Chapter 6
Game AI Panorama

This chapter attempts to give a high-level overview of the field of game AI, with particular reference to how the different core research areas within this field inform and interact with each other, both actually and potentially. For that purpose we first identify the main research areas and their sub-areas within the game AI field. We then view and analyze the areas from three key perspectives: (1) the dominant AI method(s) used under each area; (2) the relation of each area with respect to the end (human) user; and (3) the placement of each area within a human-computer (player-game) interaction perspective. In addition, for each of these areas we consider how it could inform or interact with each of the other areas; in those cases where we find that meaningful interaction either exists or is possible, we describe the character of that interaction and provide references to published studies, if any.

The main motivations for us writing this chapter is to help the reader understand how a particular area relates to other areas within this increasingly growing field, how the reader can benefit from knowledge created in other areas and how the reader can make her own research more relevant to other areas. To facilitate and foster synergies across active research areas we place all key studies into a taxonomy with the hope of developing a common understanding and vocabulary within the field of AI and games. The structure of this chapter is based on the first holistic overview of the game AI field presented in [785]. The book takes a new perspective on the key game AI areas given its educational and research focus.

The main game AI areas and core subareas already identified in this book and covered in this chapter are as follows:

- **Play Games** (see Chapter 3) which includes the subareas of *Playing to Win* and *Playing for the Experience*. Independently of the purpose (winning or experience) AI can control either the player character or the non-player character.
- **Generate Content** (see Chapter 4) which includes the subareas of autonomous (procedural) content generation and assisted content generation. Please note that the terms assisted (procedural) content generation and mixed-initiative (procedural) content generation (as defined in Chapter 4) are used interchangeably in this chapter.
• **Model Players** (see Chapter 5) which includes the subareas of *player experience modeling* and *player behavior modeling*, or else, *game data mining*.

The scope of this chapter is not to provide an inclusive survey of all game AI areas—the details of each area have been covered in preceding chapters of the book—but rather a roadmap of interconnections between them via representative examples. As research progresses in this field, new research questions will pop up and new methods be invented, and other questions and methods recede in importance. We believe that all taxonomies of research fields are by necessity tentative. Consequently, the list of areas defined in this chapter should not be regarded as fixed and final.

The structure of the chapter is as follows: In Section 6.1, we start by holistically analyzing the game AI areas within the game AI field and we provide three alternative views over game AI: one with respect to the methods used, one with respect to the end users within game research and development and one where we outline how each of the research areas fits within the player-game interaction loop of digital games. Then, Section 6.2 digs deeper into the research areas and describes each one of them in detail. With the subsection describing each area, there is a short description of the area and a paragraph on the possible interactions with each of the other areas for which we have been able to identify strong or weak influences. The chapter ends with a section containing our key conclusions and vision for the future of the field.

### 6.1 Panoramic Views of Game AI

Analyzing any research field as a composition of various subareas with interconnections and interdependencies can be achieved in several different ways. In this section we view game AI research from three high-level perspectives that focus on the computer (i.e., the AI methods), the human (i.e., the potential end user of game AI) and the interaction between the key end user (i.e., player) and the game. Instead in Section 6.2, we outline each game AI area and present the interconnections between the areas.

Game AI is composed of (a set of) methods, processes and algorithms in artificial intelligence as those are applied to, or inform the development of, games. Naturally, game AI can be analyzed through the **method** used by identifying the dominant AI approaches under each game AI area (see Section 6.1.1). Alternatively, game AI can be viewed from the game domain perspective with a focus on the **end users** of each game AI area (see Section 6.1.2). Finally game AI is, by nature, realized through systems that entail rich human-computer interaction (i.e., games) and, thus, the different areas can be mapped to the interaction framework between the player and the game (see Section 6.1.3).