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## New Intelligent Search of Mobile Agents

Authors:

Jang, Hung-Chin (jang@cs.nccu.edu.tw)

Lien, Yao-Nan (lien@cs.nccu.edu.tw)

Dept. of Computer Science, National Cheng-Chi University, Taipei,  
Taiwan, R.O.C.

Huang, Jyh-Shyan (frank@cs.nccu.edu.tw)

Dept. of Applied Mathematics, National Cheng-Chi University, Taipei,  
Taiwan, R.O.C.

Liu, Fu-Han (s8229@cs.nccu.edu.tw)

Dept. of Computer Science, National Cheng-Chi University, Taipei,  
Taiwan, R.O.C.

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### Abstract

In a mobile computing environment that supports mobile agents, a client is able to send an agent to visit a sequence of servers in the network. Tracking the locations of agents becomes a critical problem in managing a mobile agent service network. In [1], Lien proposed several blind and intelligent search methods and studied their performances. One of those is Asymmetric Binary Search (ABS). In ABS, forward and backward probes will end up with different results. Probing a visited server can exclude some servers out of search list, while probing an unvisited server can't.

We propose a Probing Range Recursive Function (PRRF) taking probing ranges into account; and an Extended Asymmetric Binary Search (EABS) method allowing a search agent to probe in various probing ranges [3]. At each probe, it chooses to probe the server that excludes the maximum expected number of servers. Simulation shows that EABS can save us up to 33% numbers of search probes comparing to that of ABS when the length of the search list closes to 100.

In PRRF, the residing probability of every server in search list is assumed to be the same. We release this assumption in the version of Refined PRRF (R-PRRF). However, we haven't run any simulation of it due to its complicated formula and hard to compute the result when the length of search list is getting larger. In our future work, we would like to improve our R-PRRF for easy and feasible computation.

To improve EABS, we would like to define a function to compute the expected number of search probes of EABS and then compare it with that of ABS. Besides, we will consider the probability of slip through and study the effect of the expected number of search probes when changes. Finally, we will compare the number of average search probes of EABS with that of ABS.

The path of a target agent may be either deterministic or non-deterministic. In the case of deterministic, the agent can be found by using BBS, EBS, IBS and ABS. If every step of the agent is deterministic, the sequence of servers to be visited by the agent can be determined beforehand. In case of non-deterministic, some steps of an agent are non-deterministic. It means that when an agent goes to one server, there are multiple alternatives to be its next stop.

Since all these search strategies are under an assumption that the agent to be searched moves along a pre-deterministic path. We propose a search strategy called Non-Deterministic Binary Search (NDBS) which releases this assumption and locates an agent through a non-deterministic path. The time complexity of NDBS algorithm is  $O(m + \log(n/m))$ .

In the future work, we will improve NDBS algorithm by considering the time duration that the target agent stayed at each server and then compute the visited probabilities of all nodes. With these information, we will choose to probe the non-deterministic node with the maximum number of excluded non-deterministic nodes. This method is called Intelligent NDBS (I-NDBS). At last, we will run a simulation to compare the performances among NDBS, R-NDBS and I-NDBS.

## Reference

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