

Web-based Platform for Multimedia Programming

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Abstract

This paper describes basic elements of the Web-based platform for multimedia programming which is designed in the framework of the WWW-oriented Workplace of Applied Programmer (W4AP). The proposed platform is hiding the insignificant features of software and hardware from the applied programmers and provides the unified style for different programming development tools, comfortable environment combining visual and multimedia programming technologies. The architecture of the W4AP server is shown supporting a programming process and manipulations with multimedia data. The examples are demonstrated of the practical use of proposed platform as well as user interface features.

Keywords: Web-based Interface, Multimedia technology, Client-Server technology, Visualization of computations and data

1. Introduction

The Internet has spread over the world. This makes it possible not only to exchange information/communicate with other people but also design, implement and debug Internet-based applications. Many services like e-mails and the web provide basic mechanisms that allow users to work together. Grid technologies [1] seek also to make this possible by providing the necessary protocols, services and software development kits enabling flexible, controlled remote resource sharing on a large scale. This allows coupling geographically distributed resources and offers consistent and inexpensive access to resources irrespective of their physical location or access point. The key point of these technologies is in providing so-called "remote access" to the different resources. This means that we have a situation, in which the user and computing systems are separated, and their cooperation is impossible without special communications channels. This requires

special attention to the software design as well as human-computer interface/protocols.

People use the Internet for entertainment, business, education, etc. For some people, the Internet is a universal database or a source of data/knowledge. In any case, intelligent and knowledgeable features of Internet service and the data being provided within these services are becoming a serious issue. Importantly, modern multimedia applications can involve new formats for easy-to-understand representation of data/knowledge algorithm specifications [2,3]. For example, although parallel computing is essential for solving large-scale problems, only experts can mostly use it. A serious point is how to increase the programming productivity of end users. Another serious point is how to reach reusability and portability of programs (including parallel programs). Multimedia techniques provide good examples of approaches for solving of the above-mentioned problems. We should have intelligence of another type of attractive access to pieces of data/knowledge, so it is important to research intelligence of multimedia Internet services.

To satisfy these requirements, the user should have the same style in choosing and/or developing the suitable methods via analysis of initial data as well as features of algorithms. At the same time, hypertext trends to the general and common interface of application software. This situation points out the importance and necessity in researching and developing a simple and unified WWW-oriented system serving remote applications via Internet.

The paper proposes the Web-based platform for multimedia programming including features mentioned above. This platform was designed in the framework of the WWW-Workplace for Applied Programming (W4AP) representing a client-server virtual machine being accessible via standard web-browser interface and has multimedia visibility operations. W4AP is hiding unnecessary features of software/hardware from users. It has the equal style of work with different programming environment. The proposed tools are organized as a

special extension of the basic W4AP architecture in order to create comfortable environment combining traditional and multimedia (visual and aural) programming technologies.

This article is organized as follows: section 2 describes the related researches that include distributed computing, resource sharing for programming, and web-based programming. Section 3 presents the W4AP architecture supporting programming and manipulating with multimedia data. The examples of the practical use of proposed platform are shown in section 4. The last part of this article is our conclusions and future researches.

2. Related works

With today's proliferation of electronic devices and near universal networking, the emphasis on personal computing has evolved to inter-personal computing. People collaborate continually in their physical environment but, despite the increasing tendency for work to involve a computer, there is little support for synchronous collaboration in today's systems. Begole et al. [4] proposed an approach to access data resources external to the application in replicated synchronous collaborative applications. However, the introduced solution of Begole focuses on synchronous access to data and files from universal networking. It does not discuss about programming developing and management.

JXTA technology is a network programming and computing platform [5]. Project JXTA was originally conceived by Sun Microsystems and designed with the participation of a small number of experts from academic institutions and industry. JXTA also uses XML as the encoding format, mainly for its convenience in parsing and for its extensibility. Nevertheless, JXTA Shell is similar to the Unix Shell for writing scripts. It is not a convenient interface for applied users.

An important issue for future distributed computing is how to manage resources in distributed systems. As computer networking has developed to the present status, resource sharing can be conducted in many ways. However, sharing resources does not seem to appear in an organized way currently. Zhou and Yang [6] propose an approach to manage the distributed resources and provide a platform for users to develop their applications with the available resources. However, the proposed platform provides a set of specific application tools on client side. It means it does not have transparency of the server. Yau and Chen [7] have proposed related techniques of resources management over networking.

Neophytou and Evripidou present a tool, Net-dbx, that utilizes Java and other World Wide Web tools for debugging of MPI programs from anywhere in the Internet [8]. The Net-dbx is a source-level interactive debugger with the full power of gdb (the GNU Debugger)

augmented with the debug functionality of the public-domain MPI implementation environments. The advantages of this tool are building a parallel debugging architecture for MPI programs and accessing by WWW-interactive interface over the Internet. They concern about the related tools of parallel programs through low-bandwidth network. The general facilities of programming are not their purpose.

As was pointed above, authors of this paper propose an application-oriented virtual machine, being accessible via standard Web-browsers [9-11]. This machine called W4AP supports the unified work style for different programming platforms, and includes special tools optimizing and controlling the program creation and implementation. This research designs a platform for multimedia programming based on W4AP architecture.

3. System Model

The W4AP is an integrated WEB-based system consisting of the server and a set of user's workstations (clients). Server and clients are connected via Internet. The W4AP-user works with standard WEB-browsers. We use also standard graphical interfaces working in the same style on different browsers. HTTP-protocols, PHP scripts and Java-applets are used for the information exchange.

There are four basic components in a W4AP system. They are the Client, W4AP-server, Local Resource (LR) and Remote Resource (RR). The client is able to provide a multiple-user interface and demand requests from the W4AP-server. The W4AP-server is able to receive requests of clients and implement required software modules in their place. LR is a local data storage server as well as computer cluster to provide parallel and distributed computations. RR represents storage and computing systems that are not connect directly to the Internet or these connections are very restricted.

Figure 1 illustrates the main elements of W4AP-server kernel which controls Internet access, supports multi-user environment as well as provide security.

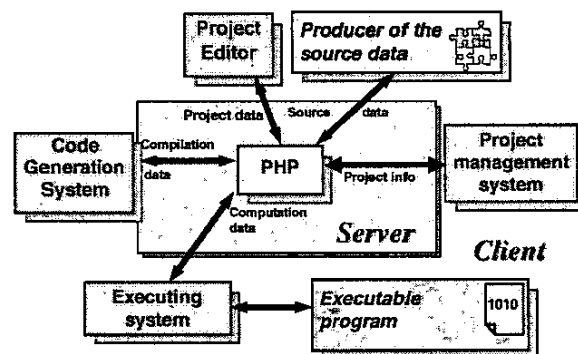


Figure 1. W4AP kernel

possible to open the multimedia project type to use and/or design multimedia applications (Figure 3).

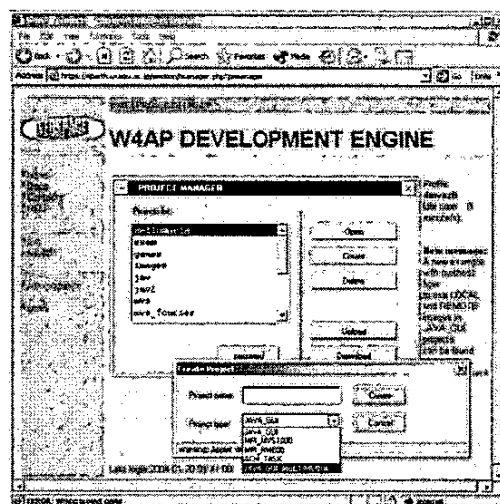


Figure 2. Multimedia data flow

Any multimedia application in the W4AP-system represents an applet implementing on the client and providing operations described in the Section 3. To support multimedia programming in the W4AP environment, the special Java-library was designed. This library is a collection of classes providing comfortable manipulations of multimedia objects such as images, image buttons, audio and video files basing on the W4AP configuration in order to hide from the user system-oriented features of this platform. The one of the main function is in programming an access to the remote/local multimedia data as well as control cash. This allows saving the traditional programming style similar to stand-alone Java multimedia applications. The last means that the user can call standard multimedia functions and packages.

The multimedia applications can work in the W4AP environment. We have designed a set of such applications powering our system. It is also possible to include any multimedia application as an embedded function. The example of such an application is the package for multimedia representation of matrix data. This package was adapted to the W4AP environment. It can be launched by pressing a special W4AP button "Visualize". Figure 4 depicts the main window, specification attributes for the data visualization, and example of matrix images. The detailed description of the package functions is shown in [3]. Functions of matrix filtration can be activated by pressing the corresponding buttons on the package toolbar. It is possible to choose filtration according to Pattern, Sign, Maximum/minimum Values as well as special functions implementing the verification of

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diagonally dominant features. It is also possible to Setup some filtration, visualization and scaling parameters.

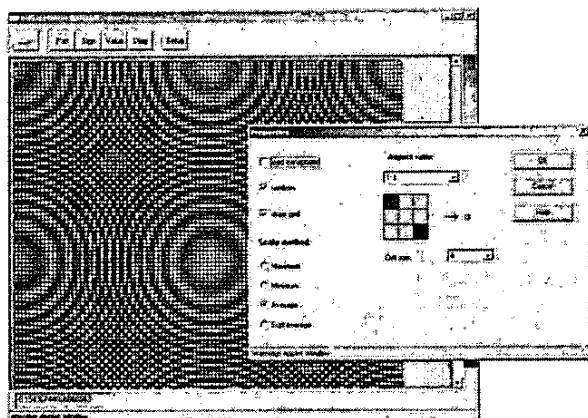


Figure 4. Multimedia matrix representation

5. Conclusion and future work

The increasing availability of Internet-oriented applications provides a very significant effect on all areas of scientific computations. Through network-resources sharing, programmers can choose suitable methodologies, algorithms, data, and tools to develop their software in complementary environment. However, the unified work style becomes importance and necessity from different development environments and special tools. This paper proposes a client-server platform to support a standard human-computer interface from variety programming-development environments and distributed cluster computing. Furthermore, multimedia technologies are applied to interface operations and result presentations of software module. The resolution cones used in the experiments were based on localization errors for a broadband signal. In case of voice signals, expected localization errors are higher. Using this information for the clustering algorithm can improve the effectiveness of the resource management process. The effectiveness of the cluster algorithm was only evaluated for one static configuration using a controlled listening experiment. For further evaluation, other configurations, including specialization back ends based on different technology are required. Therefore, the W4AP supporting of CSCW (Computer Supported Cooperative Work) applications is a further direction. Distance learning over Internet is also a research direction of W4AP, it can be developed a programming learning environment via applying interaction mechanism on W4AP platform.

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