The design and implementation of data system based on Polymorphic Graphics and text

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Abstract. This paper introduces a set of professional data management system based on polymorphic graphics, which is established according to the requirements of software engineering management. It introduces the key technologies of the system, such as the main function module design, three-tier architecture quick design tool, online visio file and pdf file browsing. The system has strong practicability and good user interface. It can effectively improve the current professional data management mode.

Keywords: polymorphic graphics and text, professional data management, design and implementation

1. Introduction
Current professional materials can be roughly divided into the following types: paper-printed equipment random drawings, issued equipment electronic materials (DOC, PDF, etc. formats), and post personnel self-organized electronic materials (DOC, VSD, etc. formats). However, its management methods mainly rely on manual labor: the drawings and materials are placed in the safe, and the search efficiency is low; the electronic data of the equipment is large in quantity and various in variety, and it is still very inconvenient to search through the file name search. Therefore, there is an urgent need for a professional data management platform that takes drawings, documents and other professional technical data as the core management object and improves the quality and efficiency of personnel equipment information acquisition as the main goal.

2. System function analysis and design
2.1. System design goals
Based on the requirements of software engineering, formulate a more reasonable design and development plan, make full use of software and hardware facilities, make the developed software system more reasonable and efficient, and give customers a good user experience. This system designs interfaces and functions according to user needs, and continuously improves and optimizes during the development process to meet user needs. The user interface is beautiful and generous, user operation is convenient, time and cost are saved, and work efficiency is improved.
2.2. System construction requirements
   a). Design principles and basic system requirements
   In order to meet the needs of users and customers, we strive to achieve simple and convenient
   operation, beautiful and generous interface, and simple and practical system functions. It is convenient
   to edit and publish professional electronic materials, and users can browse online with existing office
   computers.

   b). Functional requirements
   As a professional data management information system, equipment data management is the core
   part. It is necessary to establish a professional catalog, unit department and other data dictionaries.
   Secondly, there must be corresponding pages and permissions for the release, review, and browsing of
   data. Finally, for the convenience of the information system, It can provide functions such as
   equipment dynamics, rules and regulations, and software downloads to provide convenience for users
   to use this system.

   c). Scalability and maintainability
   In order to adapt to the subsequent development of the business, the system function authority
   should have maintainable functions to cope with the subsequent possible demand changes.

   d). Security requirements
   The security design must be strengthened to prevent illegal intrusion and unauthorized access.
   Users are divided into system administrators, data administrators, and access personnel. They have
   different access and operation permissions. At the same time, they record user logs and track user
   behavior. You can also set up regular database backups in the program to prevent unavailability or
   data loss due to database problems.

2.3. Functional modules of the system
According to demand analysis, the system is divided into five functional modules: comprehensive
information, equipment data management, data review, personal information, and system management.
Each module contains several sub-functions. The specific functions are shown in Figure 1.

![System function module diagram](image)

**Figure 1.** System function module diagram

Users access various functional modules and sub-functions according to role permissions. All users
can browse comprehensive information, browse and query equipment information, and manage
personal information; system administrators have system management permissions, data
administrators can maintain equipment information, and data auditors can review Equipment data, the
data after review can be browsed and inquired by ordinary users.
3. System design and implementation
Taking into account the scalability and maintainability of the system, the system development adopts Microsoft's .NET framework platform, Microsoft Visual Studio 2010 and SQL Server 2008 database and other related software tools for design. The system is a B/S architecture, and the client uses a browser. Visit the server side.

3.1. Three-tier architecture design of the system
This system uses CodeSmith's template-based code generation tool to achieve rapid development of ASP.NET programs, which not only guarantees the software quality of the system but also shortens the development cycle. After completing the logical and physical realization of the SQL Server database, the CodeSmith tool software can be used to generate the source code of the three-tier architecture based on the C# language. CodeSmith comes with a lot of templates, and users can also customize templates to effectively reduce programming workload. The three-tier architecture uses layering to reduce inter-layer dependencies and achieve "high cohesion, low coupling", making the system easier to maintain and reuse. The project generated by CodeSmith contains three independent sub-projects in the Visual Studio Manager, including the following three-tier architecture: user interaction layer (Web.UI), business logic layer (BLL), data access layer (DAL), and overall architecture as shown in picture 2.

a). User interaction layer (Web.UI): Based on B/S (browser/server) to realize the display of the foreground and the background, and show the designed functional effects to users. Users can log in to the system through a PC and use a browser, and can use the system after completing user verification.

b). Business logic layer (BLL): Establish a class library for the business logic layer, obtain user instructions and data from the Web.UI layer or send data to the Web.UI layer, and complete the reading and writing of data sources through the DAL layer.

c). Data Access Layer (DAL): Establish a data access class library, accept instructions from the BLL layer, implement access operations to data sources (databases and files) and return results.

![Figure 2. Code implementation mode of three-tier architecture](image)

3.2. Online editing and processing of polymorphic graphics
Baidu online editor is currently one of the most popular free and open source online editor controls, referred to as "UEditor" in English, is a WYSIWYG rich text online editor developed by Baidu web front-end R&D department. It is lightweight, customizable, and pays attention to user experience. It is
open source based on the MIT protocol and allows free use and modification of the code. Its function is quite powerful. As a website background editor, it can easily manage pictures, upload files, and forms, what you see is what you see The resulting online editing function is not easy to deform the webpage after it is published. The ASP.Net version of the editor can be seamlessly connected with the website after the website is configured and installed to solve the problem of online editing and publishing of graphic information.

3.3. Online browsing of professional information electronic files

PDF, Word, and Visio formats are the main formats of current professional data files. Generally, the office or wps article processing software is installed on the computer, and the Word file can be downloaded and opened directly from the browser link. The latest version of mainstream browsers for electronic files in PDF format generally supports online browsing. Firefox and Google do not need to install plug-ins, and IE browsers need to install PDF plug-ins. Open the website url address directly in the browser to browse the PDF file. The Visio file browser does not support online browsing. Microsoft provides the Visio Viewer plug-in. The IE browser that installs the plug-in can support online viewing of Visio drawings and diagrams, but does not support editing and modification functions. Other mainstream browsers other than IE (or use the IE core) do not support the Visio Viewer plug-in. The latest version is Visio Viewer 2010 (note that the 64-bit or 32-bit version is installed according to the operating system of the machine). Call the local Visio Viewer object in the IE browser to open the Visio file in the website in the browser. The specific functions are as follows:

```csharp
private void ShowVSD()
{
    DBConnect DBConnect = new TlGasMaterials.DBUtility.DBConnect();
    string id = Request.QueryString["id"].ToString();
    string Url;
    Url = DBConnect.GetStringValue(" select FileUrl from Attachs where id='" + id + "', 0);
    // Get file Url parameters
    string Info = "<object id="ole_visio"
    codebase="visioviewer.exe"
    height="100%"
    width="100%"
    classid="{279D6C9A-652E-4833-BEFC-312CA8887857}">
    + "<param name="_cx" value="31485" />
    + "<param name="_cy" value="20373" />
    + "<param name="BackColor" value="16777200" />
    + "<param name="AlertsEnabled" value="-1" />
    + "<param name="ContextMenuEnabled" value="-1" />
    + "<param name="GridVisible" value="0" />
    + "<param name="HighQualityRender" value="-1" />
    + "<param name="PageColor" value="16777215" />
    + "<param name="PageVisible" value="-1" />
    + "<param name="PropertyDialogEnabled" value="-1" />
    + "<param name="ScrollbarsVisible" value="-1" />
    + "<param name="SizeGripVisible" value="-1" />
    + "<param name="ToolBarVisible" value="-1" />
    + "<param name="SRC" value="" + Url + "" />
    + "<param name="CurrentPageIndex" value="0" />
    + "<param name="Zoom" value="-1" />
    + "</object>");
    DivVSD.InnerHtml = Info;
}
```
3.4. System user interface design
The main user interface has a good user experience, adopts a two-tier menu frame design, has good scalability, and is compatible with mainstream browsers and display resolutions.

The effect of using the Visio Viewer plug-in to open a Visio file online in IE browser is shown in Figure 4. It supports online drag, zoom and display settings. You can also call the local Visio program to edit the file directly.

![Visio Viewer plugin displays Visio files](image)

**Figure 3.** Visio Viewer plugin displays Visio files

4. Conclusion
The professional data management system based on polymorphic graphics and text fully grasped user needs before designing. According to software engineering management, it adopted a reasonable B/S model, and applied CodeSmith's template-based code generation tool, Baidu online editor, and Microsoft A variety of new technologies such as Visio View control have achieved good practical results. The later system also needs to continuously optimize the design, improve and perfect the functions according to user needs.

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