An Image Management System

GRADUATE PROJECT REPORT

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ABSTRACT

The Media Center of the Mary and Jeff Bell Library, Texas A&M University Corpus Christi, maintains a huge collection of art slides. Currently professors and students of the College of Arts and Humanities have to make an appointment with the media center to view and study these slides. The whole process takes a lot of paper-work and time. This project developed an Image Management System using MySQL to store the art slides as images and a Web interface using PHP to access these slides. Students will have access to images in study guides prepared by their professor or by the administrator. The administrator and faculty have access to the entire image database and have access privileges like searching the database for certain slides, setting up the slides for student study guides, and adding and deleting slides from a study guide. Faculty will also be able to view the slides from previous semesters and prepare exams online for the students.
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1. BACKGROUND AND RATIONALE

1.1 Introduction

The College of Arts and Humanities at Texas A & M University-Corpus Christi offers various courses which require students to study a large collection of art slides maintained by the Media Center of Mary and Jeff Bell Library. Professors send slides to the media center on a regular basis where they are scanned and loaded into a computer as bitmap images by a student worker. Students visit the media center to study those slides.

1.2 Current system and its drawbacks

The slides are received, scanned and stored as bitmap images on the computer by a student worker. Each slide is given an id number for the bitmap image. The professor sends a list to the media center to pull out the slides that are needed for tests. Students make an appointment to study these slides and not more than two students can engage in slide/image reviewing at a time. This consumes a lot of time for the students and during exams it is practically impossible for every student to get their requested schedule approved. The whole process of making an appointment for students and professors requires a lot of paper work, which wastes the valuable time of staff, professors and students. Different professors offer the same course every semester and there is no record of which slides the professor has used during the previous semester for that course. Students who live off campus have to spend lot of time and money coming back to the library to study these slides. The media center has hired a student worker to maintain these slides. There is a lot of work done by the student worker even before the professor and student review these slides. The Media Center and the University spend lots of money on this job and still the system has many drawbacks as seen above.
1.3 Advantages of the New System

A new database was created and populated using the data from an old Microsoft Access database by running Perl scripts. New tables were created to copy the data and ensure that the data copied is consistent with the old database. The new database is fast and efficient. No supervision is needed. Many students can use at the same time. Students can view the slides from anywhere they want.

It reduces the workload of the professor and makes it easier to locate a specific slide out of 13000 slides. The professors will be able to set up study guides for their classes without wasting time. The system maintains a history folder that has slides used by the professors from previous semesters. It is safe and easy to use, whereas with the other method, the slides are stored as hard copies and they are prone to wear and tear. The slides saved as images are well protected by adding advanced security measures to the database, which don’t allow unnecessary access to third parties. The project also reduces workload on the administrator. This project uses a MySQL database for storing the images. MySQL is a more capable and more efficient database compared to Access. It takes less time to retrieve and download images using MySQL.
2. NARRATIVE

2.1 Overview

The main goal of the Image Management System (IMS) is to automate the processes of slide viewing, downloading, saving and evaluating by the students and instructors of the College of Arts and Humanities at Texas A&M University, Corpus Christi. The system allows students to view and review the slides selected by their professor. All the slides have specific details explaining the characteristics of the image. The instructor has an additional set of tools such as setting up the study guides for the students. The system is equipped with a user-friendly interface. Scripts are written in PHP to insert the images into the database. Proper security measures were incorporated when developing the system. The system will be implemented and used by the College of Arts and Humanities.

2.2 Features of the Data Base System

The application is Web-based and has several features. Students have access to a study guide folder which contains slides from their class. Professors prepare the study guides for the students. Professors also have the capability of searching the database. The administrator has privileges such as searching the entire database for slides, adding and deleting users, and adding and deleting course sections.

2.3 Description of the User Interface

There are three types of users associated with this database system: faculty, students and the administrator. Three interfaces have been developed: faculty interface,
student interface and administrator interface. In addition, the Error page and Search page were also developed. A link will be provided under Art Slides on the main page of Mary and Jeff Bell Library. Clicking on that link will take users to the main page of IMS which has links to the Student page, Faculty page and Administrator page. The users will be entering their user name and password. Only upon successful login, will the users be able to access the database.

2.3.1 Systems Home Page

This is the first page that the user sees when he/she accesses the system. The page gives a brief description of the system and its functionality. It has links to the Student page, Faculty page and Administrator page as shown in the Figure 2.3.1.

![Figure 2.3.1 Home Page](image)

The Image Management System is for use by the faculty and students of the College of Arts to view the images related to their course work. This is a password protected site and you must be enrolled in a related class to get the authentication to view these pages. Please contact your Professor for the details on how to access the system.

Student Login | Faculty Login | Administrator Login
2.3.2 Student Login Screen

The **Student** login screen prompts the student to login into the system, as shown in Figure 2.3.2. It asks the user to enter his username and password. Then the system validates the user's authentication and transfers the user to the database gallery. Otherwise, it displays an **Error** page and transfers the user back to the Home page.

![Student Login Screen](image)

Figure 2.3.2 Student Login Screen
2.3.3 Faculty Login screen

The Faculty login screen has a user name and password as shown in Figure 2.3.3. Upon correct entry of name and password, the system transfers the instructor to the database gallery where the instructor can select any image he wants to view. In addition the instructor can also download and save images.

![Faculty Login Screen](image.png)

**Figure 2.3.3 Faculty Login Screen**
2.3.4 Administrator Login screen

The Administrator screen looks similar to the Student and Faculty screens and is shown in Figure 2.3.4. On successful login, the administrator will enter the Administrator page where he will have access to the entire Image Management System. Failure to enter the right username and password will prevent entry into the system and an Error page appears.

![Administrator Login Screen](image)

Figure 2.3.4 Administrator Login Screen
2.3.5 Error Page

This page shows up when the student, faculty or administrator enters a wrong username or password as shown in figure 2.3.5. The user has to enter his username and password again.

Figure 2.3.5 Error Page
2.3.6 Administrator page

The Administrator page has links such as Home, Add User, Delete User, Reset Password, Images, Courses, Search and Logout as shown in Figure 2.3.6 on the next page.

Home

This is linked to the Mary and Jeff Bell Library home page, where there is link for the Image Management System titled Art Slides.

Add User

This link asks if the user is a student, faculty or an administrator. Faculty and administrator are added directly by entering their first name and last name. Students may be added either from a file or directly by entering the student’s first and last names.

Figure 2.3.6 Administrator page
Delete User

The Administrator can delete a user by selecting the first name, last name and member type with this link.

Reset Password

The Administrator can change passwords of the members by entering user name, new password and member type.

Images

The administrator can add, delete and edit images using this link.

Course

The administrator can add and delete a course. He can also assign a professor who is teaching the course that semester.

Search

The administrator can search for any slide in the database using the artist name or title of the art.

Logout

Administrator will be taken to the main page of Mary and Jeff Bell Library upon clicking this link.
2.3.7 Faculty Page

The **Faculty** page has links for the **Study Guide**, **Search**, **Add Students**, **Change Password** and **History** as shown in Figure 2.3.7. After selecting Study Guide, the professor can prepare a study guide by going through the slides in the database. **Search** will allow the faculty to search the entire database using artist name and title of the slide. The **History** link has slides from previous semesters.

![Faculty Page Image](image-url)

*Figure 2.3.7 Faculty Page*
2.3.8 Student page

The Student page has links to Change Password and Study Guide as shown in Figure 2.3.8. Students are able to change their password and have access to the study guides for their own classes only.

![Student Page Screenshot](image)

Figure 2.3.8 Student Page
2.3.9 Search Page

The Search page asks the user to select either the artist's name or title of the art to do the search as shown in Figure 2.3.9. Images will be returned based on the search criteria selected by the user.

![Search Page Screenshot](image)

**Figure 2.3.9 Search Page**

2.3.10 Image Pages

The Image page consists of thumbnail images that are returned after doing the search as shown in Figure 2.3.10. Images can be added to the study guide from this page by the faculty. Clicking on the thumbnail will enlarge the image with details of the image at the bottom of the page as shown in Figure 2.3.11.
Figure 2.3.10 Thumb Nail Image

Figure 2.3.11 Enlarged Image
3. PROJECT ENVIRONMENT

The Image Management System is designed to run on any Web browser such as Internet Explorer. The MySQL 3.23 relational database system running under the Linux operating system is used as the back end. The Hypertext Markup Language (HTML) is used to generate all front-end documents. PHP Hypertext Preprocessor (PHP) scripts are used to access the MySQL database. Structured Query Language (SQL) is used for querying the database.
4. SYSTEM DESIGN

The Design and Implementation of the Image Management System for the
College of Arts and Humanities is discussed in detail in this chapter. The Image
Management System (IMS) was developed using PHP (PHP Hypertext preprocessor) and
MySQL. The IMS is installed on the Mary and Jeff Bell Library Test server running on
Redhat Linux v.9.0 and running Apache as the Web server. The IMS is made accessible
to both faculty and students. The following steps were taken to complete the development
and testing of the Image Management System.

- Implemented the System using the HTML, MySQL, and PHP scripts.
- Imported existing Image information and other data to the MySQL database
  from MS-Access database.
- Installed and tested the system with live data.

4.1 System Overview

4.1.1 PHP

PHP is a general-purpose scripting language that is used for Web development
and can be easily embedded into HTML. PHP is mainly used in server side scripting like
collecting the information from the user, generating dynamic pages, and in sending and
receiving cookies.

PHP can be used on most of the major operating systems, including Linux, UNIX,
and on Microsoft Windows machines. PHP also supports most of the Web servers like
Apache, Microsoft Internet Information Server, Personal Web Server, Netscape and
iPlanet servers, and Oreilly Web site Pro server [Yank 2001].

PHP provides the luxury of procedural object oriented programming and a
mixture of both to the user. When using PHP the user is not limited to output only in HTML, but also has capabilities like outputting images, PDF files and even Flash movies and text in XHTML and XML [Weiling 2001].

PHP supports a wide range of databases, which include dBase, Oracle, Access, File Pro, Informix, ODBC, MySQL, Sybase and Empress. Web page's can be easily connected to the databases making them dynamic by using PHP. PHP also has support for other services using protocols like LDAP, IMAP, SNMP, NNTP, POP3, HTTP, and COM (on Windows). It can also be used as open raw network sockets and interact using other protocols. PHP has support for the WDDX complex data exchange among all Web programming languages [Maxfield 2000]. PHP supports instantiation of Java objects and using them transparently as PHP objects. It uses the CORBA extension to access remote objects. Figure 3.1 shows the 6-step PHP process.

Figure 4.1.1 6-Step PHP process
4.1.2 MySQL

MySQL is free software, which is very fast, multi-user and a robust SQL database server. It is compatible with different platforms and can be used with C, C++, Java, Python and Perl [Du Bois 1999]. It supports many column types signed/unsigned integers 4 and 8 bytes long, FLOAT, DOUBLE, CHAR, VARCHAR, TIME, DATE, and YEAR types.

MySQL has full operator and function support in SELECT and WHERE parts of the query and also supports LEFT OUTER JOIN and RIGHT OUTER JOIN with ANSI SQL and ODBC syntax. It allows for both fixed length and variable length records. It is ideal for handling large databases.

4.1.3 JavaScript

The system uses the JavaScript executed on the client's Web browser for the validation of the user input data.

4.1.4 Apache Web Server

The System uses Apache Web Server running under the Linux operating system to execute the PHP scripts. It sends the HTML document containing the response of the user’s query to the client’s Web browser.

4.2 Database Design

4.2.1 Design and Entity Relationship

The database for IMS is a built-in MySQL relational database system running under the Linux operating system. The database was designed by keeping in mind the future expansions. The database uses the relational model, minimizing data redundancy.
Figure 4.2.1 Entity Relationship Diagram
Figure 4.2.1 shows the Entity-Relationship diagram for the IMS. The tables store all the details of images in the system. The primary key is filename in the image table which will be used as reference key or foreign key by other tables to maintain the integrity constraint.

4.2.2 Description of Database Tables

This subsection gives a brief description of the tables and fields in the database and their relationships. The data dictionary for each table is provided in Appendix A. The database consists of 20 tables. The following is the list of tables in the database and they are shown in Figure 4.2.2:

1. Administrators
2. Artists
3. Courses
4. Course_images
5. Exams
6. Faculty
7. Faculty_Courses
8. Images
9. Images_Class_number
10. Images_Cutter
11. Images_Data
12. Image_subject
13. Medium
14. Nationality
15. Source
16. Students
17. Students_Courses
18. Style
19. Vendor
20. Image_History

![Image of database structure]

**Figure 4.2.2 List of Tables**

*Administrators*

This table consists of fields like first_name, last_name, user_name, password

and last_login. Any number of administrators can be given access to Image Management System by adding them to the Administrator table.
Artists

This table consists of fields like id, artist_name and dates. Artist names are arranged in alphabetical order. Id is a numerical number given to each artist name starting from one.

Courses

The course table consists of fields like course_number and course_title. New courses with their titles will be added to this table when the administrator adds a course and title.

Course_Images

This table consists of fields like course_id, image_id, semester, year, faculty_id, notes and important. Each course uses different images, so images specific to a course are saved in this table.

Exams

This table consists of various fields like course_id, faculty_id, semester, year, exam_number, image_id, and date. Faculty will be able to set online exams for the students with the help of this table.

Faculty

The faculty table has fields such as first_name, last_name, user_name, password, last_login and active. The table holds names and encrypted passwords of the entire faculty that are using the Image Management System.

Faculty_Courses

This table has fields like faculty user names and the course numbers that they are teaching. It also has fields of semester and year.
Images

The image table has various fields such as artist, file_name, nationality, date, medium, size etc. This table stores the entire information of an image.

Image_class_number

This table consists of id and class_number of all the images.

Image_Cutter

This table consists of fields like id and cutter of all the images.

Image_Data

This table consists of fields like id and subject.

Medium

The medium table consists of all the medium types that are used to create images.

Nationality

The nationality table consists of names of all the nations from where the art images have been collected.

Source

The source table contains an id field and source_name field.

Students_Courses

This table consists of fields such as user_name, course_number, semester, and year.

Style

The style table has fields of id and style_type of the images.

Vendor

The vendor table has fields with id and vendor_name.

Image_History

This table contains fields such as course_id, image_id, semester, year, faculty_id, notes and important.
4.2.3 Entity Relationship of Log-in Process

The Entity relationship of the login process is shown in Figure 4.2.3. The Home page is connected to the other pages and when the student/faculty/administrator enters the correct user name and password, the PHP script runs for authentication and checks the user name and password in the password table. If the password doesn't match with the user, an Error page pops up showing a login failure.

Figure 4.2.3 Schematic diagram for log-in process
4.3 Database Implementation

4.3.1 Implementation of the Tables

The tables were created according to the Image Management System hierarchy.

4.3.2 Importation of Existing Data

After creating the tables, existing data were gathered from MS-Access 97 and processed to fit the MySQL format. The data from MS Access tables were converted to tab delimited text files and were imported into MySQL database using the following Perl script:

```perl
#!/usr/bin/perl

open(INPUT, "$ARGV[0]") || die "Error:$!\n"
open(OUTPUT, "$ARGV[1]") || die "Error:$!\n"
while(<INPUT>)
{
    $_[0] =~ s/["]/\"/g;
    print OUTPUT ";
}
close (INPUT);
close (OUTPUT);
```

The following perl script is used to create each of the new tables from the Images tables in Access:

```perl
#!/usr/bin/perl
use DBI;

$user = 'skumar';
$auth = 'plc@s0';
$dsn = 'dbi:mysql:Art_Slides=localhost:3306';
my $dbh = DBI->connect($dsn, $user, $auth) || die "Can't connect to the database: $DBI::errstr\n";
my $sth = $dbh->prepare('select * from VENDOR');
$sth->execute();
while(@row = $sth->fetchrow_array())
{
```

25
my $ith = $dbh->prepare("UPDATE IMAGES set vendor=
$row[0] where
IMAGES.vendor=".$row[1]." ");
$ith->execute();

4.4 Design of the User Interface

The Image Management System consists of three main interfaces: Student Interface, Faculty Interface and Administrator Interface. Security of the Web pages for each of the three interfaces of the Image Management System is maintained by using session cookies that are generated when the user logs into the system. Generated session cookies include Userid and Sessionid, where Userid is generated from user’s name and Sessionid is generated from a random value. Both these values are used in maintaining security between visits to different pages of the interface. All other scripts of the interface compare these values with the values stored in their respective tables. If the values do not match, the user is transferred back to the Login Page.

The following section presents a brief description of Administrative module, Faculty module and Student module and underlying queries of the System.

4.4.1 Administrator Login

Input: User Name, Password

Session Cookies: Userid, Sessionid

Function: The AdminLogin.php script deletes all the previously set cookies and displays the Administrator Login Page (Figure 2.3.4), which prompts the user to enter his/her User Name and Password. When the user submits the form, the user_login.php script is executed which authenticates the user by comparing the values entered with the values stored in the Administrator table. If the values provided are incorrect, an error message is displayed saying he is not authorized to enter. Otherwise the user_login.php
generates a random session value and updates the Sessionid field in the Administrator
table. The user_login.php script also generates two session cookies, one with the User
Name called Userid and other with a random value called Sessionid and transfers the user
to Administrator Page.

4.4.2 Administrator Page

Input: None

Session Cookies: Userid, Sessionid

Function: The script add_students_form.php displays the Administrator Page, which
consists of basic information about the page with a set of options. This set of options will
allow the administrator to select a particular link to access all the information relevant to
that link.

Output: An HTML page containing basic information about the administrator. This page
also displays the following set of options: Add User, Delete User, Reset Password,
Images, Courses, Search, View Study Guides, View History and Logout.

4.4.3 Faculty Login

Input: User Name, Password

Session Cookies: Userid, Sessionid

Function: The FacultyLogin.php script deletes all the previously set cookies and
displays the Faculty Login Page, which prompts the user to enter his/her User Name and
Password. When the user submits the form, the user_login.php script is executed which
authenticates the user by comparing the values entered with the values stored in the
Faculty table. If the values provided are incorrect, an error message is displayed saying
he is not authorized to enter. Otherwise the user_login.php generates a random session
value and updates the Sessionid filed in the Faculty table. The user_login.php script also
generates two session cookies, one with the User Name called Userid and other with a
random value called Sessionid and transfers the user to Faculty Page.

4.4.3 Faculty Page

Input: None

Session Cookies: Userid, Sessionid

Function: If the faculty is teaching more than one course the script
study_guide_form.php displays the Faculty Page. The faculty will have an option to
choose the course they want. The script study_guide.php displays the Faculty Page if
the faculty is teaching just one course. The page consists of basic information about the
page with a set of options. This set of options will allow the faculty to select a particular
link to access all the information relevant to that link.

Output: An HTML page containing basic information about the faculty. This page also
displays the following set of options: Study Guide, History, Add Students, Change
Password, Search and Logout.

4.4.5 Student Login

Input: User Name, Password

Session Cookies: Userid, Sessionid

Function: The StudentLogin.php script deletes all the previously set cookies and
displays the Student Login Page, which prompts the user to enter his/her User Name and
Password. When the user submits the form, the user_login.php script is executed which
authenticates the user by comparing the values entered with the values stored in the
Students table and whether the user is a Student. If the values provided are incorrect, an
error message is displayed saying he is not authorized to enter. Otherwise the 
user_login.php generates a random session value and updates the Sessionid filed in the 
Students table. The user_login.php script also generates two session cookies, one with 
the User Name called Userid and other with a random value called Sessionid and 
transfers the user to Student Page.

4.4.6 Student Page

Input: None

Session Cookies: Userid, Sessionid

Function: If the student is enrolled in more than one course the script
study_guide_form.php displays the Student Page. The Student will have an option to 
choose the course they want. The script study_guide.php displays the Student Page if 
the student is enrolled in just one course. The page consists of basic information about the 
page with a set of options. This set of options will allow the faculty to select a particular link to access all the information relevant to that link.

Output: An HTML page containing basic information about the student. This page also 
displays the following set of options: My Study Guide, Change Password, and Logout.
5. EVALUATION AND RESULTS

The Image Management System was tested and evaluated by persons from the Mary and Jeff Bell Library and faculty from the College of Arts and Humanities. Feedback received from them was used to improve the efficiency of the system. The system was also tested and evaluated with mentors from College of Arts and Humanities and administrators who will be dealing with the maintenance of the Image Management System in the future. The evaluation had two purposes: to examine how well the project was implemented and to analyze the extent to which the stated outcomes of the project were achieved.

The administrative interface was tested and evaluated during various stages of the development by the Network Manager, the Administrative secretary of the Media Center, and the student worker who will be the administrator of the Image Management System. Feedback was received from them to improve the IMS.

The results of testing and evaluation of the administrative interface prompted improvement of IMS by setting up new options to the administrative interface such as searching the database for images using only artist name or the title of the art. The thumbnail image was permitted to be enlarged to give a better view to the user. The administrator was also given the option of adding images to the study guide.

The student interface was tested with the faculty of the College of Arts and Humanities and by the student worker in the Media Center, the Network Manager, and the Administrative secretary of the Media Center. Because of these evaluations; different study guides were developed for students who are enrolled in more than one class.
Students were also transferred to their course study guide page directly without any confusion.

The faculty Interface was tested with the faculty of College of Arts and Humanities. Changes that resulted from this testing and evaluation include: different study guides were set for professors teaching different classes. Images were added to their study guides directly from the history folder and images were deleted from the study guide if not important. The option of creating online exams for students has been postponed temporarily and can be done as future work. Images were given darker borders to increase the overall appearance of the image because of the lighter background used.

Overall the implementation of the project was found to be largely as planned, with some changes made to address changed circumstances or in response to lessons learned during implementation. The Image Management System will be installed on Library Web Server. All the existing data will be transferred to the database. Students and faculty of College of Arts and Humanities will be the main beneficiaries of this system.
6. FUTURE WORK

The Image Management System was successfully designed and implemented for the College of Arts and Humanities. In the future the project can be improved in a lot of ways. Online Examinations forms with a timer along with each image can be developed. Professors should be capable of viewing the student examinations and be able to grade them. A grade link can be created in the student page where they can view their exam grade. Students and Faculty can be given an option to change the number of images per page and size of each image. A Settings link can be provided in student and faculty interfaces to implement the function. Students and faculty can also be provided a search option on the study guides. Providing the search option on the study guides makes it easy and quick for the users to find a image.

The Image Management System can also be extended into College of Science and Technology. Students can access the glassware they will use for the experiments in Organic Chemistry and General Chemistry laboratories. Online access to the images of the specimens can be provided for students to view in various biological science classes.
7. CONCLUSION

The Image Management System is well designed and implemented for the College of Arts and Humanities at Texas A&M University-Corpus Christi. The Image Management System provides an excellent online study tool for students and faculty of College of Arts and Humanities. The **Student Page** provides students with an option of viewing their course study guides. These study guides are prepared by their respective faculty. The system gives flexibility to the students to view their images whenever and wherever they want. The faculty will be able to set a study guide for each of their classes. The Faculty can do a search on the image database and select the slides relevant for their class. Faculty can also view the study guides from previous semesters and be able to transfer them to their class if necessary. The administrator has privileges such as adding and deleting faculty, courses, students and images to the database. The administrator is also provided a search option by which he/she can retrieve a specific image by selecting, either artist name or title of the art. Overall the Image Management System saves a lot of time for the faculty and students of art classes requiring the study of images. It also lessens the time spent by the administrator on managing this database thus saving money for the University.
BIBLIOGRAPHY AND REFERENCES


