Poker