ABSTRACT
This work presents WAY-Z39.50, a system whose main goal is to provide adaptive access to digital libraries catalogues through Z39.50 servers. The system adapts gradually to the user depending on her interaction in two ways: different interfaces are created to try to improve the communication with the user and parallel searches in other servers are generated in order to save user’s time. As there can be users who are not familiar with this kind of adaptation, they can always decide not to let the system make any modification concerning both aspects.

KEYWORDS: Information access, Adaptive systems, Digital libraries, Z39.50, WAY.

1 Introduction
WAY-Z39.50 is an implementation of a general model called WAY that defines how to build information access systems that adapt to the user. The system, composed of a net of six intelligent agents, is organized into three modules in charge of each of the system tasks: the interaction with the user, the communication with the servers and the acquisition, verification and maintenance of updated information about the location and services of available Z39.50 servers.

The interaction with the user module comprises the communication with the user and the interface adaptation. These tasks are performed by two agents:

- The user communication agent that builds and manages the interface depending on information about the user and her environment such as: the location, the hardware and software platform and the information provided by the interface adaptation agent.
- The interface adaptation agent that analyses the user’s actions to decide which interface modifications to propose. For instance, the fields used to make queries can be used to suggest a change in the order of the searching fields beginning with those most frequently used.

The communication with the servers module generates parallel searches adapted to the user and manages the communication with the information servers. These tasks are performed by two agents:

- The searching collaboration agent that generates parallel searches in the servers it decides that are more appropriate for that user (the ones more visited, with best performance, etc.). It also decides how many parallel searches to launch depending on several parameters, such as the machine load.
- The information retrieval agent that implements the client part of the Z39.50 information retrieval protocol. It is in charge of the communication with this kind of servers to obtain both the results of the user’s queries and additional information concerning Z39.50 servers.

The information about servers module is obtained, verified and maintained by:

- The information servers searching agent that looks for information sources, as web pages or news groups, and consults them searching for possible Z39.50 servers locations that the information servers maintenance agent will verify.
- The information servers maintenance agent that receives information about possible servers location and verifies their performances. It repeats the operation with a higher or lower frequency depending on the amount of changes in the data obtained.

WAY-Z39.50 is a distributed implementation of the WAY model remotely accessible, implemented in java programming language (around 20.000 code lines), using applets and RMI (Remote Method Invocation) technology and supported by a postgresQL data base. The system development is about to enter its evaluation phase.

2 A session with WAY-Z39.50
When a user first enters the system, she is asked to enter a user name and a password. These data do not restrict the access but they are only used to identify the user and the agents that are assigned to her (a user adaptation agent and an information access agent). These agents are in charge of the adaptation process and the storage of the user preferences that are used in the reasoning process of the agents. These preferences include the options that the user can explicitly define (as the background color) and the ones that the agents propose and she accepts. Thus, saving the agents
means maintaining the user preferences about the interface and the searching process, as they are a part of the agents state. Whenever a user reenters the system, she will be assigned her two personal agents (a user adaptation agent and an information access agent) by recovering their previous states and, therefore, her last preferences.

At this point, the user interface adaptation agent builds a particular interface for that user. If this is the first time the user enters the system, a default interface is shown. This first interface depends on the kind of machine the user is connecting from and on the default language selected in the navigator used to access the system. During the session, the user interface adaptation agent is also active and spying user actions. The observation process generates information that is used as input for the reasoning process that suggests changes in the interface.

The user can always accept or refuse proposed changes, as some users do not want computers to take decisions that affect their work without their permission. Let’s show a couple of examples about the possible adaptation. A user may have visited only books records so the interface adaptation agent would propose the user to order the records beginning with the ones corresponding to books. If the same user consults mainly records in Spanish the agent would propose to order the records beginning with books in Spanish and following with books in English and so on. Figure 1 and 2 show examples of WAY-Z39.50 customized interfaces.

The results of the searches launched by the information access agent are suggested to the user indicating the number of records found matching her query in other servers. This way, the user saves the time that she would employ in making another query in the same server or going to another server and repeating the query, as it should be done in the classical systems that integrate many library servers.

Finally, the user can choose to go deeper into one of the proposed searches, refine the query or choose another server, beginning the whole process again. From any of these decisions, all the agents will collect information that will be used as inputs for future operation as input variables to the agents behaviour.

3 Conclusions

The main advantages of using WAY based systems, and particularly the advantages provided by WAY-Z39.50, are the interface and the searching adaptation. Adaptation of the interface to the user actions is provided while she is using the system, which means that there is no need to ask the user in any moment.

Adaptation of the searching process gets more and more refined each time the user makes a new search. The system offers alternative searches in the servers preferred by the user that respond best to information requests, saving user’s time.