Courseware Help Small Program Development

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Abstract-With the continuous development and popularization of information technology, wechat mini programs, as a new form of application, are gradually becoming an indispensable part of people's lives[2]. With the development of modern information technology, the development of a Python based courseware to help the small program to facilitate students to fully mobilize students' learning interest and thinking enthusiasm, so that they feel immersive learning in such a situation, their observation, thinking, memory, imagination and other abilities will be greatly improved[1]. Wechat mini programs are light, easy to develop, easy to spread and other characteristics, you can quickly develop small applications to meet specific needs. The significance of this study lies in the application of wechat mini program technology to broaden students' learning space, enhance the interaction between students and teachers, improve the management and service level of college counselors, and provide students with better service experience and work efficiency.

Key words: Python, Django, courseware, applet, front-end, back-end.

1 Introduction

With the continuous development of science and technology, traditional teaching methods can no longer meet the needs of contemporary students. In order to improve the teaching quality, it is particularly important to strengthen students' autonomous learning ability[3].. Modern information technology can provide students with a richer and more innovative learning experience and help them better understand and apply scientific knowledge. This article will explore how to develop a set of small programs based on Python language technology to help improve students' self-learning ability. At the same time, this study will adopt the architecture of front end separation to realize the separation of front-end interface and back-end data, so as to improve the maintainability and scalability of the system. Specifically, this study will adopt Vue.js framework as the front-end development framework and Django framework in Python language as the back-end development framework to realize the development mode of separating the front and back ends.

2 System process design

The courseware mini program platform has two modules: the student side and the teacher side. For the first time, students are authorized to log in on wechat. Students fill in the account password, and the background will bind the student ID with their own wechat after submission.

Students will no longer log in with the account password, and each subsequent visit, answer questions and upload pictures will be included in the background database. Teachers use the account password to log in, the teacher side is divided into two parts; One is the end that needs to answer students' questions, and the other is the end that has completed the list of answers. As shown in Figure 1 system structure diagram belo.
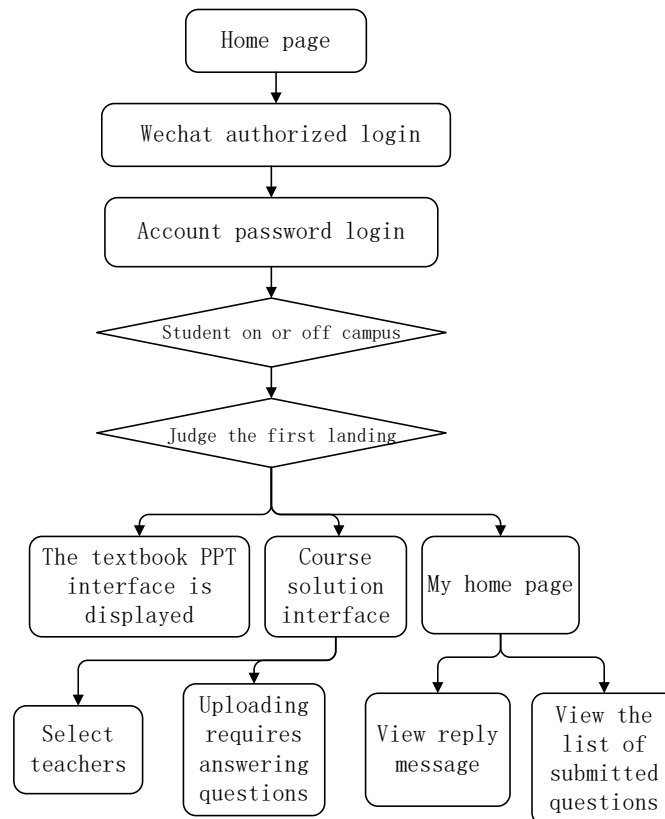
```
┌─────────────────┐
│    Home page    │
└─────────────────┘
         │
         ▼
┌─────────────────────┐
│ Wechat authorized login │
└─────────────────────┘
         │
         ▼
┌─────────────────────┐
│ Account password login │
└─────────────────────┘
         │
         ▼
  ◇ Student on or off campus ◇
         │
         ▼
  ◇ Judge the first landing ◇
         │
   ┌─────┼──────────────┐
   ▼     ▼              ▼
┌────────┐ ┌────────┐ ┌──────────┐
│The     │ │Course  │ │My home   │
│textbook│ │solution│ │page      │
│PPT     │ │interface│ └──────────┘
│interface│ └────────┘
│is      │
│displayed│
└────────┘
   │         │          │        │
   ▼         ▼          ▼        ▼
┌────────┐┌─────────┐┌────────┐┌──────────┐
│Select  ││Uploading││View    ││View the  │
│teachers││requires ││reply   ││list of   │
│        ││answering││message ││submitted │
│        ││questions││        ││questions │
└────────┘└─────────┘└────────┘└──────────┘
```

Figure 1 System structure

3 Small program development

This development uses uni-app development software to develop front-end mini programs. uni-app is a framework that uses Vue.js to develop all front-end applications. Developers write a set of code that can be released to multiple platforms such as iOS, Android, H5, and various mini programs.

This paper is mainly through the actual project progress to explain, courseware help small program to achieve student login, identify student identity information, through the title, ISBN number to search the required courseware, course question module, teacher answer topic function module to introduce. Implementation of student login function. In order to prevent the theft of student information, students log in with the specified account password and then bind

with wechat openid to achieve the second automatic login momentum. The following is the introduction of the front-end function implementation code[4]:

3.1 Account, password login function implementation.:

1) Operation Account and password are text boxes.

2)The number of words in the account should be limited to 8-10 characters.

3)The password can contain only 8 to 16 characters (digits, letters, and special symbols). Note: ① Digits, letters, and special symbols.

4)The account and password cannot be empty.

```
isEmpty(source) {
        var str = source.replace(/(^\s*)|(\s*$)/g, "");
if (str == "" || str.toLowerCase() == "null"
 || str.length <= 0) {return false;
                } else {return true;}}
get_length(str) {
var realLength = 0,len = str.length,charCode = -1;
            for (var i = 0; i < len; i++) {
charCode = str.charCodeAt(i);
            if (charCode >= 0 && charCode <= 128)
                    realLength += 1;
            else
                realLength += 2;}
                return realLength;}
```
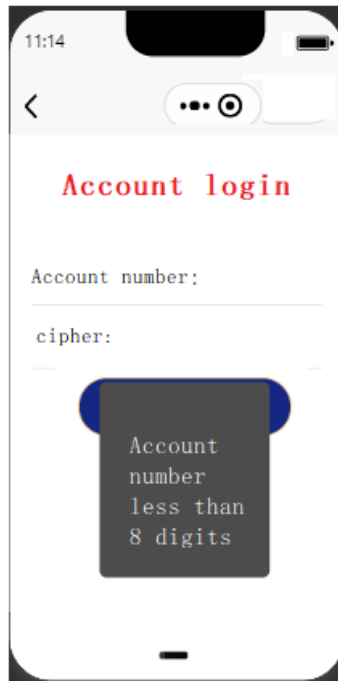
Figure 2 Calculation of account length

3.2 Photo upload function

1) The principle of uploading pictures is achieved by calling the wx.uploadFile() method in the wechat applet open interface. With this method, you can upload the local image file to the server and return the corresponding image path.

2)Upload picture steps:

a)The principle of uploading pictures is achieved by calling the wx.uploadFile() method in the wechat applet open interface. With this method, you can upload the local image file to the server and return the corresponding image path.

b)Create a new "Upload Photo" button in the applet development tool.

c)In the Upload Photo dialog box that is displayed, you can upload a picture or take a picture from the local PC.

d)Click the "Picture" button, select the picture file you want to upload, and then click the "OK" button.

e)Prevent users from uploading too large pictures, resulting in the background running speed of the uploaded picture size is less than 2M set.

f)Save the returned picture path in the page data, and directly use the path as a picture link when the picture needs to be displayed.

The above is the small program development tool to upload the specific steps of the picture, of which step 3 is more important, because the step involves uploading a single or multiple pictures of the way to choose. At the same time, you need to pay attention to the size and format limits of the image during the upload process. Even if the upload is successful, if the size exceeds or the format is incorrect, the image cannot be displayed normally.

```
chooseVideoImage() {
    uni.showActionSheet({
    title: 'Upload type',
    itemList: ['Picture','Take photos'],
    success: res => {
        console.log(res);
        if (res.tapIndex == 0) {
          this.chooseImages();
            } else {
                this.chooseVideo();
                }}});
                },
if (tempFilesSize <= 2000000) {
        this.imageList= this.imageList.concat(res.tempFilePaths);
} else {
 wx.showToast({
title: 'The picture must not be larger than 2m!',
        icon: 'none'              })}
```
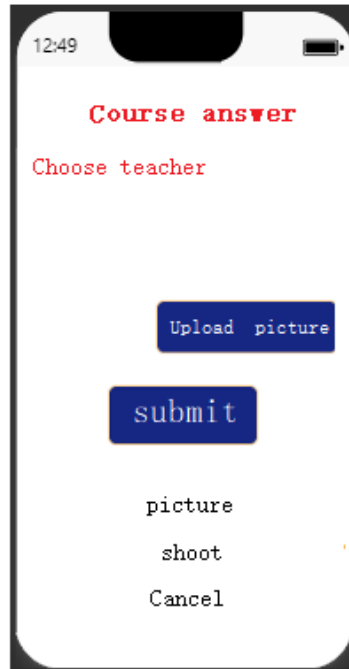
Figure 3 Image upload type and size Settings

4 Set up the server

Cloud server is a simple, efficient, secure and reliable computing service with flexible and scalable processing capacity. It is simpler and more efficient to manage than a physical server. Tencent cloud server was adopted in this study. The deployment server was based on centos7+nginx+uwsgi+python3+django, and pagoda panel system was installed to manage the project[7].

Pagoda panel system is a very easy to use web server management control panel, pagoda panel can create a site, FTP upload and download data, database, https protocol SSL certificate; Secure management operation, scheduled tasks, file management, PHP multi-version coexistence and switching; Built-in LNMP and LAMP. Simply put is to simplify complex things, visual interface operation, very convenient.

4.1 The server is mainly developed using Django framework in Python language.

Python syntax is simple and easy to learn, and the code is highly readable. In this system, Python is mainly used to realize back-end data processing and business logic, including student information query, message information submission, etc.

4.2 Django is an open source Web application framework with the following features:

1)Django provides efficient ORM (Object Relational Mapping) tools for easy database access and manipulation.

2)Powerful template engine: Django provides a powerful template engine that makes it easy to separate front from back and render data.

3)Rich extension library: Django has a rich extension library that makes it easy to implement various functions and applications.

In short, the backend technology of wechat applet mainly includes Python language and Django framework. By using these technologies, it is convenient to realize the data processing and business logic at the back end, and realize the functions of separating the back and back end and data rendering.This server uses the Pycharm editor, and the local server is set up and debugging first.Figure 4 Local server setup:
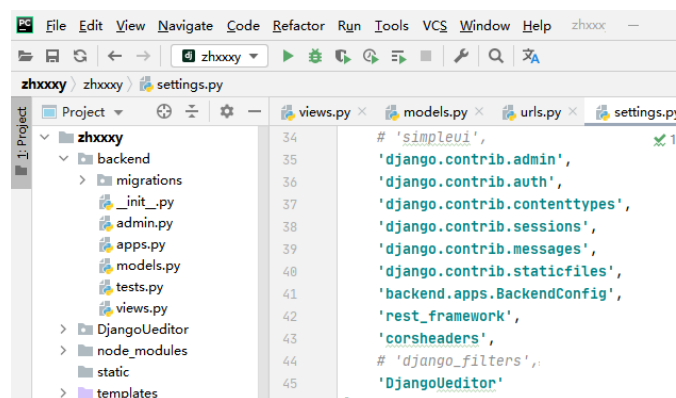

Figure 4 Local server setup

5 Database construction

MySQL database is a relational database management ystem, which can store and manage a large amount of data and   rovide fast, reliable and secure data access. In this system, MySQL is used as the main tool for data storage and management, which is used to store and manage users' personal information, question answering information, picture information and other data.

Realize information management and interaction between students and teachers. navicat is a fast, reliable and comprehensive set of database management tools designed to simplify database management and reduce administrative costs. Navicat's intuitive graphical interface provides an easy way to manage, design, and manipulate MySQL data[6].

The following is a brief introduction to the establishment of the backstage student question answering database code as follows:

class kcdyk(models.Model):

name=models.CharField(null=True,blank=True,max_length=300,)

ktxx = models.CharField(null=True, blank=True, max_length=300)

kttjsj = models.CharField(null=True, blank=True, max_length=300)

xzjdls = models.CharField null=True, blank=True, max_length=300)

small_imagekt=models.ImageField(upload_to='drug_img/%Y/%m/%d/', verbose_name='Problem picture')

small_imagelshf=models.ImageField(upload_to='drug_img/1/%Y/%m/%d/', verbose_name='Solution picture')

lshfxx = models.CharField('Answer information', null=True, blank=True, max_length=300)

lshfsj=models.CharField('Solution time', null=True, blank=True, max_length=300)

lshfxm = models.CharField('Return name', null=True, blank=True, max_length=300)

ashanchu= models.CharField('The user clicked to delete the feedback', max_length=5, default="Not deleted") #

aquxiao = models.CharField('Whether to cancel feedback', max_length=5, default="Not cancelled")

6 Unit test

Unit testing is the testing of the core modules in the system, the purpose is to verify whether each module of the system can work normally and meet the expectations[5].. In this study, unit esting is mainly conducted for the back-end API interface and data storage, and Python's unittest framework is used for testing.

6.1 The steps for unit testing are as follows:

1) Write test cases: Write test cases according to the functions of the API interface and data store.

2) Execute test cases: Use unittest framework to execute test cases to check whether the system can run normally.

3) Analysis of test results: According to the test results, determine whether the system meets the expectations, and fix the problem.

Through unit testing, this research verifies whether the core module of the system can work normally, finds and fixes some problems, and lays a foundation for subsequent functional testing and performance testing。

According to the browsing quantity of students to courseware, we can set up the student-courseware browsing matrix, set the threshold U to the browsing quantity matrix, and then calculate the density of students browsing courseware[8]. The browse matrix calculation is shown below：

$$\text{Dense} = \frac{\text{D\_number}}{\text{X\_number} * \text{A\_number}} \tag{1}$$

D_numberI ndicates the number of courseware that students have viewed， Represents the number of students enrolled in the courseware mini program，Represents the number of all courseware on the small program platform 。 When ＜u，It means that the courseware browsing matrix is sparse, and the popularization of courseware mini programs should be

strengthened.。 When＞u，At that time, the courseware help small program is more popular among students and can provide help for students' learning。

The similarity of students' learning courseware is calculated by the cosine similarity method of mathematical model, and the proximity between courseware is measured by calculating the Angle between them. The calculation formula is as follows：

$$\cos（u，v）=\frac{\sum_{i\in I_{u,v}}^{n} a_{u,i}\ a_{v,i}}{\sqrt{\sum_{i\in I_u} a_{u,i}^2}\sum_{i\in v} a_{v,i}^2} \tag{2}$$

By calculating the similarity of students' learning courseware, we can get the most browsed courseware：M={D_kejian1,D_kejian2……D_kejianN}。

According to the intensity of students' browsing courseware, students' demand for learning courseware can be predicted, and the textbook courseware can be organized, and the collection of professional courseware in this area can be strengthened to improve students' requirements for learning

Through the functional test, this study verified whether the functions of the system can work normally, found and repaired some problems, and laid the foundation for the subsequent performance test.As shown in Figure 5 matching storage of user's wechat information and account, user login information is successfully stored.

id	openid	axuehao	aphone	abanji	azhuanye
2777	oDdXs5Nv5L	230101	1234	23	1
2778	oDdXs5BW5--1	230101	0228	23	1
2779	oDdXs5HmzAW	230101	1914	23	1
2780	oDd: ⁻PDBWy	230101	1130	23	1
2781	oDdXs5FaYSWc	230101	2950	23	1
2782	oDdXs5G_CijA6	230101	1620	23	1
2783	oDdXs5JhteoBf	230101	1442	23	1
2784	oDdXs5EA3ekp	230101	0900	23	1
2785	oDdXs5Fv1r-dr	230101	260ⁱ	23	1
2786	oDdXs5FdJuAKl	230101	0500	23	1
2787	oDdXs5EsYG9H	230101	1600	23	1
2788	oDdXs5FnoxlZL	230101	0100	23	1
2789	oDdXs5D ···	230101	2513	23	1
2790	oDdXs5PNXC.	230101	3000	23	1
2791	oDdXs5DxiNZq	230101	0100	23	1
2792	oDdXs5LZkYuB	230101	302ⁱ	23	1
2793	oDdXs5AIPↄ	230101	1649	23	1
2794	oDdXs! ↄₙↄJ1	230101	2525	23	1
2795	oDdXs5F' ⁻⁻η6	230101	2020	23	1
2796	oDdXs5LV6-aX.	230101	2920	23	1
2797	oDdXs5CLPn_sA	230101	026!	23	1
2798	oDdXs5DwHwh	230101	171!	23	1

Figure 5 Matching storage of user information and account

7 Courseware display

It is mainly to add to add the courseware to the server folder through the background web page, and to design the storage path of the courseware in the storage, and store the courseware path in the Mysql database, the front-end accesses the courseware by calling the courseware path in the database.

First through the module 'models.FileField 'Set up courseware database，Through the module 'upload_to 'Set the file storage path.

```
class kejpicture(models.Model):
akecheng = models.CharField( max_length=100, null=True, blank=True)
    awenji = models.FileField
    (upload_to='drug_img/%Y/%m/%d/',verbose_name= 'Documents')
```


Figure 6 Courseware upload page

Front-end call, through the student filled in the name of the textbook search, through the textbook and courseware matching, through the MySQL database courseware file location link, the file is displayed in the front end of the small program..The following code will conduct a keyword search code introduction：

```
if(!that.searchKey){
    for (var i=0;i<len;i++) {
            if(that.dictArr[i].indexOf(that.searchModel)>-1){
                newArr.push(that.dictArr[i])                    }
            }else{
                for (var i=0;i<len;i++) {
                    if(that.dictArr[i][that.searchKey].indexOf(that. searchModel)>-1){
```

```
if(that.dictArr[i][that.searchKey].indexOf(
that.sear chModel)>-1){
newArr.push(that.dictArr[i])}
}}
```

The small program side finds the storage location of the courseware through the courseware link to display part of the code as follows：

```
<uni-swipe-action-item :options="options"
v-for="(item,index) in kcdddd" :key="index"
        @click="fkonClick($event,index,item.id,item.
lshfsj,getDocumentUrl()+item.small_Documen)">
</uni-swipe-action>
```


Figure 7 Front-end courseware display

8 Conclusions

In the development of this small program, the overall design of the system includes two parts: front end and back end. The front-end uses Vue.js in uni-app for development, and the back-end uses Django framework as a Web server to achieve a separate architecture. According to the above analysis, the overall design of the system includes the following aspects:

A. The front and back end separation architecture, the front and back end development mode is changed from serial to parallel, which significantly improves the development efficiency.

B. The back-end provides an API interface, and the front-end realizes data interaction by invoking the API interface.

C. Separate front - end development improves safety.

Through the above design, the system can realize the architecture of front and back end separation, improve the development efficiency and system performance.

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