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# Analysis on the performance of mobile agents for query retrieval

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## Abstract

The factors that affect the performance of mobile agents in retrieving information from the Internet are the number of agents and the total of routing time taken by the participated agents to complete the assigned tasks. Fewer numbers of mobile agents used to execute the tasks will cause lower network traffic and consume less bandwidth, and the total time taken to retrieve the query results can be minimized. In this paper, the performance of mobile agents for query retrieval is analyzed. Specifically, the performance of mobile agent in obtaining a query result from the remote hosts using an extended hierarchical query retrieval (EHQR) approach is proposed. It is based on a hierarchical and a parallel dispatching of mobile agents to the remote servers in order to retrieve the query results. Experimental results show that the proposed approach reduces the number of mobile agents and also improve the total time taken to retrieve the query results compared with other approaches.

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*Keywords:* Mobile agents; Query retrieval; WWW; Databases; Dispatching agents; Performance study

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## 1. Introduction

Currently it is time consuming to obtain the aimed information from the Internet due to the rapid growth of the World Wide Web (WWW). Also it is a current important issue to develop a method for efficient information searching and retrieval. In order to achieve this, efforts for reducing the connection time, the communication time, and the information retrieval time should be taken into serious consideration. Mobile agent technology has been identified as an efficient tool for searching and retrieving information from the Internet [1,2]. The main advantage of this tool is that a mobile agent can search information instead of users [3]. Also, mobile agent technology can reduce network traffic, overcome network latencies, and the enhance robustness and fault-tolerant capabilities of distributed applications [4,5]. Compared with conventional distributed computing, such as a remote procedure call (RPC), a mobile agent migrates to the node where the data is located instead of transmitting data across the network. It performs its task there, and returns to the original node with the results taken from the nodes that have been visited. Because of this feature, it can help application developers maintain low network bandwidths.

In particular, when data transmission causes bottlenecks in a current networks, mobile agent is one of the alternative technology to be used to reduce the execution time dramatically [6]. Thus, a mobile agent can utilize the bandwidth of a network much more efficiently than a direct connection when it is accessing remote databases [7,8]. Mobile agents consume network bandwidth only when they travel through the designated set of nodes. If the sender can schedule and optimize the mobile agent's itinerary, the performance of the system may be maximized. Baek et al. [9] have stated that there are two significant planning factors affect the performance of the systems in a network environment that are the number of mobile agents and each mobile agent's itinerary. These two planning factors must be well scheduled. Badly scheduled itineraries can cause longer execution times, as a result of the higher routing costs.

In this paper, we analyze the performance of mobile agents for query retrieval by using the on-line and off-line query retrieval approaches applied in the Mobile Agent Search System (MaSS). The on-line query retrieval approach is based on the query retrieval using on-line where direct connection to the WWW by the mobile agents has been developed. For the off-line query retrieval approach, the mobile agent have retrieved the query results from the designated search engines such as AltaVista [10], Yahoo [11], Excite [12], etc. during the night time. On the next day, the user will retrieve the query results from the databases in the local prefetch (LP) servers.

Here, we propose a method to improve the performance of mobile agents to retrieve query results from the off-line MaSS by using an extended hierarchical query retrieval (EHQR) approach. The EHQR approach is based on the combination of a parallel and a hierarchical dispatching of mobile agents to retrieve

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