

Chapter 7

Narratives of an Artificial Agent: Mental World and Narrating

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ABSTRACT

In this chapter, the author develops a computational model of the narrative ability for artificial agents. To illustrate an overview of this study, the author addresses an architectural and conceptual systematization of the narrative ability. The proposed model consists of two essential elements: the “mental world” as the internal representation of the world that is formed from many stories, and the mechanism of “narrating” as the act of expressing part of the mental world. In this chapter, the basic concepts and system frameworks of the narrative ability, mental world, and narrating are presented.

INTRODUCTION

Narrative is a crucial aspect for the development of the intelligence of artificial agents. The significance of narrative in the domain of artificial intelligence (AI) is explained from the following two perspectives. First, a narrative is a universal mode of interpersonal communication. In a broad sense, a narrative refers to an expression of events in a real or a fictional world based on a language or other sign systems (Prince, 2003). For example, humans communicate everyday experiences to their family members in a narrative form. Humans acquire and share knowledge of the current status of their societies from narratives in mass communications, e.g., television and newspaper reports. Historical narratives distribute the knowledge of the distant past beyond the time scale of human life. Furthermore, humans cultivate richer worldviews through fictional narratives such as folk tales, fairy tales, picture books, and literary narratives. Second, a narrative or story is thought of as the general form of the representation of a memory of events in the world. In other words, a human mind can organize past experiences in the form of a narrative or story. This type of memory is known as episodic memory (Tulving, 1983) in psychology. The formation of expectations or plans for future events is similar to narrative composition.

In modern society, artificial agents based on AI technologies work, play, or live with humans in real and virtual environments. For example, a humanoid robot Pepper developed by Softbank (n.d.) can

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perform quasi-affective interactions with humans. Several researchers have been addressing the development of computational models of robotic agents who autonomously learn languages or symbols through interaction with the environment (Taniguchi, 2010). However, very few studies have tried to address the computational modeling of the narrative ability as a core element of the intelligence of an agent. The narrative ability of an agent will be an essential element for building a deep relationship with humans. For example, if an agent who lives as a member of a family has the ability to memorize and recount daily experiences, the agent will become an irreplaceable part of the family.

In this chapter, the primary objective is to explore a computational model of the *narrative ability*—a mental system of manipulating narratives—as the foundational element of the intelligence of an artificial agent. The author uses the term *narrative agent* to refer to an agent who possesses the narrative ability. The author assumes that the narrative ability is developed by the following two essential elements:

- **Mental World:** In this study, “mental world” refers to the representation of the world inside the “mind” of an agent, in contrast to the physical world. It is formed from many stories constructed by narrative-based cognitive activities, including interpretations of experiences, interpretations of narratives, and one’s imagination.
- **Narrating:** Narrating is the act of expressing a story in the mental world in the form of a narrative that is based on a language or other sign systems.

Throughout this chapter, the author addresses the systematization of the narrative ability. The chapter is organized as follows: In the “BACKGROUND” section, the conceptual and theoretical background of this study will be presented. In the “STRUCTURE OF NARRATIVE” section, the basic structure of a narrative as the basis of modeling the narrative ability will be formalized. In the “BASIC CONCEPT OF THE NARRATIVE AGENT” section, the author will develop a macroscopic architecture of the narrative ability. In the “MENTAL WORLD” and the “NARRATING” sections, the conceptual systematizations of the structure of the mental world and the cognitive process of narrating will be addressed, respectively. Finally, in the “FUTURE RESEARCH DIRECTIONS” section, several future issues will be discussed and in the “CONCLUSION” section, concluding remarks will be presented.

BACKGROUND

In this section, previous AI studies relevant to the narrative ability will be described.

Narrative as Memory and Knowledge

AI Studies by Schank and His Colleagues

From the early years of AI, the relationship between the intelligence and a narrative or a story has been explored by Schank and his colleagues. They proposed several AI theories of narrativity-based models of knowledge representation, including script knowledge, episode memory or story knowledge, and dynamic memory (Schank & Abelson, 1977; Schank, 1982). In addition, they formulated the concept of case-based reasoning (Riesbeck & Schank, 1989) as a model for solving a new problem by using a previous similar episode (a case and its solution). Script knowledge is a well-known knowledge model

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