A Help System for the Intelligent Room

Andy Chang CHANGA@ALUM.MIT.EDU
200 Technology Square, Room 832, Cambridge MA, 02139

Abstract

An intelligent environment should provide interactive and convenient help to a user. As a step toward this vision, I have developed an interactive agent-based Help System for the MIT Artificial Intelligence Laboratory's Intelligent Room. This Help System uses multiple modes, such as graphical displays and speech recognition, to interact with the user. Help content in the Help System is written in XML, and is displayed using Sun's JavaHelp system. As of April 2001, the Help System is an operational component of the Oxygen project's E21 Conference Room.

1. Introduction

1.1 Objective

My objective is to create a Help System for the Intelligent Room at MIT's Artificial Intelligence Laboratory. The Intelligent Room's Help System provides a user with interactive and multimodal help.

1.2 Motivation

This Help System addresses three issues. First, as intelligent environments such as the Intelligent Room become more capable, they also become more complex. The Help System makes the Intelligent Room easier to use (Coen, 1998).

As with many large projects, the knowledge about the Intelligent Room is spread across numerous researchers. The Help System centralizes this knowledge, and thus eases the access of information. This is especially useful when Intelligent Room technology is distributed to other Oxygen projects.

Finally, the Help System provides the ability to autonomously demonstrate the features and functionality of the Intelligent Room. Before the Help System, a researcher had to engage the Intelligent Room in some form of interaction in order to demonstrate its features. With the Help System, the Intelligent Room can autonomously demonstrate its own features.

1.3 Previous Research

The Sally (Groh, 1999) system was a precursor help system for the Intelligent Room. Sally's approach was to start with an empty knowledge base and accumulate knowledge by learning information from users in the Intelligent Room. However, Sally was never fully implemented, partly due to the high time expense of the initial knowledge accumulation. In addition, while Sally supported multimedia data, the data within Sally was unstructured. As a result, it is difficult to browse the information contained within Sally.

There have been many Intelligent Help Systems and Tutorial Systems (Morrisroe, 1988; Byerley et al., 1988; Cunningham et al., 1988; Scanlon et al., 1988). These systems incorporated knowledge representation, information capture, user modeling, and expert systems. They provide useful background research for the Intelligent Room's Help System.

2. Design Features

This Help System differs from the previous Intelligent Help Systems because the multimodal capabilities of the Intelligent Room enables this Help System to interact with the user using multiple interfaces. The Help System is designed to take advantage of the Intelligent Room's human-computer interaction capabilities, such as speech recognition. For example, a speech recognition system understands a command from a user in the Intelligent Room, while multiple projectors display images and help files to the user. The use of multiple modalities allows the Help System to accommodate a wider range of users and situations than a system with a single modality (Oviatt et al., 2000). In addition, there is evidence that combining information from multiple modalities results in a stronger neural reaction in the brain than the effects of a single modality (Sharma et al., 1998).

Secondly, the Help System offers interactive help, where information flows bidirectionally between the computer and the user. This interactive approach provides a better user experience than a static printed manual, where the flow

of information is typically unidirectional. For example, the Help System can show the user how to accomplish a task, and then the user can ask the Help System to perform that task.

3. Overview of Implementation

3.1 Help Files

Developers in the Intelligent Room write help files using XML. XML allows a help file author to structure and organize the information within a help file.

Help files can contain text, multimedia, hyperlinks, and action links. Action links trigger actions in the Intelligent Room, and make help files more interactive than static text. For example, the `<do>` element in an XML help file causes the Intelligent Room to perform a specified task, such as `<do>Turn on the lights</do>`.

3.2 Agents

The Help System consists of multiple software agents. These agents are written using the Java-based Metaglue Agent system (Coen et al., 2000). The agents in the Help System are responsible for loading help files, managing the knowledge base, and responding to queries for help from the user. The distributed nature of Metaglue enables the Help System to use multiple computers for information processing and display, even though the knowledge base itself is centralized.

3.3 User Interfaces

The Help System's visual interface uses JavaHelp[1] to display and browse through help files. The visual user-interface is a Metaglue agent, so it can display a JavaHelp navigator on any computer with a display running Metaglue.

The Help System uses speech recognition to understand verbal commands from the user, and speech synthesis to output spoken language to the user. For example, a person in the Intelligent Room can say "Please tell me about the phone," and the Intelligent Room will respond accordingly.

The Help System is compatible with other user interfaces, such as gesture recognition. When the Intelligent Room incorporates gesture recognition capabilities in the near future, then the Help System can react to a gesture such as a shrug.

[1] JavaHelp is a Java-based help system, and is similar to Windows Help.

4. Contributions

This research has led to the development of an autonomous, interactive, and multimodal Help System for the Intelligent Room. As of April 2001, the Help System is an integrated component of the Oxygen project's E21 Conference Room[2].

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[2] For more information, please see http://e21.ai.mit.edu