



Creating Evolved and Hand Coded Companion Characters

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Video games often provide players with assistance in the form of companion characters who fight alongside them. In most cases, these agents respond to situations according to preprogrammed behavioral routines, so their actions are determined by their human programmer. In this work, the Java middleware Pogamut [1] was used to create both a companion bot whose behavior is defined by an evolved neural network [2], and one whose behavior is hand coded for the purpose of comparing their behavior.



Project Goals

- Create a **hand coded bot** "Jude" that will **follow teammate** when there are no enemies nearby, and will **fight visible enemies** if it has sufficient health.
- Create an **evolved bot** "Ethan" whose objectives were to maximize its team's score while minimizing the damage its team received.

Unreal Tournament 2004

Unreal Tournament 2004 (UT2004) is a **first person shooter video game** released by Epic Games in 2004. The game is known for its **online multiplayer modes**. One of the most popular game types is **Deathmatch**, in which players are able to repeatedly respawn, and points are earned by killing other players. Whoever has the most kills at the end of the game wins. For this project, we have worked with the variant **Team Deathmatch**, where the goal is to kill players on the opposing team.

References

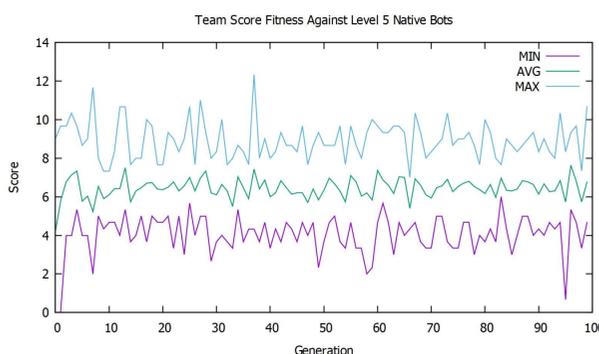
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Evolved Bot "Ethan"

Ethan used the NEAT algorithm [2] to evolve for 100 generations, using multiple sensors, the most relevant of which measured:

- **Distance to nearest teammate**
- **Health levels of the team**
- **Teammate visibility**

The bots quickly evolved to a point where they were able to consistently beat the native UT2004 bots they were fighting against, and the graph of their evolution was flat aside from normal variation.



Future Work

The end goal of this project is to **learn which companion bots humans prefer**, and the reasons for that preference. Therefore, extensive human trials will be conducted evaluating human responses to both the hand-coded and evolved bots in the future.

Hand Coded Bot "Jude"

Jude was made using the Java middleware Pogamut [1] to control its actions. Jude would **roam around the map looking for useful items** if it did not see any other players. It will **follow any teammate** it encounters, and **fight visible enemies** if it has sufficient health. This behavior was designed to replicate human collaboration, where two players will often work together by staying in close proximity to each other, making it easier to defeat enemies.

The decision tree shown below provides a visual guide to Jude's actions and their triggers.

