

The Architecture of a Mobile Agent for Digital Library System

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ABSTRACT

Digital libraries are means of easily and rapidly accessing books, archives, and images of various types, they have the potential to store much more information, because digital libraries require very little physical space for storage. Many-a-times, researchers using digital libraries are faced with the problems of information retrieval from the databases of the digital libraries when some information are required or needed. The ability of the mobile agents to navigate several databases seamlessly and gather needed information with a higher throughput makes mobile agent the much-needed tool for easy information retrieval from the digital libraries. The architecture of Mobile agent for Digital library system has been presented in this work using C-sharp.

Keywords : Digital library, Agent, Networks, Architecture

I. INTRODUCTION

An electronic library (also referred to as digital library or digital repository) is a focused collection of digital objects that can include ,text, visual material, audio material, video material, stored as electronic media formats (as opposed to print, micro form, or other media), along with means for organizing, storing, and retrieving the files and media contained in the library collection. The electronic content may be stored locally, or accessed remotely via computer networks. An electronic library is a type of information retrieval system.

The term virtual library was initially used interchangeably with digital library, but is now primarily used for libraries that are virtual in other senses such as libraries which aggregate distributed content [1]. A distinction is often made between content that was created in a digital format, known as born-digital, and information that has been converted from a physical medium, e.g. paper, by digitizing. It should also be noted that not all electronic content is in digital data format. The term

hybrid library is sometimes used for libraries that have both physical collections and electronic collections. For example, American Memory is a digital library within the Library of Congress.

Mobile agents are programs that encapsulate data and code, which may be dispatched from a client computer and transported to a remote server for execution [2]. When large quantities of remote-sensing data are stored at distributed remote hosts, moving the computations to data is a more realistic and feasible approach, compared with migrating data to the computations. Instead of gathering data distributed in remote sites at a centralized site, users can dispatch mobile agents to a destination site to perform information retrieval and filtering locally, and to return to a user the results of analysis. Thus, the information transmitted over the network is minimized, especially when using a low-bandwidth access network.

In computer science, a mobile agent is a composition of computer software and data which is able to migrate (move) from one computer to another

autonomously and continue its execution on the destination computer [3]. Most especially, mobile agent is a process that can transport its state from one environment to another, with its data intact, and be capable of performing appropriately in the new environment. Mobile agents decide when and where to move. Just as a user directs an internet browser to "visit" a website (the browser will merely download a copy of the site or one version of it in the case of dynamic websites), similarly, a mobile agent accomplishes a move through data duplication. When a mobile agent decides to move, it saves its own state, transports this saved state to the new host, and resumes execution from the saved states [4].

II. MOTIVATION OF THE STUDY

In many real life problems, a need to develop algorithms to search for mobile agents in information retrieval system solutions is needed. Area of algorithms is vast and in this research, we are interested in developing an agent for solving the problems formulated for mobile agent in gathering file information from the clients or local systems back to the host system.

The advantages of digital libraries as a means of easily and rapidly accessing books, archives and images of various types are now widely recognized by commercial interests and public bodies alike [5].

Traditional libraries are limited by storage space; digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain it. [5]. As such, the cost of maintaining a digital library can be much lower than that of a traditional library. A physical library must spend large sums of money paying for staff, book maintenance, rent, and additional books. Digital libraries may reduce or, in some instances, do away with these fees. Both types of library require cataloging input to allow users to locate and retrieve material. They also increase availability to individuals who may not be traditional patrons of a library, due to geographic location or organizational affiliation. Some of these advantages

motivate the researcher to embark on mobile agents in digital library system

- a. No physical boundary. The user of a digital library need not to go to the library physically; people from all over the world can gain access to the same information, as long as an Internet connection is available.
- b. Round the clock availability a major advantage of digital libraries is that people can gain access 24/7 to the information.
- c. Multiple access. The same resources can be used simultaneously by a number of institutions and patrons. This may not be the case for copyrighted material: a library may have a license for "lending out" only one copy at a time; this is achieved with a system of digital rights management where a resource can become inaccessible after expiration of the lending period or after the lender chooses to make it inaccessible (equivalent to returning the resource).
- d. Information retrieval. The user is able to use any search term (word, phrase, title, name, and subject) to search the entire collection. Digital libraries can provide very user-friendly interfaces, giving click able access to its resources.
- e. Preservation and conservation. Digitization is not a long-term preservation solution for physical collections, but does succeed in providing access to copies of materials that would otherwise fall to degradation from repeated use. Digitized collections and born-digital objects pose many preservation and conservation concerns that analog materials do not. Please see the following "Problems" section of this page for examples.
- f. Space. Whereas traditional libraries are limited by storage space, digital libraries have the potential to store much more information; simply because digital information requires very little physical space to contain them and media storage technologies are more affordable than ever before.
- g. Added value. Certain characteristics of objects, primarily the quality of images, may be improved.

Digitization can enhance legibility and remove visible flaws such as stains and discoloration [6]. It is obvious that for every new system to be designed or newly designed system must have a purpose as being the aim of the new system to be designed. However, the objective of the research is to develop the architecture of Mobile Agents for digital libraries that can migrate from one library host to another in distributed network for information retrieval.

III. LITERATURE REVIEW

Mobile agents have been introduced initially in [7] that permitted to processes to choose themselves to move on the sites of a network in order to work locally onto resources. A mobile agent [8], [9], [10] is a process that can move from a site to another site in order to achieve a task. In general, the mobility is provided using some primitive like: move (site) that permits the agent to move toward the site designated by the parameter.

Mobile Agents are the programs that move between computers or nodes of network, autonomously trying to fulfill some specific goals given by users. Agents are different from other applications in that they are goal- oriented: they represent users and act on their behalf to achieve some set goals in an autonomous manner – i.e. they control themselves, as in the decision where and when they will move to the next computer or node. Mobile Agents do provide a viable means of performing network security assessment and analysis efficiently and effectively. Mobile agent neither brings new method to detect for IDS nor increases detection speed for some kind of attracting. Nevertheless, it improves the design, construct, and execute of IDS obviously [11].

Other definition of mobile agents are presented in [12], [13], [14], [15], [16]. Mobile agent is software that can migrate from one node to another in a computer network. It can create reports about activities of software and can as well collect data [17].

A mobile agent system provides primitives allowing the agents to communicate with each other and with the servers on the visited machines. These communication primitives take the form of message passing or procedure or method calls [18].

Mobile agents are autonomous and intelligent programs or software that are capable of moving through a network searching for and interacting with the resources on behalf of its user or network administrator [19] Amosa [20], [5], [21], [22], [23], [24]. A mobile agent is an executable program that can migrate from one computer to another, at times, of its own choosing in a network. This means that a mobile agent is free to travel to any place in the network. It can execute without requiring a link with or being controlled from the originating location. Also, mobile agent is an execution unit that is able to migrate autonomously to another host and resume execution there, continuing from where it left off [25].

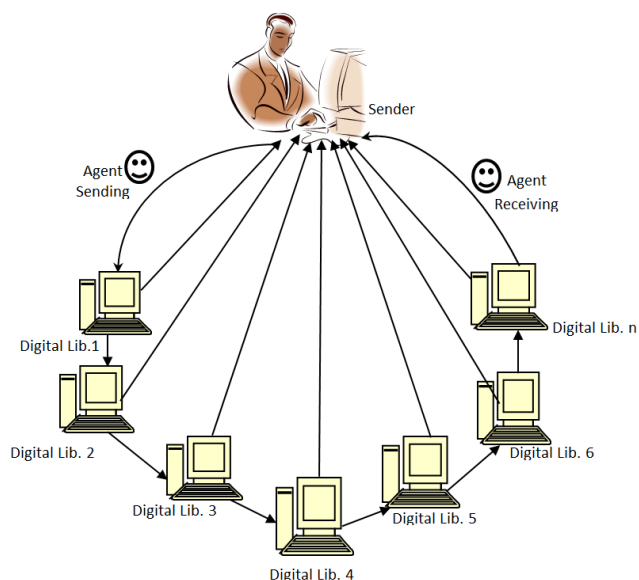
IV. ARCHITECTURE OF THE MOBILE AGENT FOR DIGITAL LIBRARY SYSTEM

The architecture of a mobile system adopted in this research consists of two types of agents namely: the static agents, otherwise referred to as Server agents, and the mobile agent referred to as Agent Monitor, together with their underlying software and hardware infrastructure. On the other hand, the architecture of the mobile agent system can also be categorized as comprising of backend and frontend engines. The backend engine is made up of the server machine and workstations which are considered to be static. The frontend is the software-based interface, which creates the environment for creating and launching the mobile agent and is dynamic in nature.

The architecture of the mobile agent for digital library indicates that when the sender search for file string from digital library 1 and that particular file cannot be found on the digital library 1, it will

autonomously move to digital library 2 and if not found, it will move to the next digital library until the agent reach the digital library n. When the file has been found, it will now report back to the server indicating the name of the system, location, file size and file directories else the agent will return file not found.

The architecture of the mobile agent for Digital library is conceptualized in Fig.1. The platform for the take-off of the Agent Monitor at the server host and the platform for its landing at the target workstations are their respective operating systems. At the server host, the Agent Monitor is created and equipped with the code, data and other necessary parameters and dispatched to the target workstations in the network. The Agent Monitor then navigate autonomously through the network from the server end and interact with the host operating system of the target workstations and its utility programs as it processes the desired information. The Agent Monitor moves from one workstation to another while carrying along intermediate results. The results obtained by the mobile agent after successful visits to a set of target workstations are transferred to the server.



V. CONCLUSION

The enhancement of the existing system would go a long way in speeding up the processing of

information retrieving by gathering or retrieving not only task being performed but also system resources information. Job satisfaction will replace frustration/fatigue of processing. Accurate usage of this project will greatly enhance the productivity of the information retrieval. While the use of computer in any organization is very appreciable, it should be stated that computer is like a slave who abide by the order of his master and not accordingly. As multi-agent system paradigm promises to be a valuable software engineering abstraction for the development of computer system; it might be advantageous to invest some time in further research in this field of mobile agent. The scope of this research is limited in the sense that, it has concentrated on network software tools monitoring aspect of network management system using mobile agent. However, one of the limitations of the research work is that it is only one out of the five identified components forming network management system that has been studied. Therefore the enhanced computerized system could be able to function properly if some consideration must be made. For effective performance, some steps must be taken into consideration:

- a. The entering of destination as address should be properly/carefully specified. It should be noted that valid but wrong destination host cannot be detected by the computer as the (*system / server agent*) will process the entered destination address, those in charge of the newly developed system must be honest in what they are processing at a specific destination (host).
- b. It is recommended that more detail study should still be made in case of a change in the system.

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