Abstract. Information acquisition from the distributed and rich resources of the World Wide Web is confronted with the following situation: there are only a few entry points for finding the right information, there is too much net traffic for information acquisition, and there is no coordination between different users. This leads to the well known problems encountered when searching for information: there is a considerable delay time using search engines, the quality of the results is in general poor, it is difficult to access the appropriate information, and the overall costs for complete satisfaction of the user's needs are considerably high. Unfortunately, these problems will not diminish; the situation will even worsen due to the exponential growth of the number of users and the information available. Current approaches handling these drawbacks such as empowering search engines or raising the bandwidth are not able to keep up.

In this paper we present a new design for distributed information systems using mobile agent techniques. Our approach overcomes the unbalanced structure of the WWW, reduces net traffic in this medium, supports automatic user grouping, information sharing and information space modeling.

Keywords: information agents, information retrieval, mobile agents, agent system design, information systems, user grouping, internet
1 Introduction

One of the central resources of modern economies is information. Information is increasingly becoming an important production factor which will amplify capital and work-force. Thus, activities for information processing (and covering the whole information life cycle) will be crucial for future prosperity. As a first step to support information processes we focus on information acquisition in modern information media like the Internet.

Precise and cost efficient search of required information is one of the major problems in the Internet today. Current retrieval support in the Internet is based on a few retrieval tools (search engines) which satisfy the information needs of many users. But the user has to examine manually the information sources in order to determine their value. Additionally, almost every user builds up his personal information space which is the basis of his personal workbench but which is almost never made public to other people. A solution to these problems or automated support of these activities could result in better information retrieval.

Problems The Internet as an information repository is characterized by distributed information sources and heterogeneous users. It has developed initial means to solve information acquisition tasks, but they are running or will run into severe problems. The situation today is characterized by centralized information sources like catalogues or search engines on one side offering access to the distributed original information. On the other side, single and distributed users are struggling to find the information they need. The granularity of both sides - huge and powerful search data repositories and single personal users - is very imbalanced. There are reasons for this situation but the dynamic development of the Internet will turn it into absurdity. This will be explained in the following.

Solutions The solution to the problems outlined above lie in the adaptation of the granularity on both sides. There is no alternative to decentralizing the access to Web resources. Decentralization can be achieved by specialized information providers focusing on certain issues and offering high-quality service. Users on the other side are forced into higher organization levels in order to reach those sources. Users might either use the service of information brokers or might organize themselves in order to become a considerable 'market force' in the electronic information marketplace.

Both sides will be supported by techniques for different fields of computer science. We propose the use and the combination of agent technology and information retrieval to group users automatically and to realize sophisticated information services.

In the project MIAOW (Mobile Information Agents on the Web) as a part of the InfoSphere project, we are combining well-known information retrieval methods with concepts of distributed artificial intelligence, especially mobile agents, to make information retrieval more precise and cost-efficient. In our approach mobile agents support the cooperation of different users with similar