Appendix B. Artificial Intelligence in Video Games

Table 1 contains a list of game intelligence systems and techniques, sorted in release year. Note that the following list of games is by no means exhaustive to cover all the type of artificial games. Moreover, the selection mainly includes the games with virtual world features, i.e., players incarnated by avatars. Thus, artificial intelligent techniques in other genres, such as real-time strategy and board game, are not included.

Table 1. List of game intelligence systems or techniques.

Game	Year	Genre	System or technique	Description
Space Invaders[1]	1978	Arcade	Stored pattern	Simulating random movements of the aliens that were actually pre-programmed into the game.
Pac-Man[1]	1980	Arcade	Complex Stored pattern	Different colorful enemies exhibit different personality traits
Rogue[17]	1980	Role-playing	PCG on game space	Provide changing play experiment with dynamic game environment generation.
Metal Gear[3]	1987	Action-adventure	Artificial behavior	NPCs are capable of hearing player movement, noticing gunshots, and behaving based on a lot more variables
Mortal Kombat[1]	1992	Fighting	FSM	Prompt enemy action in each single state
Civilization II[4,5]	1996	Turn-based strategy	MCST	To create a competitive opponent
Creatures[11]	1996	Life Simulation	Artificial life model, Neural network	Simulate real life functions, such a mutation and decision making
Half-Life[3]	1998	First-person shooter	FSM, Squad AI	Enable members of a squad of NPCs to coordinate their behaviors, allowing them to see their colleagues and notice if they are killed through sense simulation
The Sims[1]	2000	Simulation	Artificial life, Terrain analysis	Create realistic, lifelike behaviors in game characters with rule-based system, genetic algorithms, flocking algorithms, and decision-making hierarchy; Make the pathfinding problem more flexible and location-based
Halo[3]	2001	First-person shooter	Decision-tree, Squad AI	Decision-tree creates dynamic enemy behaviors, such as cover-based behavior
Black and White[6]	2001	Simulation	Belief-desire-intention model, Decision tree, Perceptron neural network	For sophisticate task selection
EVE Online[17]	2003	MMORPG	PCG on game system	Create the entire solar system
.kkrieger[17]	2004	First-person shooter	PCG on game bits	Create texture, meshes, and sounds
Halo 2[7]	2004	First-person shooter	Behavior tree	It is a hierarchical finite state machine to create complex tasks for control in different granularity
F.E.A.R.[3]	2005	First-person shooter	GOAP	The architecture is for NPC to extremely varied behavior that was perceived as intelligent, and to adapt to new situations.

Façade[15]	2005	Interactive drama	Computational narrative	Through artificial intelligence to bring interactive storytelling experience
Diablo II[17]	2008	Action-adventure	PCG on game scenarios	Create quests
GTA4[3]	2008	Action-adventure	Emotion-response, Squad AI, Decision-tree	Emotion-response enable NPCs to react in a realistic way
Left 4 Dead[13,16]	2008	First-person shooter	AI Director, Pathfinding	A PCG mechanism to provide players a dynamic experience based on their performance; A* algorithm is applied to move NPCs to a certain location
Killzone 2[8]	2009	First-person shooter	HTN planning, Squad AI	NTN planning is based on visual perception to create believable NPCs,
Silent Hill: Shattered Memories[9]	2009	Survival horror	Psychological profiling	A PCG mechanism to adjust gameplay elements based on the player's personality determined by the interaction with the game
Heavy Rain[15]	2010	Interactive drama	Computational narrative, Virtual camera	Improve immersion in storytelling
The Elder Scrolls V: Skyrim[14]	2011	Open world	Radiant AI	Allow NPCs to dynamically react to and interact with the world
Hitman: Absolution[10]	2012	Action-adventure	Reinforcement learning	For animation to generate realistic locomotion for NPC crowd
République[12]	2012	Action-adventure	Tactical Pathfinding, GOAP, Point of interest (POI)	POI allows NPCs to randomly utilize the nearby items to create great variety behaviors
GTA5[1,2]	2013	Action-adventure	Pathfinding, Artificial life, NPC-to-NPC interaction, Computer vision	Computer vision is applied to learn distance to stop signs in a race
The Last of Us[3]	2013	Action-adventure	Companion AI	For NPC to coordinate with player character.
Alien: Isolation	2014	Survival horror	Adaptive behavior	NPC behavior is adapted with each decision made by players
Forza Horizon 2[3]	2014	Open world	Drivatar system	Use Neural networks to learn about driving of each player of the game for emulation
Metal Gear Solid 5[1]	2015	Open world	Smart opponent	NPC can hunt players, improve health levels, reload ammo or seek cover during battle
No Man's Sky[18]	2016	Open world	Extreme PCG	Everything in the world is procedurally-generated

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