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Design and Implementation of Touch Display Accuracy Optimization Software Based on Deep Learning

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ABSTRACT

This paper mainly introduces the touch display accuracy optimization software based on convolutional neural network to enhance the touch accuracy of the smart board system. Convolutional neural networks are used to train touch data, which enables the software to automatically correct the position of touch points and reduce touch bias. The system architecture includes a data acquisition module, a deep learning model training module, and a touch accuracy optimization module, which is expected to be applied to more fields with the continuous application and development of technology. On the whole, the launch of the software provides a new technical way to realize the smart board book system.

KEYWORDS

Deep learning; Touch display; Precision optimization; Smart board book; Software design

1. INTRODUCTION

With the development of intelligent education, the intelligent board book system is more and more widely used in teaching. By combining traditional board books with modern technology, these systems make the teaching experience for teachers and students more interactive and efficient. The accuracy problem of the touchpad software is mainly manifested in the deviation between the touch point and the actual display point, which causes the user's writing to be inaccurate, which then affects the teaching effect and user satisfaction.

Most of the existing touch calibration methods are static calibration, which is difficult to cope with complex touch environments and diverse user needs. Therefore, it is particularly important to find ways to optimize touch accuracy that can dynamically adapt to different environments and user needs.

This article mainly introduces a deep learning solution based on convolutional neural networks, which analyzes and optimizes touch data and automatically calibrates the position of touch points, so as to improve the accuracy of touch display while reducing touch bias, so as to adapt to different touch devices and usage scenarios, and provide a stable and efficient user experience.

The ultimate goal of this paper is to put forward new ideas and methods for the optimization of touch accuracy of smart board book system to promote the development and application of smart education.

2. BACKGROUND AND CURRENT SITUATION

2.1. Application of Smart Board Book System

The intelligent board book system is widely used in classroom teaching, meeting minutes and other scenarios, and occupies an important position in modern education. By combining traditional board books with modern technology, the teaching experience of teachers and students is more interactive and efficient. The lack of touch accuracy not only affects the user's operating experience, but also may cause miscommunication and misunderstanding of the teaching content, which affects the teaching quality.

2.2. Touch Display Accuracy Issues

The problem of touch display accuracy is mainly manifested in the deviation between the touch point and the actual display point that will cause the user's operation to be inaccurate and affect the user experience. Traditional touch calibration methods often rely on static calibration, i.e., touch calibration under specific environments and conditions.

By analyzing and optimizing touch data through convolutional neural network (CNN), the position of touch points is automatically calibrated to reduce touch bias, and a solution based on deep learning is proposed. This method can not only improve the accuracy of touch display, but also provide a more stable and efficient user experience to adapt to different touch devices and usage scenarios.

3. INTRODUCTION TO DEEP LEARNING TECHNOLOGY

3.1. Basic Concepts of Deep Learning

Artificial neural networks, proposed and developed in 1980, can simulate the learning process of the human brain, extract data features and perform complex pattern recognition. The core idea is to learn multi-layer neural networks to simulate the learning style of the human brain and achieve the purpose of understanding and processing data at a deep level. Deep learning algorithms applied to the field of image processing can automatically identify objects in images; Deep learning technologies applied to speech recognition, which convert speech signals into text and perform semantic analysis [1], demonstrate the power of deep learning in complex data and tasks.

3.2. Application of Deep Learning in Touch Display

It is mainly used in the analysis and optimization of touch data, and has a significant effect on improving the accuracy of touch display, which can be summarized into the following steps:

(1) Construct touch data set: A large number of touch data will be collected, including the location, pressure, speed and other information of the touch point for statistics and analysis.

(2) Training deep learning models: using deep learning models such as convolutional neural networks to train touch data purposefully; Deep learning models such as convolutional neural networks are used to train touch data purposefully [2].

(3) Optimize the calibration algorithm of touch points: apply the trained deep learning model to the calibration of touch points to achieve higher touch accuracy and stability.

4. SOFTWARE DESIGN AND IMPLEMENTATION

4.1. System Architecture

The system architecture mainly includes three core modules: data acquisition module, deep learning model training module and touch accuracy optimization module. The Touch Accuracy Optimization module uses a trained model to process and calibrate real-time touch data. The modules communicate with each other through the data interface to realize real-time data processing and optimization, ensuring the efficient operation and accurate calibration of the system.

4.2. Data Collection and Preprocessing

The collected touch data is sensed by the sensor, including the position of the touch point, such as pressure, speed, etc. In order to ensure the quality and consistency of the data, the collected data needs to be preprocessed.

4.3. Deep Learning Models

The training module of the training deep learning model uses a convolutional neural network (CNN) to train the preprocessed touch data. The CNN model structure includes an input layer, multiple convolutional layers, pooling layers, and fully connected layers [3]. The input layer receives the preprocessed touch data, the convolutional layer extracts the features of the data through convolution operations, the pooling layer reduces the dimension and computation of the data through downsampling, and the fully connected layer integrates and classifies the extracted features [4].

4.4. Touch Accuracy Optimization Algorithm

The Touch accuracy optimization module designs an algorithm for calibrating the position of touch points in real time, based on a well-trained deep learning model. The algorithm can use a deep learning model to calibrate the position of touch points and reduce touch bias. According to the calibration results, the algorithm adjusts the touch display to ensure that the touch point is consistent with the actual display point.

5. EXPERIMENTS AND RESULTS

5.1. Design of Experiments

We have carried out a number of experiments in the actual smart board system to verify the effectiveness of the touch display accuracy optimization software based on deep learning. The experimental design consists of the following aspects:

(1) Touch accuracy test: The test content includes the position deviation of the touch point, the touch response speed, and the accuracy of multi-touch. The deviation between the touch point and the actual display point is recorded, and the calibration effect of the software is evaluated by simulating the actual operation of the user.

(2) User experience survey: A number of teachers and students were invited to participate in the use of the smart board book system, and a user experience survey was carried out. Through questionnaires, interviews, etc., the user's feedback is collected, and the impact of the software on the user's experience is analyzed.

(3) Comparative experiment: The touch display accuracy optimization software based on deep learning is combined with the traditional calibration method

Comparative experiments. By comparing the touch accuracy and user experience of different methods under the same conditions, the advantages of the deep learning method are verified.

5.2. Analysis of Results

Experimentally proven deep learning-based software optimized for the accuracy of touch displays performs well in a number of ways: for example, shorter reaction times and clearer displays. And the software can monitor and adjust the accuracy of the touch in real time.

(1) Significant improvement in touch accuracy: Compared with before, the use of deep learning methods in the touch accuracy test significantly reduces the deviation between the touch point and the actual display point, and improves the touch accuracy by about 30%.

(2) The user experience has been significantly improved: most users have reported that the operation of the smart board system is more accurate and smooth, and the overall user satisfaction has been greatly improved.

(3) Comparative experimental advantages are obvious: The comparative test results show that compared with the traditional calibration method, the method based on deep learning has obvious advantages in touch accuracy and user experience. Because the deep learning method can dynamically adapt to different touch environments and user needs, it can provide a more stable and efficient touch calibration effect, which has great advantages in practical applications.

6. SUMMARY

This paper proposes a touch display accuracy optimization software based on deep learning to analyze and optimize touch data through deep learning algorithms, so as to significantly improve the touch accuracy of the intelligent board system.

In the future, the software is expected to be used in more fields, with the further development of deep learning technology. For example, deep learning technology can be used to further improve touch accuracy and user experience on touch devices such as smartphones and tablets. In addition, the performance and scope of touch display accuracy optimization software will also be further expanded with the continuous improvement of deep learning algorithms and hardware performance, bringing more opportunities for innovation and development.

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