Chapter XVI

Designing Model-Based Intelligent Dialogue Systems

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Intelligent Systems are served by Intelligent User Interfaces aimed to improve the efficiency, effectiveness and adaptation of the interaction between the user and the computer by representing, understanding and implementing models.

The Intelligent User Interface Model (IUIM) helps to design and develop Intelligent Systems considering its architecture and its behavior. It focuses the Interaction and Dialogue between User and System at the heart of an Intelligent Interactive System. An architectural model, which defines the components of the model, and a conceptual model, which relates to its contents and behavior compose the IUIM. The conceptual model defines three elements: an Adaptive User Model (including components for building and updating the user model), a Task Model (including general and domain specific knowledge) and an Adaptive Discourse Model (to be assisted by an intelligent help and a learning module).

We will show the implementation of the model by describing an application named Stigma - A STereotypical Intelligent General Matching Agent for Improving Search Results on the Internet.

Finally, we compared the new model with others, stating the differences and the advantages of the proposed model.

INTRODUCTION

In recent years we have witnessed research and application developments oriented to simplify the communication between the user and the computer. The development of intelligent systems involves the understanding of user's needs and tasks and the implementation of this knowledge in order to assist, guide, or help the user to accomplish his/her work. These systems have to monitor input activities and construct a model of the user. Adding intelligent components to the interface, like context sensitive help ("dancing clip" of Microsoft Word) together with complex tutorial and helping strategies, it should be possible to assist users differentially, according to the task to be performed and user's experience (Dix et al., 1997).

Most systems are not designed to reflect users' models of their domains or the tasks they wish to perform. Instead they are "tool centered": they provide sets of general purpose tools that are used as components of a solution of user's problems. The users are required to use the tools and adapt their behavior accordingly (as in Windows). Crow and Smith (1992) argue that the "tool centered" conception creates dissatisfaction with systems since users struggle to translate their high level goals into low level instructions to the tools.

Significant work has been underway in both the human computer interaction and artificial intelligence fields trying to give proper solutions to the development of Intelligent User Centered Systems. (Maybury and Wahlster, 1998; Maybury, 1993; Sullivan and Tyler, 1991). Many efforts have been made in the fields of Multimedia Input Analysis and Output Generation based on speech, gesture, image, language, graphics, temporal, spatial representation and reasoning. Other works were concentrated on dialogue understanding and user modeling to support user assistance, providing usable presentations, error remediation or tutoring. (Hefley and Murray, 1993), adapting the system to the user's preferences and/or characteristics (Sukaviriya et al., 1993) and implementing Intelligent Agents, Plan Recognition, Learning and Adaptation techniques (Lieberman, 1995 - Letizia).

All the reported works are enlightening and refer to various important aspects of an Intelligent Dialogue System. However, in order to develop Intelligent Systems in an ordered path, we need to work within a conceptual framework which will help us to define the needed components, its rules, its relationships and possible arrangements. The IUIM provides us with such a framework.

The Intelligent User Interface Model (IUIM) (Goren-Bar, 1999a, 1999b) is composed by two sub-models: the Architectural Model (which defines the components of the model) and the Conceptual Model (which relates to its contents and behavior). In order to understand the contribution of the IUIM to the design of Intelligent Dialogue Systems, we will start by describing the major components of an intelligent system. Then, we will relate shortly to both models: the architectural model of the IUIM and its comprising elements; and the conceptual model, which includes a stereotype-based user model, a task model, and a dialog manager operating learning, adaptation and smart help mechanisms. Then we show an implementation of the model by describing an application named Stigma — A STereotypical Intelligent General Matching Agent for Improving Search Results on the Internet. We conclude by comparing the new model with others, stating the differences and the advantages of the proposed model. We will also refer to its implications and limitations and propose trends for future research.

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