Design and Construction of Web-based Remote Interactive Training System for Agriculture-related Talents

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Abstract. In order to promote the further development of the process of "integration of urban and rural construction", the state has launched the strategy of "rural revitalization". In this regard, the society has also put forward higher requirements for technical talents related to agriculture. In order to ensure the training quality of agriculture-related talents, this paper takes computer as the development hardware, and combines web technology with multimedia technology to construct a web-based remote interactive training system for agriculture-related talents. The development of the system adopts B/S architecture, follows MVC design pattern, and uses Java Web application development framework to develop the system server. The system evaluates the actual application effect of the platform with AHP algorithm model, and improves the training evaluation system. The FFmpeg software of the system is redeveloped, and the function of decoding and storing data of FFmpeg is implanted into this teaching system, so as to realize the audio and video playing function of interactive training classroom, arouse students' enthusiasm and improve teaching effectiveness.

Keywords: education mode of agriculture-related talents · Interactive teaching · Streaming media · AHP algorithm

1 Introduction

In the Opinions on Comprehensively Promoting the Key Work of Rural Revitalization in 2022 promulgated by China on February 22, 2022, it was put forward: "Promote the application of scientific and technological achievements in the fields and support college students to start businesses in rural areas" [1]. The exposition of education and agriculture-related work provides a new path for the training mode of agriculture-related talents in higher vocational colleges. But at present, there are still the following problems in the development of agriculture-related talents in higher vocational colleges: First, the supply and demand of agriculture-related talents are unbalanced. Secondly, the training quality of agriculture-related talents is poor, and it is difficult to match the reality of education and employment. Finally, the training mode of agriculture-related talents in

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higher vocational colleges is outdated and there are few practical activities, which leads to poor practical application ability of students [2]. Based on the above problems, this paper constructs a web-based remote interactive training system for agriculture-related talents, so as to optimize the running conditions of higher vocational colleges, innovate the training mechanism of agriculture-related talents, and cultivate compound technical talents with social awareness and practical skills.

2 Key Technology Introduction

2.1 Streaming Media Technology

Streaming media technology is a multimedia network transmission technology, which can realize the real-time transmission of audio and video files. In this system, the online live broadcast function of agriculture-related teaching mainly uses video stream and audio stream. First of all, the audio and video content is collected, and after encoding and compression, the streaming media files are uploaded to the streaming media server through streaming media transmission protocol, which is also called push streaming. Then, the client also obtains the resources of the streaming media server through the streaming media transmission protocol, and finishes decoding and playing. This process is called pull streaming [4]. The realization of streaming media technology mainly depends on streaming media protocols. The transmission protocols of streaming media are divided into various types according to the underlying protocols they depend on.

2.2 Development Process

According to the technical requirements of the above-mentioned related applications, the configuration and deployment of the development environment of the web-based remote interactive training system for agriculture-related talents are completed. Firstly, Linux is used as the operating system of the development environment, FFmpeg is used as the development framework of streaming media function, and then Java Web application development framework is used to develop the system server. The system will deploy the overall development in layers in MVC mode to maintain the operating efficiency of the system [5]. Deploy NGINX version 1.21.5 in the server equipment to ensure that it can support the reception and distribution of functional data of the whole system. The construction steps are as follows: First, download Nginx compression package and RTMP compression package and install them. Then, configure Nginx and compile it. On the basis of the default configuration of Nginx, add the RTMP third-party module with the add-module command, and finally start Nginx with the. /nginx command. After that, Nginx + RTMP server is selected as the streaming media server of interactive teaching system. Finally, RTMP module is deployed on Nginx to realize the forwarding of streaming media data and complete the deployment of basic functions [6]. Through the introduction of the above technologies, the technical feasibility of constructing a web-based remote interactive training system for agriculture-related talents is determined.

```
ef record_ audio():
    p = pyaudio.PyAudio)
    #Create an input stream
    stream = p.open ( format=FORMAT, channels=CHANNELS, rate=RATE,
input= True, frames_ per_ buffer=CHUNK_ SIZE)
    wf = wave.open(audio_ filename, 'wb')
    wf.setnchannels(CHANNELS)
    wf.setsampwidth(p.get_ sample_ size(FORMAT))
    wf.setframerate(RATE)
    while allowRecording:
        #Read the data from the recording device and write directly to the wav file
        data = stream.read(CHUNK_ SIZE)
        wf. writeframes(data)
    wf.close()
    stream.stop_ stream()
    stream.close()
    p.terminate()
```

Fig. 1. Screen recording implementation code

3 Functional Implementation

3.1 Online Learning Module

Due to the particularity of some courses of agriculture-related majors, online learning courses in the system will be conducted in the form of live broadcast. After the user logs in to the system, he can check the required course arrangement in the personal center. Before class, the system will automatically send the class reminder to the user and push it to the classroom studio. The user can automatically jump to the studio by clicking the reminder link [7]. In the live broadcast room, teachers and users can give a comprehensive explanation of agricultural knowledge. For example, when teaching plant physiology and biochemistry and plant nutrition and fertilization, teachers can take advantage of the real-time intuitive advantages of the live broadcast room, and use models or experiments to show the methods and principles to students, so as to deepen their learning impression. Students can use the barrage function of the live broadcast room to interact with teachers cordially, and can communicate with teachers in real time when in doubt. The system also provides a screen recording function for student users. Students can record the teacher's live teaching according to their own situation, so as to facilitate the later review. The key code of screen recording is shown in Fig. 1 [8].

3.2 Online Practice Module

In order to ensure the actual effect of online teaching and enhance students' practical application ability, an online practice section is set up in the system. In this section, teachers will regularly publish all kinds of agricultural offline practice activities to practice centers, such as training in agricultural products bases, studying in product experiment centers, and visiting agricultural enterprises, and students can form their own teams to participate. The system practice is divided into three stages. In different stages, students need to upload the practice results on time. At the end of the practice, the system will generate the final score according to the practice stage score, and the score will be included

Table 1. Statistical tables of practice activities

Activity name	Number of participants	Number of visitors	Number of collectors
Agricultural products base practical training	472	758	862
Product experiment center learning	338	842	887
Agricultural enterprise visit	190	581	496

in the final evaluation [9]. The system will also regularly extract the activity participation data of 1,000 students as samples for calculation, so as to obtain the practical activities with the highest data, and generate Table 1, which will finally be included in the program options for later practical activities. The ranking of resources involves heat calculation, that is, the demand and quality of resources are determined according to the participation of students. The calculation formula used here is shown in Formula 1. Among them: S_1 represents the ultimate popularity of practical activities, L_t represents the number of activity views, I_i represents the number of participants, r is the full speed of the activity, and t is the time [10].

$$S_1 = \sum_t \frac{L_t + I_i}{(t+1)^r} \tag{1}$$

4 Conclusion

To sum up, higher vocational colleges should actively respond to the call of the state, strengthen the comprehensive training of agriculture-related talents on the basis of the unique advantages of majors. The remote interactive training system for agriculture-related talents constructed in this paper integrates the existing educational advantages, updates the training mode of agriculture-related talents by using the advantages of Internet technology, improves students' practical ability and professional technical level, and thus accelerates the pace of realizing the rural revitalization strategy.

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