Chapter VII

Building Intelligent Multimodal Assistants Based on Logic Programming in the Meme Media Architecture

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Abstract

This chapter introduces a software architecture to build intelligent multimodal assistants. The architecture consists of three basic components: a meme media system, an inference system, and an embodied interface agent system that makes multimodal presentations available to users. In an experimental implementation of the architecture, the author uses three components as the basic framework: IntelligentPad for a meme media system, Prolog for a logic programming system, and Multimodal Presentation Markup Language (MPML) for controlling an interface agent system. The experimental implementation shows how character agents are defined in a simple declarative manner using logic programming on meme media objects.
Introduction

Web applications, which are computer programs ported to the Web, allow end users to use various remote services and tools through their Web browsers. A Web application is a program that has an HTML-based front-end for users to utilize services provided by a remote HTTP server. There are an enormous number of Web applications on the Web, and they are becoming the basic infrastructure of everyday life.

In the article “Agents that Reduce Work and Information Overload” written in 1994, Maes (1994, p. 1) predicted the current situation of the Web as follows:

The “information highway” will present us with an explosion of new computer-based tasks and services, but the complexity of this new environment will demand a new style of human-computer interaction, where the computer becomes an intelligent, active and personalized collaborator.

This prediction has come true and we are facing the demand for computer-based intelligent assistants. We have now more than $10^9$ pages on the Web and most of those pages are crawled by major search engines. Although we have seen remarkable developments in information retrieval technologies, such as ranking and clustering of Web pages (Joachims, 1998; Page, 1998), it still takes a lot of time to get satisfactory information by trying to retrieve documents from the Web. The more pages we have on the Web, the more time it will take for users to get satisfactory results from the Web.

In the last decade, technologies involving intelligent user interfaces (IUI) have evolved in the boundary areas between Human-Computer Interaction and Artificial Intelligence research (Lester, 2001). Lieberman (1997, p. 67) states, “An agent should display some [but perhaps not all] of the characteristics that we associate with human intelligence.” Agents that provide active assistance to a user with computer tasks are called interface agents Maes (1994). Examples of today’s successful interface agents include junk filtering functions implemented in e-mail client applications.

Embodied interface agents are interface agents that have a lifelike “body.” By introducing a lifelike body to agents, interactions between agents and humans take on multimodality, including speech, facial expressions, and body gestures. Embodied interface agents are also applied in several e-learning systems (Graesser, VanLehn, Rosé, Jordan & Harter, 2001; Lester, Voerman, Towns & Callaway, 1999). We can already see the effectiveness of use of embodied agents (Höök, Persson & Sjölinder, 2000).
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