An Intelligent NPC Framework for Context Awareness in MMORPG

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Abstract

Recently AI(artificial intelligence) is one of the issues in the on-line game, a research that a game character seems to be realistic and is progressing using AI technique. Especially NPC is an important part of the AI researches of on-line game, and it is concerned by a game player and an architect. We proposed an intelligent agent framework to implement the NPC technique after studying the NPC technique using context awareness that reacts to the PC(Player Character) actively.

1. Introduction

AI technique had been recognized as the accompanying part in the game, but nowadays its importance is increasing with the growth of computer hardware and graphic technique [1]. Particularly recent game AI is noticeable and developing. Because AI technique which applied to game and game catches popularity in Korea, a foreign company tries to enter Korean market with a commercialized game AI technique. Although an importance of AI technique is understood, it stays still in its basic level.

In the game, an AI performs various roles, one of that is to perform related role of game and to present intelligent act of a character. A NPC(Non Player Character) that acts actively by oneself without direct control from a PC(Player Character) is common issue among the various games genre[2].

In the early computer games, simple pattern NPC was needed, but current NPCs perform a diversity of roles such as that commanding complex strategy and tactics with PC in MMORPG[3]. Actually intelligent NPC has a great effect on whether a game user is interested in the game. Nowadays, the technique of intelligent NPC and Agent is concerned, and the intelligent NPC using context awareness is needed for showing reactions against game player.

This paper analyzes a Context Awareness technique for intelligent NPC. This paper is organized as follows. Section 2 describes the game AI techniques, Section 3 studies the cases of the ability of NPC as applied to the game, and Section 4 discusses an AI technique for intelligent NPC. Finally, Section 5 proposes intelligent agent framework which shows reaction against game player.

2. Background & Related Works

The research which applies AI method to game has been tried. The game used AI method such as Finding, Finite State Machine, Fuzzy State Machine, Script, Flocking, Decision Tree, A-life, Neural Network and Genetic Algorithm. Currently, among these methods, Finding and Finite State Machine are widely used[2][3].

A classical meaning of game AI is that defined a character or agent is controlled by computer in the game, but currently it is also defined as a character or agent having self-control ability that performs intelligently through the peripheral environment or past experiences. Game AI makes a character to do intelligent actions, and it lets NPC moves naturally without game player's control[4]. In this case, the key point is going head to head between game player and AI. The purpose of AI is not only for trying to win against game player it must perform as a relative role approximately.

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Table 1. The AI Methods for game

AI Method	content
FSM	A model of behavior composed of a finite number of states, transitions between those states, and actions.
Expert System	A software system that incorporates concepts derived from experts in a field and uses their knowledge to provide problem analysis to users of the software.
Case-based Reasoning	The process of solving new problems based on the solutions of similar past problems.
Decision Trees	A decision support tool that uses a graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility.
Fuzzy Logics	Derived from fuzzy set theory dealing with reasoning that is approximate rather than precisely deduced from classical predicate logic.
Flocking	A common demonstration of emergence and emergent behavior.
Artificial Life	A field of study and an associated art form which examine systems related to life, its processes, and its evolution through simulations using computer models, robotics, and biochemistry.
Neural Networks	An information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information.
Genetic Algorithm	The science of heredity and variation in living organisms.

And in case of RPG(Role Playing Game), it can be an assistant role and leads a beginner of game. Also, an AI control animation motion, and helps a character arrives at its destination from current position through searching and moving course.

The Sims game where developed in US presents a real life situation wherein a character has aspiration, so the game can be played well after satisfied it. The salient AI factor of Sims is that it applied successfully an artificial life (A-life) and fussy logics to game for character's aspiration. In the case of the Unreal Tournament, the game applied a Flocking method for natural movement of the group of characters. While the Warcraft3 reduced unnecessary calculation time through applying hierarchical AI. [Table 1] scribes the AI methods used for game.

As using team-AI method in the Zera and Swat4 game, it is possible to lead with just one command as 'go to the target' instead of several commands such as 'open the door', 'fire', etc.

In the Granado espada that applied Multi Character Control(MCC), AI method is used for three-dimensional path searching. Especially the introduction of pass finding engine made successful for three-dimensional path searching. Also MCC method has a feature for interchanging between a leader character and a subordination character. The Ragnarok presents an artificial life and artificial feeling as using AI.

Cases of the Eve-online on CCP and Aion on NCsoft introduced the Interaction System that player has effect on the game system, and game system has effect on the whole game player again. Interaction System means that has an effect on between game user and game. The player's behavior is recorded and that is reflected on the game environment. For example, if player gets something like specific mushroom which is a game

item, then the character transformed into a mushroom, and if player hunts a Mobile Character, then the Mobile Character is going to be stronger than before. Also the value of item that dropped from Mobile Character when killed is different.

3. The ability of an NPC in the game

An NPC in the game is one of important things for game AI researches, it concerns for the game producers and players. An NPC is a character controlled by AI of game engine without player's intervention [5].

Actually just few years ago, the role of NPC was very simple such as selling an HP(Healing Potion), MP(Mana Potion), weapon and defenses, and its movement was very limited. But nowadays, an NPC has quite a good AI and shows different characteristic against players. Sometimes the player must please an NPC, because the NPC influences the player during playing a game. In the WOW(World of Warcraft), if the player and NPC have unfriendly relations to each other in the neutralization area, the NPC tries to attack the player.

There is no doubt that an AI will grow from now on, at that time the NCP will come out very intelligently.

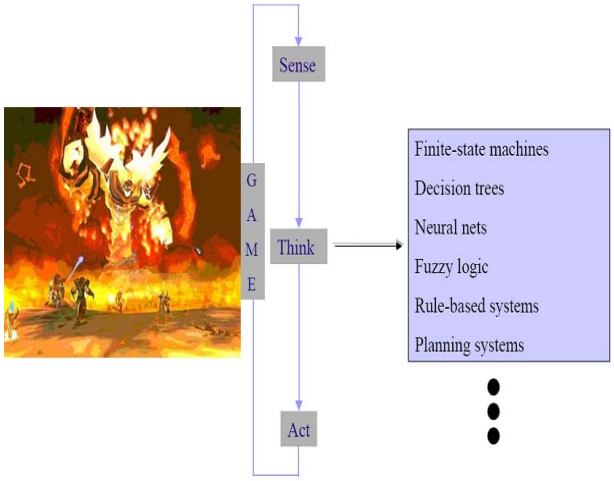

Figure 1. Execution Flow of an AI Engine

4. Context Awareness for intelligent NPC

A simple NPC with game producer's intention as an intention of game producer makes to lose interest. Also PK(Player Kill) system, that caused the interest, gives rise to side effects. Therefore, Context Awareness intelligent NPC is needed for running actively with the player.

Context means an information that making a circumstances between a user and application, and between the user and ubiquitous computing[6][7]. Context Awareness technique has very important role to grasp the user's demand after analysis of user and user's surroundings. An intelligent NPC that applies context awareness provides services using the surrounding are information such as the user's state, environment and previous information. The representation system is Gaia[8] and TEA[9] for providing of Context Awareness function.

Gaia which developed for distribution middleware in University of Illinois provides Context recognition which is used in Smart space of Ubiquitous computing environment. [Figure2] shows the conceptual architecture of Context recognition framework. Context recognition framework is consist of several agents that perform searching, Context, sensing and event distribution. Also, Context recognition framework of Gaia includes ontology system for semantic operation between agents.

TEA was developed by Nokia and three other agents with EU support for 2years. The goal of TEA was to develop a Context recognition framework which can be installed in compact mobile device. The compact mobile device grasps the Context through the TEA, and finds out automatically which service a user wants. [Figure 3] shows the conceptual architecture of Context recognition framework in TEA. The Context recognition framework of TEA was designed for applying the optimum execution performance with assurance of recognition capability through applied machine learning method.

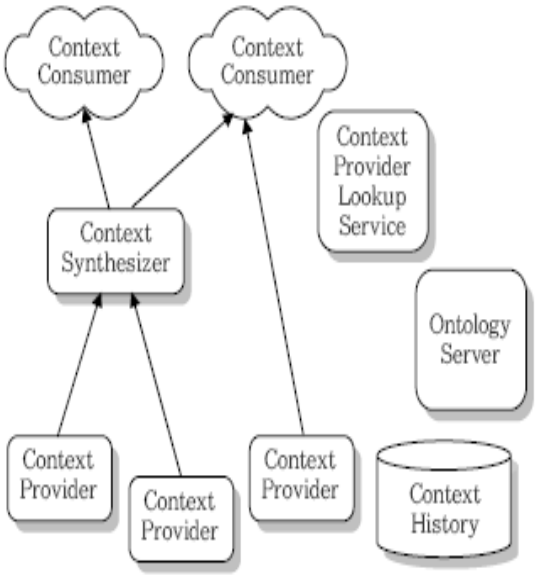

Figure 2. Architecture of Context Recognition Model in Gaia

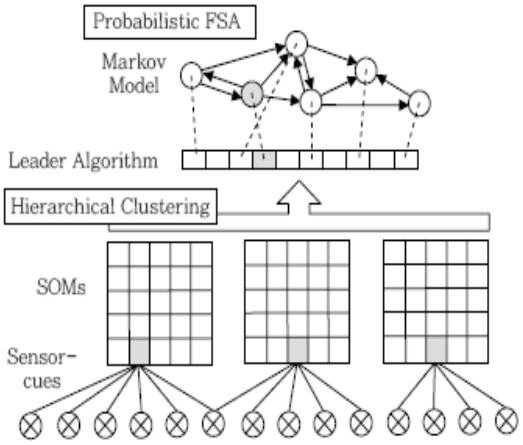

Figure 3. Architecture of Context Recognition Model in TEA

5. Intelligent NPC framework of Context Awareness

Actually the action in the MMORPG(Massive Multi-player Online Role Playing Game) is begun by Context Awareness. The understanding of player's surrounding such as player's state, enemy's state and the other things is one of important factors for playing game. In fact, intelligent NPC must have basic construction and function of intelligent agent. Minsky[10] and Sloman[11] are typical model of intelligent agent framework.

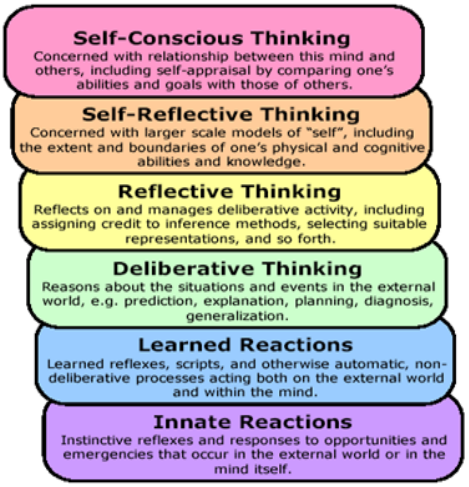

Figure 4. Intelligent agent framework of Minsky

[Figure 4] and [Figure 5] propose the model with various function such as reflective function self-learning function reaction function, etc.

Agents not only communicate each other directly, but also it is possible to do independent processing or parallel processing as operating condition through various and heterogeneous information on the data pool. NEO IAS is kind of intelligent information processing framework, consist of several agents [12].

Also, it can be developed gradually, and apply to various application because it has the capability to of adding an agent or deleting an agent easily.

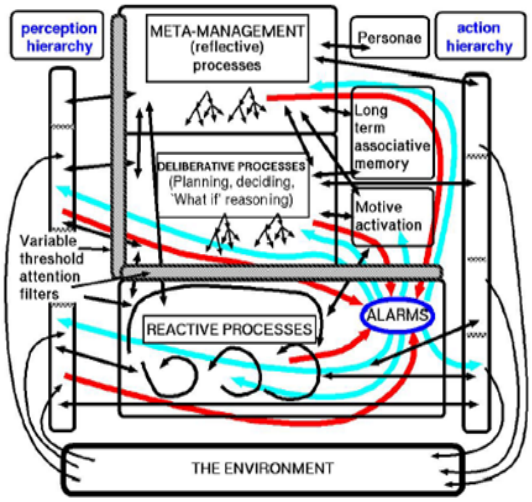

Figure 5. Intelligent agent framework of Sloman

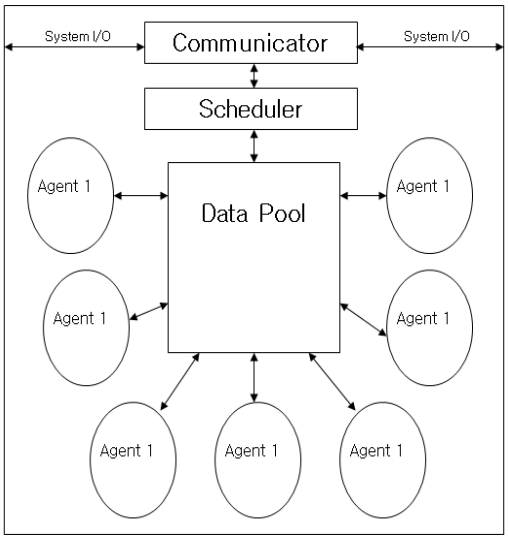

Figure 6. Architecture of NEO IAS

[Figure 7] presents of NEO IAS processing cycle for intelligent NPC

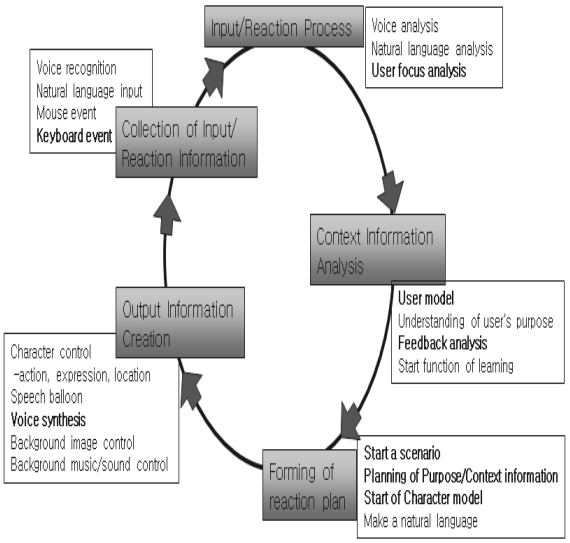

Figure 7. NEO IAS processing cycle for intelligent NPC

6. Conclusion

This paper analyzes a Context Awareness technique for intelligent NPC. We proposed an intelligent agent framework to implement the NPC technique after studying the NPC technique using context awareness that reacts to the Player Character. Our team of this research has a plan as follow to develop intelligent NPC framework for implementation of intelligent NPC. We will apply the NEO IAS(Intelligent Agent System) to intelligent NPC framework. From now on, we will develop intelligent NPC framework and intelligent NPC function, and test through a game server.

7. Acknowledgement

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