In distributed information retrieval, mobile agent planning is one of the most important techniques for completing a given retrieval task efficiently. The number of mobile agents and total execution time are two factors used to represent the system overhead that must be considered as part of mobile agent planning (MAP) for distributed information retrieval. Using fewer mobile agents results in less network traffic and consumes less bandwidth. Regardless of the number of agents used, the total execution time for a task must be kept to a minimum. A retrieval service must minimize both these factors for better system performance, and at the same time, it must be able to supply the required information to users as quickly as possible. In this thesis, we propose a new MAP approach that we have named cost effective MAP (CEMAP). Our approach minimizes the number of mobile agents and total execution time while keeping the turnaround time to a minimum. We also develop two different versions of the CEMAP: (1) Timed CEMAP (TCEMAP) and (2) Dynamic CEMAP (DCEMAP). In addition to the important two factors, the time constraints at the nodes of an information repository must also be taken into account when attempting to improve the quality of information retrieval. Therefore, we propose the second planning algorithm, called TCEMAP, to minimize both the number of mobile agents and the total execution time under the condition that the turnaround time is kept to a minimum, even if some nodes have a time constraint. For better performance, mobile agents that are more sensitive to network conditions must be used. We need to consider dynamic network conditions, e.g., variable network bandwidth and disconnection, such as is found in peer-to-peer (P2P) computing to reflect the dynamic network condition more accurately. We propose the third planning algorithm, named DCEMAP, that dynamically adjusts a mobile agent’s itinerary as the agent travels, and allows the agent to complete its task within a specified time period (turnaround time), even though network conditions are changing continually. The algorithm works by maintaining primary and alternative agent itineraries, and switching the agent to an alternative itinerary whenever the agent is in danger of missing its time constraint. If the agent decides to skip some nodes to satisfy the turnaround time, then clones of the agent can process these skipped nodes. Moreover, we incorporate a security and fault-tolerance mechanism into our planning approach to better adapt it to real network environments. Although these algorithms tend to slightly increase the planning cost, an experiment study shows that these algorithms enhance the system performance significantly. By adopting these algorithms, systems can maintain lower the two factors while satisfying the minimum turnaround time.

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