Application of Online and Offline Teaching Mode in the Course of "Embedded System" Under the Background of Internet

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Abstract. Since the Internet was proposed many years ago, the application of the Internet has become diverse. Now, with the importance of education, the Internet is gradually being used in teaching. Therefore, the purpose of this paper is to explore the application of online and offline teaching mode in embedded system courses under the background of the Internet. In this paper, after consulting the literature on embedded systems and online and offline education models, the data model is constructed by using BP neural network algorithm to process and analyze the relevant data, and the experimental results are drawn. Experimental results show that the Internet-based online and offline teaching model is of some help to the embedded system curriculum.

Keywords: Internet, Online and Offline, Embedded Systems, Teaching Mode

1. Introduction
With the development of the Internet, a variety of new technologies have been proposed, a variety of network software has been found and widely used in the field of learning and education [1]. In recent years, some enterprises in China have also made some achievements, such as Netease, Xuetong, wisdom tree, China University MOOC and other software, which have set up special learning software for students to learn courses [2]. Due to the complexity of the course, it is not enough to rely on the teacher to explain a lot of knowledge. Therefore, after a previous attempt, we found that separate online teaching is not good, because there is no good supervision, the students' self-control ability is poor, and the final result is not good [3]. So, we finally decided to use the online and offline dual teaching mode to help the learning of the course [4].

China's education development history is particularly long, and in addition to recent decades, the previous two thousand years have relied on Teachers' offline teaching to guide students to complete the course learning, whether in China or in Europe and the United States [5]. In the past, the teacher explained in class, and then arranged homework tasks at the end of the course for the students to go home to complete, waiting for the next class to check, and then pointed out the problem. So, for offline teaching mode, our education experts have a long and valuable experience. After so many years of exploration, with the help of experts from China Education organizing committee and Reform Commission, China has basically determined the general syllabus and teaching tasks [6]. But now because of the rapid development of the Internet, computer technology has been long-term
development, a variety of novel technologies emerge in endlessly. Compared with the past, now we have more choices, not only offline teaching mode, but also online teaching mode. However, due to the short time of online teaching mode, it is still not paid much attention to and used on a large scale. It was used on a large-scale last year, but the result is very little. So, we decided to use the online and offline dual education mode to tutor students' courses [7]. Because only using the offline teaching mode is a waste of existing resources, and in the future, we will certainly enter the online teaching mode. So, from now on, we have been groping for a correct way of learning, that is online and offline combined with tutoring learning [8].

Embedded system, it can also be seen as an alternative computer system. And it has a hardware structure, so it is more difficult to learn [9]. If we only use offline teaching, after years of exploration, we find that it is not enough. Because there are many books and knowledge points to learn, and some class hours are not enough to meet the needs of teaching tasks, and the embedded system is best to carry out experimental operation in order to better understand. Therefore, the course still uses online and offline dual teaching methods to learn [10].

2. Cosine Association Analysis Algorithm

2.1 BP Neural Network Algorithm

Artificial neural networks (ANN) are widely used in many fields, and ANN systems emerged after the 1840s. It is connected by many neurons with adjustable connection weights. With large-scale multi-line processing, distributed information storage, good self-organization and self-learning ability characteristics. It has been widely used in information processing, pattern recognition, intelligent control and system modeling. In particular, error reverse propagation training (BP network) can be close to any continuous function and has a strong nonlinear mapping capability. In addition, the parameters of the network can be set according to the specific situation, such as the number of intermediate layers, the number of processing units in each layer, and the learning coefficient of the network, so it plays an important role in many applications.

As mentioned earlier, because the number of training set samples is limited, this article only fine-tunes on the basis of the training set, so the correction rate can not be taken too much. In this article, the initial correction rate of the model is 30%, and the correction rate increases by 80% per 2 cycles of training, i.e.

\[ l_r = l_{r0} \alpha^{\frac{t}{2}} \]  \hspace{1cm} (1)

In the system: \( l_{r0} - 30\% \); \( \alpha = 0.2 \), \( t \) is the current number of training cycles; round down. The loss function is defined as cross-entropy and the formula is as follows:

\[ L = \sum_{i=1}^{K} y_i \log y'_i \]  \hspace{1cm} (2)

Type: \( y \) and \( y' \) are the real label and forecast input of the picture respectively; the number of categories is \( K \)-6. In this paper, the random gradient drop algorithm of the drive is used as the optimizer, and each parameter is updated to:

\[ \omega_{t+1} = \omega_t - l_r \nabla L(\omega_t) + \gamma (\omega_t - \omega_{t-1}) \]  \hspace{1cm} (3)

In the \( \gamma \): 0.9 is momentum; \( L \) (wl) guides the argument wl for the loss function. That's what we're finally going to get.

3. Experiment

3.1 Experimental Process

We compare the advantages and disadvantages of the three modes of instruction by setting up three modes of instruction. We set up three classes to evaluate grades at the end of the semester by using
different teaching methods. In order to prevent differences in effort due to individual adversity, we distribute students at all levels to three classes on average for experimentation, and then count their data to get the results we need.

3.2 Selection of Experimental Data
We randomly selected three classes from the 18th level of our mechanical automation program, disrupted their students on average and rehearsed them, and then completed the experiment by using different teaching modes for the embedded system course.

4. Evaluation results

4.1 Data Analysis

| Results                     | Excellent | Pass | Failed | Total number of people |
|-----------------------------|-----------|------|--------|------------------------|
| Offline instruction         | 22        | 14   | 4      | 40                     |
| Teach online                | 12        | 16   | 12     | 40                     |
| Teach together online and offline | 28        | 9    | 3      | 40                     |

We use three different teaching methods to guide students on embedded systems courses. The exam is then performed at the end of the semester and the results are counted in a table, as shown in the table above. From this we can learn that the number of excellent offline teaching accounted for the majority, the number of failed only 10%. And the number of excellent online teaching is small, the number of failed is accounted for 30%. The result of joint online and offline teaching is an increase in the number of good people and a decrease in the number of people who fail. It may be due to lax supervision, resulting in a relatively lax overall learning attitude, resulting in poor performance.

![Figure 1. Statistics of the results of the three modes of instruction](image-url)
Figure 2. An evaluation of attitudes towards new modes of instruction

Figure 1 is an intuitive diagram based on Table 1 to show the differences between the three modes of instruction more intuitively. Figure 2 is from these 40 students, the distribution of questionnaires to inquire about the evaluation of the new teaching model. Figure 2 pointed out that there are 20 students think this new mode of teaching is very good, there are 16 students think it is OK, but 4 students pointed out that no, and then we learned through the inquiry that the reason they think not to do is mainly because the network is poor and platform resources are not good, which in certain circumstances greatly affect their learning situation, so we will improve on this.

4.2 Embedded Systems
An embedded system is a device consisting of hardware and software that can run independently of itself. Its software is different from the computer's software composition, its software only includes the operating environment of the software and the operating system. But its hardware compared to the software is complex and diverse, there are signal processors, storage and other aspects of the content. Embedded systems are between different from ordinary computer processing systems. It can't store as much information as a computer because it has only a small amount of storage media.

Embedded system is an application-centric, modern computer technology-based dedicated computer system. Its main purpose is to allow users to turn on the power can directly use the system's functions, basically do not need a second development operation or only a small amount of configuration to use. Its specificity lies in the fact that it is developed specifically for certain applications, so it is a software and hardware integration system. Because this configuration can effectively reduce the cost of the system and increase the reliability of the system, so that users have a better experience. But its design and the current mainstream computer system design is basically the same, are using integrated circuits and the same system structure configuration. But compared to this, it adds embedded operating systems and real-time operating systems, as well as data analysis and processing systems for specific applications. Moreover, embedded systems can be used in multiple scenarios and flexibly replace hardware and software to implement the specific needs of users.
Embedded systems first appeared after microprocessors were discovered. Since the microprocessor was discovered in 1971, due to the widespread use of microprocessors, computer manufacturers have begun to provide microprocessors specifically for users to choose a dedicated embedded system suitable for their own use to embed between their own devices to meet their own needs. This is the birth of embedded systems. Then, in the 1980s, as the level of microelectronics improved, manufacturers of integrated circuits created a special microcontroller for io design, which we call a microcontroller. Later in the 21st century, with the rapid development of the network, embedded systems have also been greatly developed. But today's embedded systems are still isolated from the Internet, but with the development of the Internet and the Internet, in the future. Embedded systems will be more widely used in life.

Embedded system features a lot, we have a little bit of the following introduction. First, it's very specific. Because embedded systems are usually specific to an application. Second, it is smaller in size. Because it integrates many circuits into the chip so that embedded systems can be embedded in the targets we need. Third, real-time is good. Because the embedded system is mainly used in the production process control and transmission of signals and other occasions, it is mainly to control the host object, so his real-time requirements are relatively high, such as handheld computers. Therefore, in the later development of embedded systems, real-time good has also become a criterion for judging. Fourth, the tailorability is good. Because embedded systems make it easy for users to tailor hardware for different situations, the software is convenient for specific occasions. Fifth, high reliability. Because some of the tasks undertaken by embedded systems are related to confidential tasks and high-risk industrial environments, the requirements for reliability of embedded systems are also relatively high in the later development. Sixth, the power consumption is relatively low. Because embedded systems are typically targeted at small systems that do not have large power supplies, this results in embedded systems also using less power to save energy. Seventh, embedded systems cannot develop themselves. Unlike artificial intelligence, which can learn itself, it has to be revamped and developed with the help of a computer system, and often requires a dedicated set of tools to exploit it. The eighth point is that when making embedded systems, hardware software is designed at the same time. In the past, the main use of hardware first design, and then design software. However, this will lead to a relatively large defect, that is, if found in the later effect is not good, to push the whole experiment to redo. The current method is conducive to real-time modification of the accomplished goal at any time to obtain an optimized solution.

And the main purpose of embedded system is to embed CPU in the target to play a role, but the embedding method is also divided into two kinds. Generally divided into full embedding and semi-embedding. The full embedding method is characterized by a separate processor system that can act as a system independently. And the embedded system constructed in this way is generally used in small portable devices, and its working environment is generally in poor condition. And it can be designed by the system itself input and output circuit, can be suitable for a variety of voltages for power supply. And it is suitable for any general-purpose computer not suitable for the market, such as aerospace, fine operation and so on. The semi-embedded system generally needs to be combined with the computer system to work properly, it generally does not have a stand-alone processor, but borrows the processor in the target system to accomplish the required tasks. And such an embedded system can only be part of the system, cannot operate as a stand-alone system.

5. Conclusion
In summary, we can learn that because the embedded system curriculum learning, the need to understand a lot of knowledge and complex, so we can use the online and offline two ways to complement each other learning. For example, we can tell all the knowledge points online in the form of online lessons, and can be played back at any time, the teacher produced the core difficulties and documents on the Internet for students to see, and then online to arrange courses for answering questions and more experimental operation courses, to help students better understand the embedded
system understanding and manufacturing. In this way, we can better learn the manufacturing of real embedded systems.

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