The AAAI-17 Workshop on
What's Next for AI in Games?
WS-17-15

AI and Multiplayer Games

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Abstract

Most games involve more than one person playing (with an illustrious history including Pong, Counterstrike, Starcraft, World of Warcraft, Minecraft, and EVE). Yet the AI systems we have built to date largely model single game players in isolated environments without other people. Whether adversarial online combat or joyful local co-op, game AI has largely ignored the elements of how agents interact in complex social environments. "Solving" Go, Jeapordy!, or chess by consistently winning against a human champion in a show match overlooks the rich social dynamics and evolving landscape around games that include multiple people.

How can AI agents reason on the interactions among multiple people (and/or agents) in a game system? Reasoning on multiplayer dynamics as they evolve over time touches on many core challenges in any live game and hits open issues in multi-agent simulations and reasoning on system dynamics. As players learn to play a game the space of strategies they pursue changes and evolves—players often discuss the shifting meta in tightly competitive games like DOTA2, Rocket League, or Hearthstone. Even when artificial agents perform well against humans—witness the change in chess playstyles and emergence of centaur strategies—people adapt to and learn from agents, in turn yielding new modes of top-class human performance. How should agents understand and adapt to evolving human strategies? How could agents cooperate with people to become more effective than either alone?

Reasoning on multiplayer interactions also makes explicit the problems of teams and social interaction in games. Matchmaking algorithms are common for online multiplayer games, but often do little more than match players based on coarse estimates of ability to win (ELO, Glicko2, TrueSkill, and so on) or ping and network conditions. Yet matchmaking is more than just estimating skill and finding another player around the same skill. Human tournament organizers often go to great lengths to construct exciting matches with unpredictable outcomes. How can intelligent systems support the construction of competitive matches and match sequences for audience entertainment? Attention to cooperative games has been even more limited: how can positive player matchups (or teams) be created? How can AI systems be used to facilitate positive social interactions? Curtail negative social interactions? Modeling only individual human emotional experiences of games de-emphasizes the core systemic problems games face in creating person-to-person interactions that are often central to the ongoing enjoyment of game experiences. Scaling these efforts to full worlds with many people around at different times and across many sessions remains an outstanding grand challenge. How can an AI system facilitate a robust and healthy lobby? Understand how to best interface with a player community to help it grow?

Game AI stands to greatly contribute to the types of games that are made and how any games with certain features (more than one player) are experienced. While many of these questions are certainly long-term grand challenges, AI and machine learning can certainly bring about vast improvements in the experience of playing games with other individuals. At the same time, these models are posed to change how we design online or local multiplayer (or new forms of multiplayer as in Dark Souls) games by providing automated ways to handle the complex social dynamics typically navigated purely by people. If the current generation of (game) AI has been focused on ways for AI to improve an individuals experience—by personalizing content through player models and recommender systems or procedurally generating content for a single person in a game—then what's next for AI in games is bringing to bear this thinking to the open area of multiple people in games.