Incremental Learning Algorithm for Online Action Game System

Junichi Hoshino, Hiroshi Mori

University of Tsukuba/ JST CREST
1-1-1, Tennodai, Tsukuba-shi, Ibaraki, Japan
{jhoshino, hmori}@esys.tsukuba.ac.jp

Abstract. One of the limitations of computer opponents in action games is that the character AI is constructed in advance, and players may become bored quickly. We have built an online action game system in which a non-player character (NPC) can incrementally learn sequences of action and combinations. NPCs can adopt different fighting strategies for fighting with different players.

Keywords: action game, imitation learning, non-player character

1 Introduction

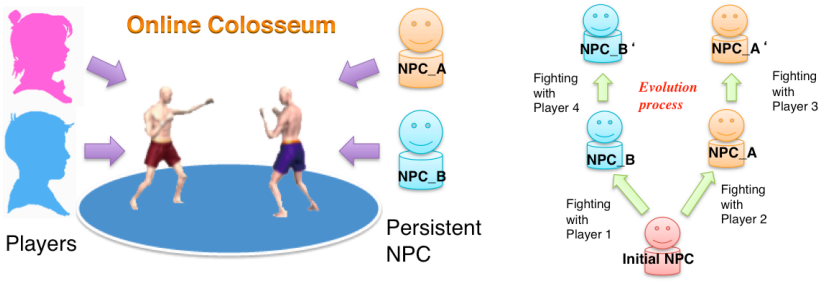
One of the limitations of computer opponents in action games is that the character AI is constructed in advance, and players may become bored quickly. In this paper, we propose an online action game system in which a non-player character (NPC) can incrementally learn sequences of action and combinations in real time. NPCs can adopt different fighting strategies for fighting with different players. Individual fighting styles can be generated from the unique fighting history. We have developed a new engine of action learning that analyzes a human player's action pattern automatically and extracts the effective fighting sequences. Action control trees are generated automatically and incrementally added to a player's action profile.

2 System Overview

Fig. 1 shows the concept of an online colosseum game system in which non-player characters (NPCs) can incrementally learn sequences of action and combinations by fighting with human players. NPCs can adopt different fighting strategies for fighting with different players. Fig. 2 shows the growing process of NPCs. Individual fighting styles can be generated from the unique fighting history.

A player profile is created from the play data of the imitated player. The information recorded in a player profile includes the player's tactics, which we discussed in the preceding sections, the tactic sequences that represent the player's strategies, and the frequency with which each of these sequences appears. When the system applies a profile to the actual playing of the game, it reads the tactics and strategies and creates

a chart of the tactic graph based on the tactic sequences (strategies) and stores it in the pool of graphs. While playing a game, the computer chooses a tactic graph that matches the selection criteria closest to the situation at a specific time, chooses the tactics in the tactic graph that corresponds to the situation that such a tactic graph refers to, and applies the actions to the game character by referring to these tactics. In the following sections we will discuss how the tactics and strategies are chosen.



(a) (b)

Fig. 1 Concept of an online action game system. (a)Many players and persistent NPCs can fight each other on the virtual colosseum. (b)NPCs can obtain different skills by fighting with different players.

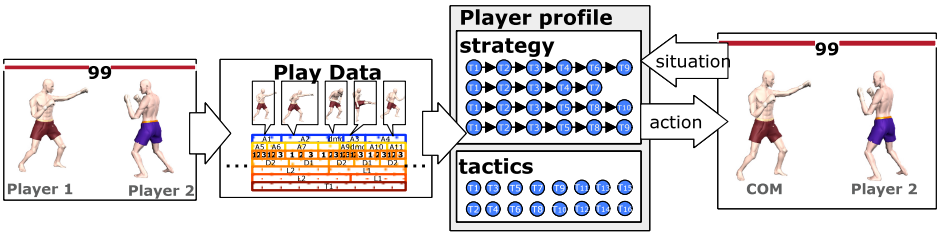


Fig. 2 Overview of the player profile sytem.

3. Conclusion

In this paper, we proposed a system that enables a computer character to imitate a human player. To do so, the system first acquires tactics and tactic sequences from play data of a player. Then, from the tactic sequences collected it creates tactic graphs that represent the strategic actions of the player. From these graphs, the system selects tactics that suit different situations. We also demonstrated the effectiveness of the system in an evaluation experiment. Furthermore, we created many different behavioral patterns for the computer by changing player profiles, which are the collections of tactic sequences and tactic graphs of the particular players.