Approaches of Higher Vocational Education Method Based on Machine Vision Technology

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Abstract. With the continuous development and improvement of vocational education, more and more higher vocational education institutions are beginning to explore the integration of machine vision technology into teaching. The goal is to improve the effectiveness and quality of teaching, including intelligent education systems, human-computer interaction, and course assistance. By analyzing the impact of machine vision technology on instructional design and evaluation, a teaching method based on machine vision and intelligent learning has been designed. This method can detect student conditions in the classroom and provide evaluation opinions and teaching suggestions based on big data experience and artificial intelligence algorithms, thus achieving intelligent assisted teaching. Finally, the important significance and development trends of machine vision technology in higher vocational education are summarized.

Keywords: Machine Vision; Vocational Education; Design; Neural Networks; Teaching Assistance.

1 Introduction

With the rapid development of artificial intelligence technology, machine vision technology, as one of the important technologies, is attracting more and more attention[1]. As a novel technology that uses computer and mathematical algorithms to analyze and process images and videos, machine vision technology has been widely applied in various industries[2]. More and more higher vocational education institutions are beginning to explore the integration of machine vision technology into teaching, with the aim of improving teaching effectiveness and quality. However, the application of machine vision technology in higher vocational education is still in its initial stage and requires further research and exploration[3]. This article will start with the current situation and problems of the application of machine vision technology in higher vocational education, explore the application research of machine vision technology in higher vocational education, analyze its development prospects and challenges, and provide references for teaching reform and development in related fields. The basic roadmap of machine vision for vocational education is shown in Figure 1.

1.1 Intelligent Education System

Machine vision technology has a variety of applications in intelligent education systems, providing students with more intuitive and engaging learning resources. The main research directions

ICEKIM 2023, May 26-28, Nanjing, People's Republic of China

DOI 10.4108/eai.26-5-2023.2337269

in this field include displaying teaching content, tracking and providing feedback on student learning processes, and evaluating student learning outcomes [4].

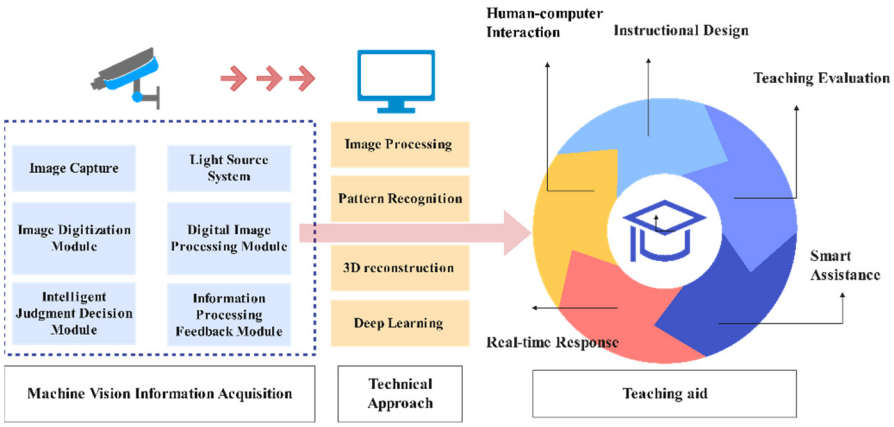

Fig. 1. Roadmap of machine vision for vocational education

Research shows that using machine vision technology to display teaching content can help students better understand course material and improve learning outcomes [5]. For example, an intelligent education system could be developed using machine vision technology and augmented reality technology to project three-dimensional models into real-world environments, helping students better understand course material.

In addition, machine vision technology can be used to track and provide feedback on student learning processes, helping teachers better understand student progress and roadblocks and adjust their teaching strategies accordingly. For instance, a student behavior monitoring method based on machine vision technology could be designed to monitor and analyze student behavior in the classroom, helping teachers better understand student learning status and problems.

Finally, machine vision technology can be applied to evaluate student learning outcomes, providing more objective and accurate evaluation results and helping students better understand their own learning status and improve their abilities. For example, a machine vision-based student work evaluation method could be designed to analyze and evaluate student work, providing more objective and accurate evaluation results.

1.2 Human-computer interaction

Machine vision technology has a wide range of applications in human-computer interaction. In the field of education, machine vision technology can provide students with more convenient and efficient learning experiences [6]. For example, a gesture recognition method based on machine vision technology can be designed to allow students to control electronic whiteboards with hand gestures during teaching operations.

In addition, machine vision technology can provide teachers with more convenient and efficient teaching tools. An interactive teaching system based on machine vision technology can be designed, which allows teachers to control the presentation and operation of teaching content through voice commands and gestures during the teaching process, thereby improving teaching

efficiency and interactivity.

1.3 Course Support

Regarding course assistance, machine vision technology has many applications. For instance, machine vision technology can be used to recognize and analyze students' handwriting and note-taking, helping students better take notes and record information. Similarly, recognition and analysis of student writing on electronic whiteboards can also enhance teaching effectiveness and efficiency.

Research has shown that using machine vision technology for course assistance can help students better understand and master course content, thereby improving learning outcomes. By utilizing both machine vision technology and natural language processing techniques, a course assistance system can be developed that automatically recognizes and organizes student notes and lecture materials, thus improving learning efficiency and effectiveness [7].

2 Teaching Design Guidance

Machine vision technology can provide teachers with more comprehensive, accurate, objective, and personalized student guidance methods, helping students learn and understand course content more effectively[8]. Currently, the main application directions and research hotspots include:

2.1 Adaptive Learning

Machine vision can adaptively adjust teaching content and difficulty according to students' real-time performance and feedback. For example, in language learning, machine vision can adaptively adjust learning content and difficulty based on students' pronunciation accuracy and speech intonation to better help students improve their language proficiency.

2.2 Personalized Learning

Machine vision can design teaching based on students' personalized needs and interests. For example, in art education, machine vision can recommend relevant painting techniques and materials based on students' painting styles and preferences, helping students better explore their potential.

2.3 Real-time Feedback

Machine vision can provide real-time feedback and guidance by monitoring and analyzing students' performance. For example, in dance education, machine vision can provide real-time feedback and guidance by recognizing students' body posture and dance movements, helping students better master dance skills.

2.4 Intelligent Assistance

Machine vision can serve as an intelligent assistant tool for teachers, helping them better manage teaching processes and resources. For example, in classroom management, machine vision can help teachers better manage classroom order and student emotions by recognizing students' identities and expressions.

3 Teaching Assessment

Machine vision technology can help higher vocational education teachers better assess their teaching effectiveness. Specifically, machine vision can provide objective data support to help teachers more accurately evaluate student performance[9].

Automated Scoring: Machine vision technology can automatically grade students' writing, image processing, speech, and other tasks, providing fast, accurate, and objective grading data. This reduces the workload of teachers and also avoids the potential bias that may exist in subjective grading.

Learning Analysis: Machine vision can analyze students' behaviors and performance during the learning process, such as observing their actual operation in experiments, recognizing their speech content, and so on. By analyzing this data, machine vision can provide more detailed learning feedback and suggestions to help teachers better evaluate students' learning status and areas for improvement.

Emotion Recognition: Machine vision can recognize students' facial expressions, speech emotions, and other data to help teachers better understand their emotional state and provide more targeted teaching feedback, thereby promoting students' learning effectiveness.

Participation Evaluation System: Machine vision can use devices such as cameras to record students' participation in the classroom, such as raising their hands or facial expressions. By analyzing this data, machine vision can help teachers more accurately assess student participation and promote a positive classroom atmosphere.

Based on the above content, a teaching method can be designed that incorporates machine vision and intelligent learning. High-definition cameras can capture real-time student information, including facial expressions, eye contact, mouth movements, posture, voice, and gestures. This information is then processed through a neural network for machine learning training. By combining feedback from teachers, the system can undergo further refinement and training to create an intelligent classroom "eye in the sky" system. This system can provide real-time evaluation of student information and classroom responses to teachers, as well as provide teaching suggestions based on past data experiences. In this way, intelligent teaching assistance can be achieved. The specific implementation method is shown in Figure 2.

The core pre-trained models, such as face detectors, pose estimators and emotion recognizers, are available from open source code libraries, such as OpenCV and TensorFlow, as follows[10]:

```
face_detector
= cv2.CascadeClassifier('path/to/haarcascade_frontalface_default.xml')
pose_estimator
=tf.keras.models.load_model('path/to/pose_estimator.h5')
emotion_recognizer
=tf.keras.models.load_model('path/to/emotion_recognizer.h5')
```

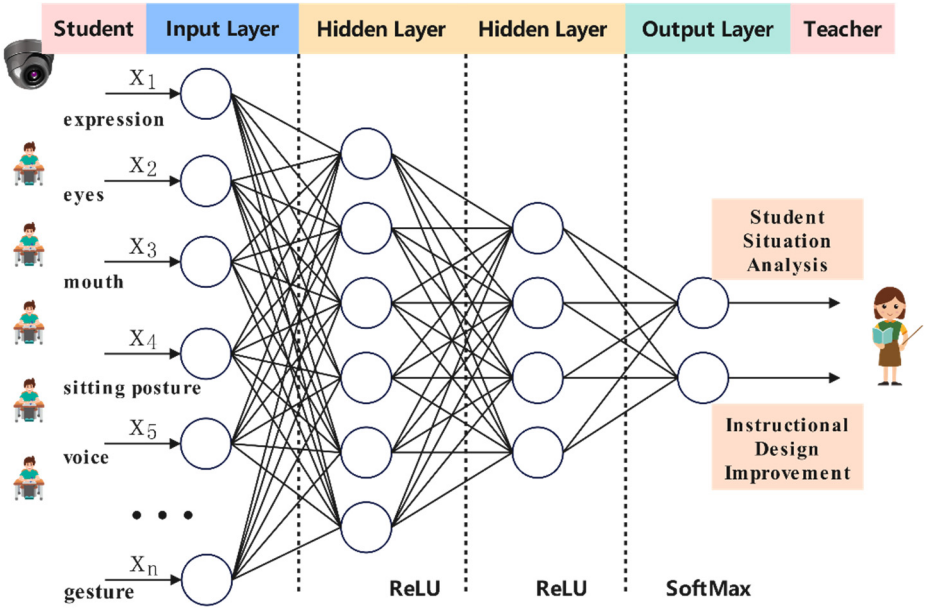

Fig. 2. Instructional design based on machine learning and neural networks

4 Development Trends

The application of machine vision technology in higher vocational education is rapidly developing. In the coming years, we can expect the following trends:

Intelligent teaching: With the continuous advancement of machine vision technology, we can anticipate that more machine vision technologies will be used in higher vocational education. These technologies can provide more accurate teaching data for teachers and can automate many teaching processes.

Diversified application scenarios: In addition to traditional teaching scenarios, machine vision technology can also be applied in other areas of higher vocational education, such as laboratory research and project practice.

Personalized learning: Machine vision technology can provide students with a more personalized learning experience. By analyzing students' learning data, machine vision technology can provide more accurate learning recommendations and guidance for students, as well as adjust course difficulty based on their learning progress.

More cooperation: As the application of machine vision technology in higher vocational education continues to increase, cooperation between educational institutions and technology companies will become more frequent. This cooperation can promote the development of machine vision technology in higher vocational education and can drive further technological innovation.

In conclusion, the application of machine vision technology in higher vocational education has broad prospects, and in the future, we can expect more machine vision technologies to be used in higher vocational education to improve teaching efficiency and education quality.

5 Conclusion

Based on the application of machine vision technology in higher vocational education, it has a wide range of uses including teaching assistance, teaching evaluation, and teaching design. The application of machine vision technology can help achieve various teaching goals, such as improving teaching efficiency, promoting student motivation, and achieving personalized teaching. Moreover, the application of machine vision technology can also promote the intelligent and diversified development of higher vocational education, enhancing the level and quality of education.

In the future, there are still many development directions and significance for the application of machine vision technology in higher vocational education. On the one hand, we can further deepen the application of machine vision technology in teaching evaluation and teaching design, to further improve teaching effectiveness and learning experience. On the other hand, we can apply machine vision technology to more complex teaching scenarios, such as laboratory research and project practice, to better help students master practical skills.

In addition, the application of machine vision technology also requires more interdisciplinary cooperation and research. In this process, it is necessary to strengthen communication and cooperation among educational institutions, technology companies, and research institutions to better realize the application and innovation of machine vision technology in higher vocational education.

Acknowledge: This work is supported by the Jiangsu Maritime Institute Doctoral Research Initiation Fund (2023BSKY04) and the Natural Science Foundation of the Jiangsu Higher Education Institutions of China (23KJB470005).

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