Desirable Behaviors for Companion Bots in First-Person Shooters

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First-Person Shooter games are a popular genre that often includes a team deathmatch mode of play, in which teams of agents try to maximize score by killing members of the other team. When played without other humans, this mode features both opponent bots and companion bots. This paper uses a human subject study with 30 participants to analyze player preference for cooperative teammates vs. skilled, but less cooperative, teammates in the game Unreal Tournament 2004. Specifically, participants play games with both a skilled bot based on neuroevolution and a less skilled bot hand-coded to be more cooperative.

Unreal Tournament 2004

Unreal Tournament 2004 (UT2004) is a First-Person Shooter (FPS) video game known for its online multiplayer modes that still have active servers. One mode is team deathmatch in which players can repeatedly respawn after dying, and points are earned by killing players on the opposing team, and the collective team score determines victory.

Human Subject Study

The human subject study consisted of 30 participants, all of whom were students, faculty, or staff at Southwestern University. Participants first played a one-on-one tutorial match against a native bot with an investigator present to explain the game. The participant would then play two 10 minute rounds of team deathmatch against two native bots with each experimental bot as a teammate.

After each round players were asked to rate the bots on a scale from 1 to 5 on five different metrics, with a higher score meaning that they considered the bot to be better in that aspect. The bots were scored on how well they followed the player, how helpful they were, how often the player saw them, their ability to avoid dying, and the number of tied ratings. The participants also indicated which bot they preferred playing with and the reasons for that preference.

Results

The results indicated that players had a preference for certain bots based on the metrics used. For example, players preferred bots that were helpful, seen more often, and had a lower death rate. The binomial test was used to determine if there were significant differences in preference.

Evolved Bot “Ethan”

Ethan’s agent architecture is simpler, but has more sophisticated combat behavior because its actions during combat are dictated by an evolved neural network. Ethan is a streamlined version of UT2 [1] with tweaks for human-like play removed. However, Ethan was evolved from scratch for this paper using a variant of NEAT [2] called MM-NEAT (Modular Multiobjective Neuroevolution of Augmenting Topologies [3]).

Hand Coded Bot “Jude”

Jude’s behavior is meant to mimic human collaboration, in which two players work together by staying close to each other, making it easier to defeat enemies. However, Jude also prioritizes its own health, both for the sake of survival, and to assure that human teammates are not tasked with protecting Jude. Jude uses a priority list of behaviors.

Average User Assessments of Both Bots.

Scores on a 1-5 scale are shown side-by-side for Jude and Ethan, with 95% confidence intervals.

Findings

- Players preferred Ethan (17) over Jude (13), but not significantly (p = 0.5847).
- Players preferred bots that were helpful, seen frequently, followed them, and scored well.
- Players who preferred Jude tended to emphasize its demeanor and the feeling of teamwork over the objective results.
- Players who preferred Ethan tended to emphasize its proficiency at scoring and avoiding death, both of which affected the final score.

References


Able to employ more team based tactics with Jude, but Ethan made winning easier.

Ethan made some players feel ignored and like their participation did not affect the game or that the game was too easy to win.

Jude seen as overly aggressive as a result of it’s simplistic combat behavior which tells it to attack by rushing directly at opponents.

Most players saw Jude’s ability to follow as a positive trait, and commented that they wished Ethan would have done the same.

The bots reportedly led players to enemies, which led to clearer results.

The term “helpful” was found to be too ambiguous, and further clarification would have led to clearer results.