ABSTRACT

The advent of large wide-area networks, such as the Internet has caused a vast increase both in the availability and the number of information sources. The ability to retrieve information from these distributed and heterogeneous resources offers great promise for obtaining and sharing diverse information conveniently. The drawbacks of most of the client-server based information retrieval techniques are, the need for a continuous connection, overhead in bulk data transfer, robustness and server workload. Mobile agents that are distributed and flexible are especially useful, to solve these problems in distributed information retrieval. During its travel in the event of information retrieval, a mobile agent may get blocked or failed due to various issues. This research work identifies some of the issues, such as dynamic travel plan, accommodation, security and reliable execution. Building a mobile agent system that incorporates all these requirements, ultimately saves time, reduces the network load and ensures the successful migration of the mobile agent.

Dynamic information retrieval requires a careful selection of the nodes on the fly, that are optimal to the user. Selecting an optimal node based on the available approaches restricts a mobile agent to migrate only to the adjacent node. This drawback limits the level of efficiency in the dynamic
determination of the next optimal node, which in turn, limits the volume and timeliness of the information retrieval task. Furthermore, the initial resource required by the mobile agent, on its arrival at a node, is memory for accommodation. This research work identifies some reasons why the memory of the node is exhausted and new agents are denied accommodation that decreases the throughput of the node, and eventually the successful migration of the mobile agent.

During its stay at a node, most of the existing security protocols protect the host from the malicious agent and vice-versa. However, the availability of a security mechanism that protects a mobile agent from attacks like tailgating is rather limited. During its execution at a node, a mobile agent and its data are subject to failure, due to node failure. Ensuring the recovery of mobile agents with the data on the fly is a challenging issue. Most of the existing failure recovery models recover the mobile agent from single node failures but with the overhead of high delay and revisit. Furthermore, other available works that tolerate multiple failures come with the excessive cost of replication and high network load. These models do not withstand continuous and multiple failure situations, and degrade the performance of mobile agent.

From all the issues listed here, it is evident that the mobile agent may get blocked at the time of migration, accommodation and execution. The available mobile agent system provides a solution for any one of the events
and moreover with their own limitations in the specified issues. Hence, a mobile agent system that incorporates a solution to the identified issues at each level of the travel of the mobile agent is required for a user beneficial information retrieval process.

In this work, a multifaceted mobile agent system is proposed for efficient and reliable information retrieval. The pre-processing phase of this system focuses on the creation of a mobile agent based on the user requirements that include, task allocation and itinerary planning. The execution phase ensures the successful execution and migration of the mobile agents. The findings of this study suggest that the location server–based dynamic itinerary provides efficient information retrieval that retrieves more relevant information quickly for any given dead line. Second, with the help of a memory allocation algorithm, the incoming mobile agents are provided with more space for accommodation. Third, a secure execution environment is assured for the mobile agents that are subject to tailgating attacks. Finally, reliable information retrieval is guaranteed through a failure recovery model that tolerates the various possible failure situations of a mobile agent due to node failures. These findings uniquely identify this work from other works in this area, which have proposed solutions for specific issues individually, which is not sufficient for mobile agent based information retrieval. This work incorporates the solution for various issues like dynamic itinerary, security and fault tolerance in order to achieve efficient and reliable information retrieval.