

AC 2009-967: THE DEVELOPMENT OF USER-FRIENDLY INFORMATION RESOURCES IN RAPID PROTOTYPING

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The Development of User-Friendly Information Resources in Rapid Prototyping

Abstract

This current NSF-ATE project provides guidance in the development of technology transfer approaches, marketing materials, understanding of the incorporation of Rapid Prototyping into the design process for manufacturing, and maintenance procedures for the purchased Rapid Prototyping equipment. The project dissemination includes regional workshops and support material that is being disseminated through workshops to publicly funded K-12 Institutions, Regional Technology Centers, Community Colleges, and Universities. This paper reports the informative website developed for the P-16 Rapid Prototyping education. The structure of the site development, its content and usage statistics collected through a web counter system are reported in this paper.

Introduction

The largest downfall of the Internet has become apparent, organizing the mass of information that is available. Lack of awareness and education are impeding the growth and expansion of the rapid prototyping (RP) industry¹. Structuring large amounts of information to enhance accessibility is the ultimate goal of the development of a RP Instructional Delivery Support (RPIDS) site, which is <http://rpids.csc.tntech.edu/> or *RPIDS.net*. There is an abundance of information available on the Internet about emerging technologies. Students and instructors can spend hours of wasted time sorting through unrepeatable sources. The goal of the RPIDS site development is to create a portal through which students and educators can interact in a constructive and well-organized learning environment. The project also maintains a growing database of presentations and handouts that can be utilized by the subscribers of the site.

Background

Several RP sites have been developed thus far. Most of them are available online and they are free for their users' industrial or educational needs.

Castle Island's information site contains various informational materials and links prepared in hypertext modes and it is commonly used for quick RP information needs². The other one is being developed by the staff of University of Utah³. This site is pretty similar to the one developed by Castle Island. The links draw broad attention from industrial and educational users. There are a number of similar sites to both developments. They can be reached via reference 4⁴.

Although there are many technological sites available in this emerging fabrication technology there is no existing knowledge base for use by educators, students and industry. Such a site should be a combination of educational panels, student information links and industrial knowledge sets. In order to address these needs, a modular site is being developed by the researchers at Tennessee Tech University.

This current paper reports the RPIDS site development and its usage by various educational and industrial institutions.

Layout

The base of the site is written in PHP. PHP is an acronym for “Hypertext Preprocessor”. PHP is a scripting language that is the primary interface in MySQL website databases. It allows server-side interaction even for the novice programmer. It also maintains a high level of security and allows for scripts to be executed on the server rather than the end user’s system⁵. Although PHP can be used as end user scripts, all scripts on RPIDS run server side only.

For optimum compatibility, html wrappers are implemented for cross-platform reliability. The process of creating a site that is efficient and has a broad range of functionality is difficult. Most pages on the site implement a set of IFrames. IFrames, inline frames, allow multiple html pages to be shown in different frames on the same page⁶. As can be seen in Figure 1 the end user’s browser sees html, while the editor of the site edits html, and the complicated PHP processes both ends behind the scenes.

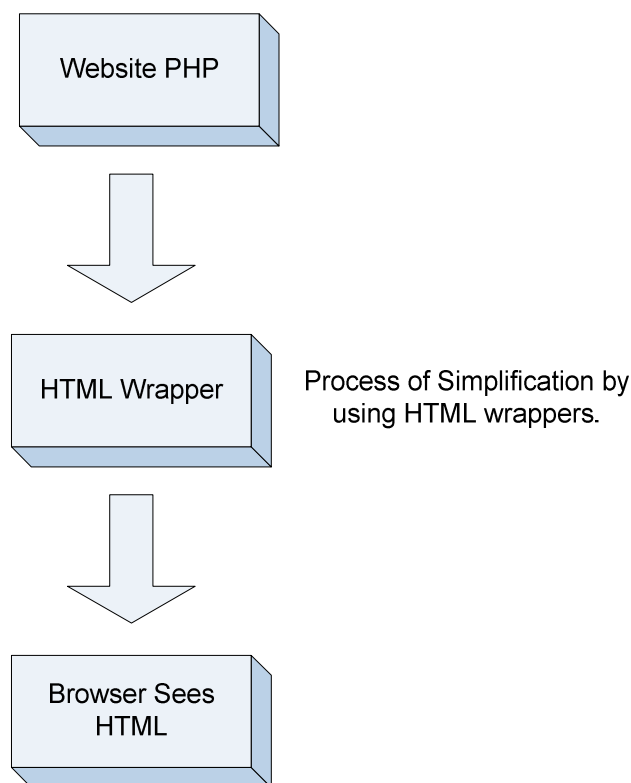


Figure 1: The Structure of the RPIDS System

The use of HTML wrappers may seem as a minor detail, but it is vital to much of the simplicity to the end user. On the end-user side, every browser interprets web data just a little differently than other browsers. If the data can be simplified before it is sent to the end-user, less

interpretation by the browser is necessary. This is done with the html wrapper setup. Although the browser processes PHP, it is simplified by the implementation of the IFrame system.

Interaction

A large portion of the RPIDS site is dedicated to student and instructor interaction. There are two types of portals for this interaction, Moodle and WebCT. The WebCT server is hosted by Tennessee Tech University along with other WebCT accounts.

The Moodle server is hosted with the RPIDS server site, utilizing open source software available for use by educational websites at <http://moodle.org>. The moodle course management system is a very complex collection of PHP scripts. It allows instructors to create a unique portal for their students to log-in to from anywhere. Teachers can host tests, quizzes, files, and a calendar for their classes. Each teacher and student has his or her User ID that directs them to the appropriate location of the site. Moodle is a completely open source and has a strong community of developers who support it. The software allows RPIDS site to offer high-end services to visitors of the site at absolutely no cost of development⁷. It is a fairly simple PHP installer file that can be run in a normal web browser. Installation can be done in less than an hour, and the server requirements are not substantial.

Most items on RPIDS site are made to be not only graphically pleasing but interactive as well. From the file hosting to the Flash calendar, everything moves and captures the viewer's attention.

File hosting

A major resource utilized by universities nationwide is the resources section of the RPIDS. There are many different file types that are converted to universal standards. As compared to PDF's, the format most Microsoft Excel or Word documents are distributed, PowerPoints are a more complicated venture. PowerPoints are converted into Flash files. These load instantly on a high-speed connection, and can be viewed with free software. The end user can use any standard platform that has a version of Flash Player installed.

The image shown in Figure 2 represents a Flash Player being utilized to view a PowerPoint file, a functionality that helps achieve the goal of working anywhere anytime. There is a script that opens PowerPoints, now Flash files, full page in its own window. It uses JavaScript because the functionality cannot be accomplished within basic PHP scripting. It gives the files the look and feel of having them already loaded onto the user's system, enabling an instructor to walk into a classroom, pull up a PowerPoint file, and have an entire classroom of students display the presentation on their computers, without downloading or e-mailing a single file. All functions of the original PowerPoint, including notes and links, are still fully functional. This is very different from most online PowerPoint distribution systems. No complicated addresses or long list of instructions are required for the students to access the information.

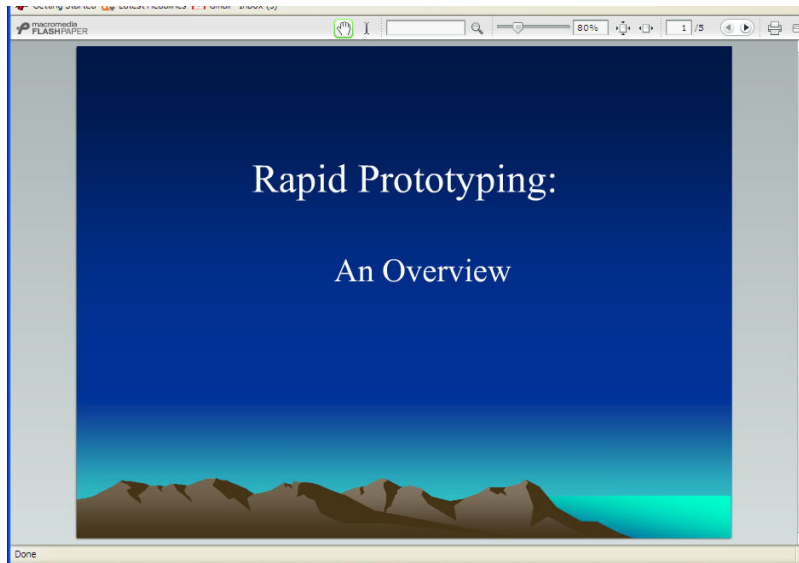


Figure 2: A View from the Resources Section

Search

The site utilizes two different search types. One allows anyone to search the site to find calendar events or news items. The other allows the user to search the entirety of the file database. It searches through PowerPoints and PDF's for any key words and sentences. This is a very complex search engine, and has to be indexed offline so that each file can be searched for keywords and subsequently stored into a MySQL database for recall by the search engine⁸.

Very soon RPIDS will be opening its webinars section, consisting of tutorials, lectures, and informative guides. They will be streamed from the servers using very simple technologies. This section will be created in Flash, allowing users to 'stream' the videos without the server having to actually implement specific streaming technologies. Embedded Flash files will allow users to start watching the files while downloading them. Users will not even realize that they are downloading the file and yet, a complete video player will be embedded into the website.

Open Area

As can be seen in Figure 3, RPIDS site also incorporates an open area of extra resources to add to the functionality and interaction of the website. The contact mediums listed on the site allows a broader knowledge base for viewers looking for more information. This networking with other contacts, namely universities, helps promote an inter-institution community with others that are involved in the RP technologies. These links are easily accessible from the home page and includes over 25 different institutions and laboratories for all users to access.

Along with the Institutional contacts, a real time news ticker is located on the home page of the website. This ticker gives up-to-date information about RP and related topics. This function gives users a real world aspect of how RP is weaving its way through our everyday world outside

of the collegiate and research atmosphere. Another tool that accomplishes the same thing is the instant quotes link which is located on the home page of RPIDS. This link offers a variety of companies that are solely involved in bringing your design into reality by RP in various different mediums. This allows user to understand and compare the different processes, associated costs, and delivery times.

A recently added poll allows users to input their views on the future development of the website. The end users are the most important people and giving them the tools and resources they need to learn is the main priority of RPIDS.

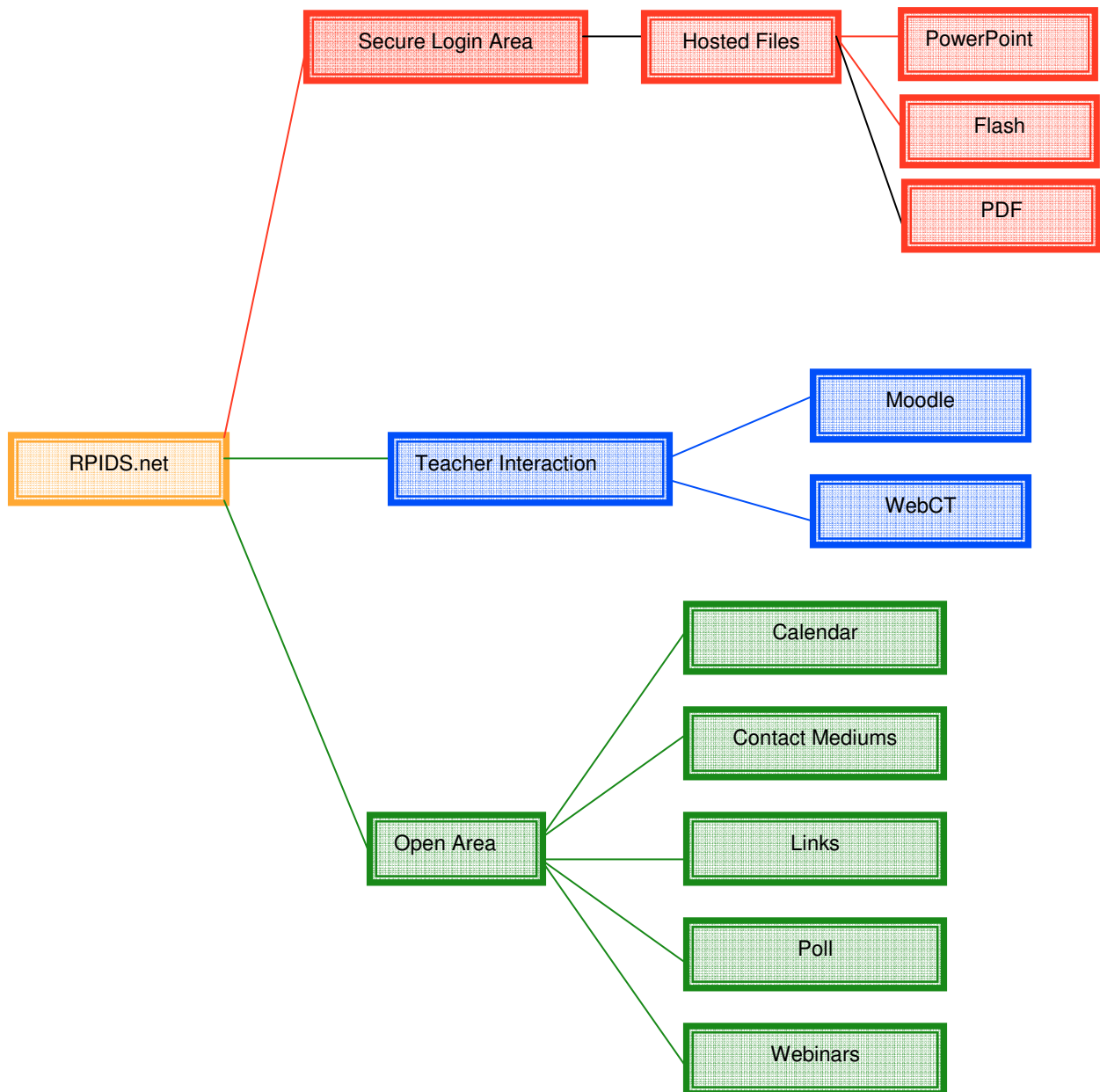
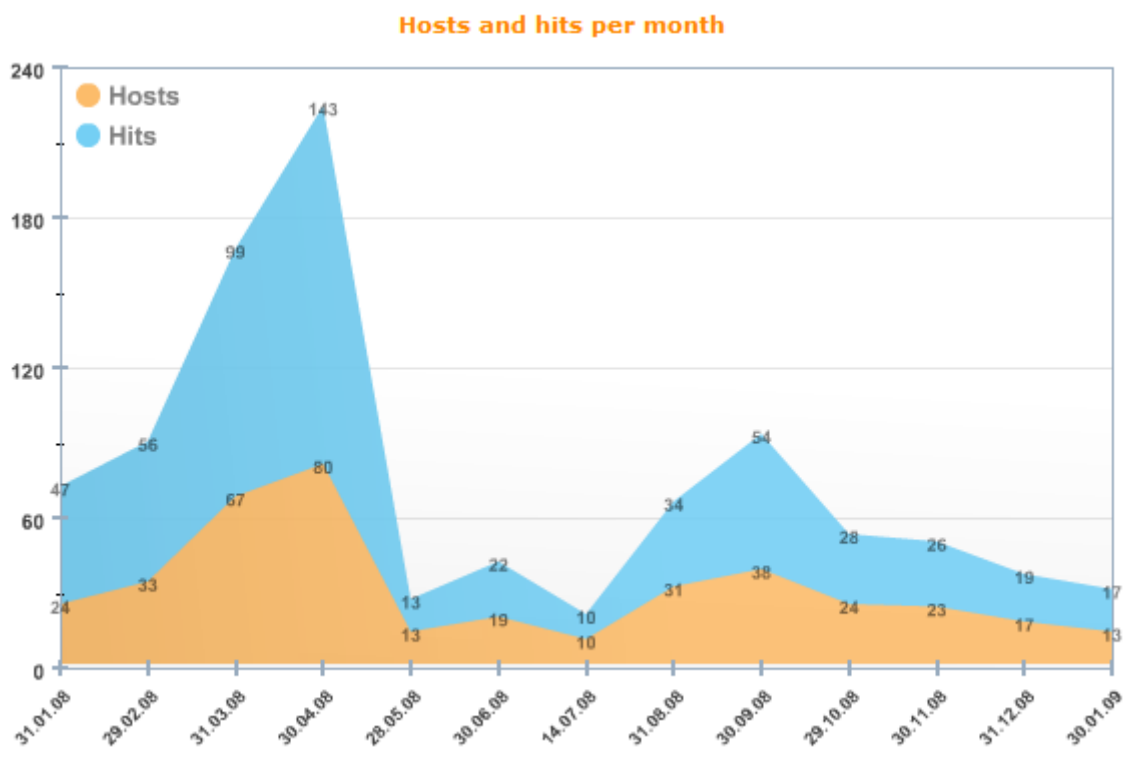


Figure 3: RPIDS Site Map

Site Usage Statistics

In order to record and tabulate the site access statistics, an account with ritecounter.com has been created. 912 hosts and 2255 hits have been recorded up to February 1, 2009. Site statistics for the year 2008 and the most current access statics have been given in Figure 4. The majority of the host and hit statistics have come from the educational institutions. The RPIDS site use was very high during the Fall and Spring semesters, but it was pretty low in Summer and Holiday Breaks.



Week report (Sunday, January 25, 2009 01:00:00-Sunday, February 1, 2009 00:59:59)								
RPIDS								
Date of registration:		Friday, November 10, 2006 06:03:11 (814 days)						
Address of site:		http://rpids.csc.titech.edu/						
Category:		Reference						
Package:		Free package						
Timezone Preference:		(CST) Central Standard Time North America UTC - 6 hours						
Visitors activity				Most active visitor		Most active countries		
Date	Hosts	Hits	New hosts	Came date:	Tuesday, January 27, 2009 10:44:25			
Cur week	3	5	0	Last visit date:	Tuesday, January 27, 2009 10:44:34			
Prev week	8	12	4	IP	149.149.152.44			
Total	912	2255		Country	United States			
				GMT timezone:	-6 (19:08:19)			
				Hits	3			
						Country	Hosts	Hits
						United States	2	4

Figure 4: RPIDS Access Statistics

The Future of RPIDS

The future of the RPIDS site looks very promising. Many other functional and educational tools will be implemented to add more depth usefulness to the website. Features such as Tips for 3D Modeling, Terminology Pages, Links to Popular RP Forums, Videos, and Pictures are likely to be added. These visual and interactive tools will allow all users to learn more about RP and its increasing role in education and industry. These resources will also be made available on National Science Digital Library (*NSDL.org*).

Conclusion

RPIDS site will be a meeting place for industry, instructors and students alike. It will allow educators to interact in every way possible with their students. It will also allow collaboration by teachers to promote the development of more resources for teaching and interaction. The RPIDS site will truly be a resource for the advancement of RP.

Acknowledgements

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