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Improvement of excel data processing function based on Spring MVC framework

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ABSTRACT

Excel is widely used due to its continuous improvement and development on Excel function. But with the development of science and technology and the subsequent increasing data amount of to be processed, the problem that excel still lacks of batch data processing and data verification is challenging. Based on Spring MVC + EasyUI framework, we proposed a Java J2EE IDE integrated development environment. An independent Java Development Kit was designed, which is able to be embedded into Excel. Using Json to transform the results of Java background processing into data that can be processed by the front-end, we realized the batch import and export of Excel data and data verification functions, which ensured the completeness and accuracy of the data entered while retaining the convenience of Excel.

Keywords: Spring MVC, EasyUI, Json, data processing

1. INTRODUCTION

With the popularity and application of modern information technology, in the actual work of a wide range of office series software Excel spreadsheet to data processing. Many government departments as well as production companies are using Excel to generate data reports in all levels of departments for data classification and aggregation, disaggregation, etc. Xu Jing¹ summarized the methods of data recording and organizing Excel software, the application of functions, data processing and other functional applications are explained to promote the realization of office automation in enterprises; Qi Xuedong and Zhang Liang² discuss the LINQ (Language Integrated Query) language for processing complex data. Tu, Haifeng and Xing, Meiyuan³ built a smart campus service platform based on Excel + VBA (Visual Basic for Applications, VBA) model, by batch preprocessing; Wang Guan⁴ developed a ship model test data processing based on LabVIEW and OriginPro, and the measured experimental data were filtered, shifted, and changed to Excel table after calculation, etc.

In this paper, based on Spring MVC (Model-View-Controller, MVC) + EasyUI framework, we developed a human-computer interactive operating system, which can realize the batch import and export of Excel data and automatic data verification function.

2. SYSTEM TECHNICAL ARCHITECTURE

Spring is an open source Java Web (World Wide Web, Web) development framework that can integrate a variety of excellent frameworks, the creation and maintenance of object and object dependencies, because of its powerful inversion control and tangent-oriented programming features can greatly reduce the coupling between objects and objects, in the enterprise program developers are widely used to simplify the development of enterprise applications^{5,6}.

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2.1 Spring MVC framework

Spring MVC is a program module applied to the Web layer, which is essentially equivalent to a Java Servlet application running on a server, with good internal application extensions, part of the Spring Framework⁷, integrated with the Spring Framework in a system with all the advantages of Spring⁸, with a wide range of practical applications⁹.

The workflow of developing the system required by the user using Spring MVC framework is as follows: firstly, the user initiates a request, which is submitted to the front-end controller and sent to the corresponding processing mapper after the front-end controller makes a path query. The processing adapter generates the data model information; then the data model information is transferred to the view parser; the view parser parses the received data model information according to the predefined rules, finds the matching image view information and fills in the data model object information to get the corresponding image result, sends the image result to the view controller for reprocessing, and generates the final view result back to the client.

2.2 Spring MVC interface

If you want to use the Spring MVC framework to achieve the associated processing of Excel data, you need to write an interface program to configure Spring MVC, the interfaces involved mainly include interface classes for external calls, business implementation class interfaces, data processing class interfaces and entity class interfaces, including: front-end controller, processor mapper, processor adapter to match the mapper, processor for data processing transformation, view parser and view and other components, these functional components that can significantly simplify Java Web development.

2.3 EasyUI

EasyUI is a computer software library for developing human-computer interaction interfaces to help computer programmers develop Java Script applications. The EasyUI plugin itself is a stand-alone, complete web framework that serves as the front-end of the Spring MVC framework, and allows programmers to make the necessary changes to the framework through simple HTML tools and according to user requirements and system development needs to achieve Excel data processing Java J2EE IDE package development.

This practice uses EasyUI's DataGrid control to achieve similar data display and processing functions as Excel tables, because the DataGrid control can embed various input controls such as input boxes and drop-down list boxes, and strictly control input formats (values, dates, etc.), thus making up for Excel's deficiencies in input validation. DataGrid control can get data from the backend through Ajax, and can also pass the data edited by the front-end page to the backend and save it to the database file to provide data support for the next step. With EasyUI's DataGrid control, it can realize the function of data editing and processing in Excel table.

3. IMPLEMENTATION PROCESS

Based on the data processing requirements, we designed a system under the Spring MVC framework with data interfacing with Excel and the process and method of data correlation check function, taking the national administrative division code table as an example.

3.1 Development environment

The system development involves diversified data objects such as Excel data files, tool tables, cells, forms and buttons, etc. In order to make the source code, data information and the developed HCI pages better integrated, the software environment and the main development tools used for the system development based on the system hardware performance are as follows.

- (1) Eclipse Jee Oxygen
- (2) Java J2EE IDE Integrated Development environment
- (3) jdk1.8.0_152
- (4) Java Development Kit

3.2 Main class libraries

In order to better complete the development task and solve the problems of string management and file access call during the system development, multiple kinds of libraries are referenced and created.

3.2.1 Spring 4.3.0. For the Spring MVC core library, it can be defined in the POM file: first introduce a base jar package, then create a controller and configure the core components with the following key code edits.

```
<dependency>
<groupId>org.springframework</groupId>
<artifactId>spring-webmvc</artifactId>
<version>
{org.springframework-version}
</version>
</dependency>
```

3.2.2 POI 3.15. Java API function library provided by Apache to support the operation of the Excel function, providing the Java side of the Excel file read and write processing, the function library covers almost all the operations and controls in the Excel software, such as font color, background color, formula settings, charts and so on can use the function library through programming to achieve, in practice, according to the page In practical applications, data can be extracted from the database according to the search conditions of the page, and the data can be processed in the background to finally output the report that the user wants, or the edited Excel data can be imported into the database file in batch according to the user's needs. The POI API library is configured in the POM file as follows.

```
<!--use for excel operation-->
<dependency>
<groupId>org.apache.poi</groupId>
<artifactId>poi-ooxml</artifactId>
<version>3.15</version>
</dependency>
<dependency>
<groupId>org.apache.poi</groupId>
<artifactId>poi</artifactId>
<version>3.15</version>
</dependency>
```

3.2.3 Commons-fileupload 1.3.1. The API provided by Apache to support file upload processing can support one or more file uploads at the same time, and is configured in the POM file in the following way.

```
<!--Apache Commons FileUpload-->
<dependency>
<groupId>commons-fileupload</groupId>
<artifactId>commons-fileupload</artifactId>
<version>1.3.1</version>
</dependency>
```

3.2.4 Json Processing. Library. In the early HTTP transmission, the basic use of text or xml format to transfer data, this format for the front and back data editing and parsing are very troublesome, developers have to write complex data editing and parsing processing procedures. With the continuous development of development technology through the Json data format between the front and back of the data transfer has become mainstream, Json processing library can be directly converted to Java objects from the front-end Json format data, but also the background to obtain Java objects

into Json data passed to the front-end string into the response, Json processing library configuration methods are as follows.

```
<!--Need this for json to/trom object-->
<dependency>
<groupId>
com.fasterxml.jackson.core
</groupId>
<artifactId>jackson-core</artifactId>
<version>${Jackson.version}</version>
</dependency>
<dependency>
<groupId>
com.fasterxml.jackson.core
</groupId>
<artifactId>jackson-core</artifactId>
<version>${Jackson.version}</version>
</dependency>
<!--Need this for json to/trom object-->
<dependency>
<groupId>
com.fasterxml.jackson.core
</groupId>
<artifactId>jackson-databind</artifactId>
<version>${jackson.version}</version>
</dependency>
<dependency>
<groupId>com.alibaba</groupId>
<artifactId> fastjson </artifactId>
<version>1.2.37</version>
</dependency>
<!--jsong-lib-->
<dependency>
<groupId>net.sf.json-lib</groupId>
<artifactId> json-lib </artifactId>
<version>2.4</version>
<classifier>jdk15</ classifier>
</dependency>
```

3.2.5 EasyUI 1.5.1. Using jquery.min.js in EasyUI 1.5.1: jquery and jquery.easyui.min.js, two JQuery base plugin libraries, create a new Web and modify the components according to user needs to complete the web base module design.

4. IMPLEMENTATION METHOD

4.1 System description

The interface of the developed HCI system is mainly operated by mouse, which is convenient and fast. The interface mainly includes two major parts: data import module, data editing and operation module. The data import function supports importing individual data one by one or through file call; the data editing and operation module mainly includes exporting, adding, displaying, editing and correlation proofreading of data, etc. The system operation interface is shown in Figure 1.

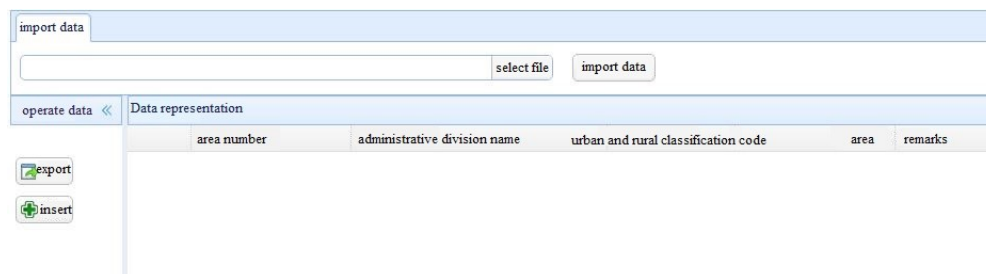


Figure 1. System operation interface.

4.2 System operation function

The system operating functions, developed in the following way.

4.2.1 Data Import. Data import module can directly import tdms and txt format data, also provides Excel file import function: through Ajax calls the background of the Excel file upload processing, and in the background through the POI read Excel data, and finally converted into Json data returned to the client display.

(1) The front-end code is edited as follows.

```
JSP:<form id="frmImport" method="post">
<table>
<tr>
<td> <input id="selFile" name=" selFile" style="width:500px"> </td>
<td width="10px"> </td>
<td> <a href="#" id="btnImport" onclick="pj.zq.mng.region.doImport()">import data</a> </td>
</tr>
</table>
</form>
JS:$.ajax({
url:"/MySpringMvcExampic/manage/region/importData",
data:formData,
enctype: 'multipart/form-data',
```

```

processData:false
contentType:false
type:'POST',
success:function(response){
var result=jQuery.parseJSON(response);
if (result.result=="ok"){
$('#dg1').datagrid('hideColumn','recordFlag');
$('#dg1').datagrid('loadData',result.data);
}
},
error:function(){
}
complete:function(){
//Error handling
$('#ddMsg').dialog('close',true);
pj.zq.mng.region.enabledAll();
}
});

```

(2) The server-side processing flow is shown in Figure 2.

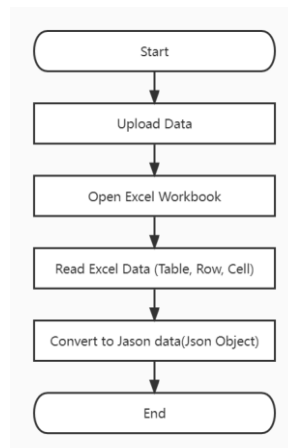


Figure 2. Server-side processing flowchart.

4.2.2 Data Operation. (1) Data Export. Since the representation data of the interface can be added and modified directly as Excel, the export function is provided for the edited data, and the exported data is saved to the import file with the same name to ensure the consistency of data number and format.

(2) Data Addition. This system mainly provides the function of adding data based on the original imported data, adding one record at a time.

4.2.3 Data Display. This area is mainly for displaying and editing imported data, and the format, maximum length, and input range of each column of data can be limited during editing and processing, and if an input error is made, the system

will prompt the corresponding error message, thus ensuring the completeness and correctness of the data. Compared with the traditional implementation which requires a separate interface to provide data addition and modification functions, it greatly enhances the convenience and ease of operation.

4.2.4 Data Editing. The DataGrid control of EasyUI is not editable by default, but the column property of the DataGrid control is an editable editor, with which the following types of objects can be edited: Text, Checkbox, Date input box and Combination Trees.

(1)Text

You can input string information and set validation rules by type attribute, such as email,url format. You can also limit the maximum and minimum length of the input. According to the custom validation rules, you can make your own validation rules. Once the validation rules are defined, you can validate the DataGrid control by setting the validation rules in the initialization process.

(2) Checkbox

Multiple lines of text information can be inputted through a multi-line text box. The associated validation method handler for multi-line text boxes is the same as for text boxes, and various validation rules can be developed in the same way.

(3) Date input box

The date input box component was developed by combining a custom drop-down box and a calendar, with different formats set according to user habits. The user can enter and select the date information in the specified format in the system operation interface, and user can also enter text information at the top of the list.

(4) Combination Trees

As the data source has both in-memory data of lists and collections, as well as xml documents and other forms, defining the properties of multiple different objects can be accomplished using a combination tree. Combination tree can be combined with the selection control and drop-down tree, its implementation process is similar to the combination box definition method, for package development, just replace the list component bundle with a tree component, you can complete the development of combination tree with multi-selection function.

With EasyUI, you can perform the above rich editing operations, and you can handle the desired editing process according to the user's customization. When you find that adding Editor to edit rows in DataGrid of EasyUI is invalid, you can set the DataGrid of this EasyUI to EnableCellEditing first, and then you can use Editor to edit rows after changing the editable state.

5. CONCLUSION

With the rapid development of information society, people are more and more accurate and convenient in processing data. The accuracy of data processing in Excel and the problem that data cannot be imported in batch are studied. Based on Spring MVC+EasyUI framework to process Excel data, it changes the way Excel needs separate interface for data addition and modification, and it can complete the display, editing and checking functions of imported data in the same interface, and it realizes the saving of Excel data into the import file with the same name, which ensures the consistency of data quantity and format. It realizes the convenience and ease of use of user operation while ensuring the integrity and correctness of data, and it has strong practical value.

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