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Image Recognition System

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Abstract: *This paper presents an image recognition system that uses techniques from Machine Learning and Computer Vision to identify and classify objects in images. The system employs convolutional neural networks (CNNs) for feature extraction and accurate classification. Input images are preprocessed to enhance quality and consistency before being analyzed by the model.*

The system is trained on a dataset to achieve reliable performance, and its accuracy is evaluated using standard metrics. The proposed solution demonstrates effective results and can be applied in areas such as security, healthcare, and automation, highlighting the growing importance of intelligent visual recognition systems. With the development of machine learning for decades, there are still many problems unsolved, such as image recognition and location detection, image classification, image generation, speech recognition, natural language processing and so on. In the field of deep learning research, the research on image classification has always been the most basic, traditional and urgent research direction. At the same time, computer intelligent image recognition technology is also conducive to gradually better respond to the development of international indicators, and promote the development and progress of various fields. Therefore, image processing technology based on machine learning has been widely used in feature image, classification, segmentation and recognition, and is a hot spot in various fields. However, due to the complexity of video images and the distribution of objects in different application backgrounds, the classification accuracy becomes important and difficult. In the paper transportation industry, image recognition technology is applied to license plate recognition to extract license plate from complex background, segment license plate characters and recognize characters, and construct a machine learning non license plate automatic generation algorithm, which may improve the efficiency of non license plate recognition. The diversity and high generation speed of license plate training sample set can achieve the purpose of effectively training strong classifier. By using genetic algorithm to optimize BP neural network to classify license plate information, the anti-interference ability and license plate recognition accuracy are improved to a certain extent.

Keywords: Artificial Intelligence, Image Preprocessing, Image Recognition, Machine Learning

I. INTRODUCTION

Machine Learning (ML, Machine Learning) [1-5] is a fundamental and critical issue in the field of image processing [6, 7], especially in the field of massive image processing, machine learning methods can be from complex data [8]. The main features of the image are separated [9], so that image recognition can be reasonably applied in various industries and fields. Image processing technology based on machine learning has been widely used in image classification, segmentation, and recognition [10]. It is a hotspot of research and research in various fields. However, due to the complexity of image distribution and different application backgrounds, the improvement of image classification [11-12] has become the focus and difficulty. Therefore, how to improve the classification method to improve the classification accuracy and classification effect of the image of the ground object is a very meaningful and difficult research topic. With the development of machine learning and the introduction and improvement of various machine learning algorithms, machine learning is of great significance to various application fields in human life. Especially with the rapid development of modern technology and the application of video images in various fields of life, machine

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learning is particularly important for the processing of video images. At present, various machine learning algorithms have been maturely applied to signal processing in engineering, but in video image processing, there is still a broad application space. Computer image recognition technology [13-17] is actually the abbreviation of computer image processing and recognition technology, also known as infrared technology. The core of this technology is computers and information. These two technologies are the most developed in the world. The former is the real carrier of technology. It undertakes the analysis and processing of the image, and then carries on the different localization correctly. The object of the information. Infrared technology can be said to be the product of social development and the progress of the times [18]. The image is input into the neural network, and the loss function is minimized by using the forward propagation and backpropagation error algorithms of deep learning. After the weight is updated, a better recognition type is obtained. Then, the trained model is used to predict the new image. The flow chart is shown in Figure 1.2. General pattern recognition system includes three important parts: image preprocessing, feature extraction and classifier. In traditional image recognition algorithm, they are separated from each other. In the framework of convolutional neural network, convolution is used to extract features directly, and then the classification results are fed back to the classifier, and the model is jointly optimized by batch gradient descent. The process of computer preprocessing [19-21] is mainly to separate the image area and background area in the image to be recognized, refine the image, enhance the image binarization, and improve the speed and efficiency of computer intelligent image recognition post-processing. In order to restore the authenticity of the image and reduce the false features of the image as much as possible, the unique features of the image can be expressed in numerical form. With the development and progress of technology, digital image is gradually used in the field of image recognition. The advantages of digital processing technology provide the basis for the further development of image recognition. In these two development stages, infrared technology explored a series of successful methods through the research and application of artificial intelligence [22,23], and finally realized the effective identification of information. Since then, this technology has been widely used. Image recognition is widely used in traffic field. In traffic construction, image recognition technology is mainly used in intelligent transportation system [24]. Vehicle information detection [25-28] has greatly promoted the development of transportation modernization

II. PROPOSED METHOD

MACHINE LEARNING

Machine Learning (ML) is a multidisciplinary subject involving many disciplines such as probability theory, statistics, approximation theory, convex analysis, and algorithm complexity theory. Specializing in how computers simulate or implement human learning behaviors to acquire new knowledge or skills and reorganize existing knowledge structures to continuously improve their performance. It is the core of artificial intelligence, and it is the fundamental way to make computers intelligent [31]. Its application spans all fields of artificial intelligence. It mainly uses induction, synthesis rather than deduction. Simply put, machine learning is a process of extracting useful information from unordered data. It spans multiple disciplines such as computer science, engineering, and statistics and requires multidisciplinary knowledge. In the Internet age, people create and collect a large amount of data. How to extract valuable information from these data is a topic worth studying. Now is also the era of “data is king”, companies are crazy to collect user data, personal information, usage habits, search records, watch records and even email content... hope to find user preferences and tap users’ needs . Who has the data, who has the next opportunity. However, it is not enough to have such data. The massive data has exceeded the feasibility of direct calculation. To extract information efficiently from it, a special learning algorithm is needed. This is the role of machine learning. The “machine learning period” is also divided into three stages. In the 1980s, connectionism was more popular, representing work with Perceptron and Neural Network. In the 1990s, statistical learning methods began to occupy the mainstream stage. The representative methods were Support Vector Machine [32]. In the 21st century, deep neural networks were proposed. Connectionism has never been seen, with the increasing amount of data and computing power. Many AI applications based on Deep Learning have matured.

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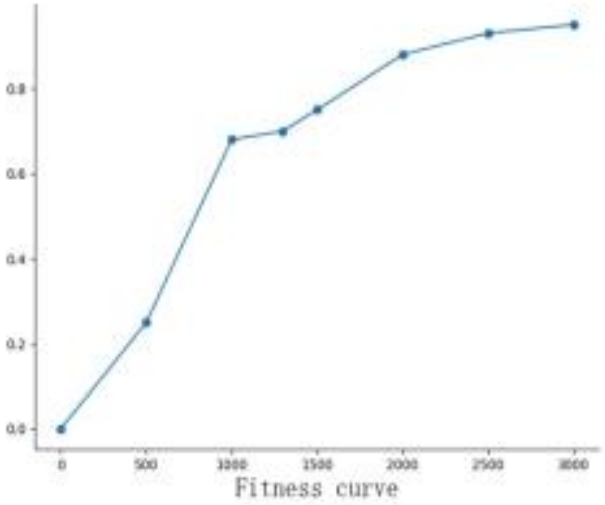
ARTIFICIAL INTELLIGENCE

In the process of using computer vision algorithm to simulate human image recognition, researchers have proposed many different image recognition models. Among them, the image recognition algorithm based on template matching is the most widely used. Whether the target image features in the image database are consistent with the target features to be matched is determined by matching the target image with the predicted image. The principle of image recognition technology in artificial intelligence is combined with the algorithm principle of computer processing data, so the simple image data information extraction and analysis can be combined with the computer, but in the case of fuzzy image information or large amount of information in the image, the recognition efficiency is high, and the image recognition technology may be reduced. Therefore, when analyzing the principle of image recognition technology, we also need to find a better and more convenient image recognition technology. Its principle is to change the image recognition technology, make the principle of image recognition technology more simple, and achieve better in function and image processing.

DISCUSSION

The experimental results show that the optimal individual has been optimized by the genetic algorithm of 5000 generations. When it evolved to the 3,000th generation, it basically converges.



The parameters of the BP neural network are: the learning rate is 0.08, and the impulse is 0.1, which is directly trained using the training sample set. The accuracy of the training set finally obtained after training is 0.9756. KNN does not require training and is an inert classification. Under the assumption that the fitness is Fitness(h1)=0.9543, Fitness(h2)=0.9456, and Fitness(h3)=0.9325, the classification results are shown in Table 1.

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TABLE I
CLASSIFICATION RESULT

Classification	Noiseless test	Noisy test	Training time	Recognition time (ms)
h 1	93.41%	86.90%	12H23M	12
h 2	95.82%	85.45%	12H23M	11
h 3	94.01%	73.56%	12H23M	12
BP	92.23%	81.96%	12M	12
KNN	92.67%	88.54%	Null value	46

FIGURE 2. H1 recognition results under fitness

FIGURE 3. H2 recognition results under fitness

FIGURE 4. H3 recognition results under fitness

III. CONCLUSION

As an important method in the field of artificial intelligence, machine learning has been widely used in traffic identification research in recent years. Because of its intelligence, good generalization and high recognition efficiency, it has gradually become the mainstream of image recognition research. This paper studies the application of image

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recognition technology based on machine learning in license plate recognition. In order to complete the research of this paper, a lot of research on the current development of license plate recognition research is carried out, and the horizontal and vertical research and research are carried out in the field of recognition. Some basic technologies of license plate recognition are studied, such as image processing, pattern classification, machine learning, artificial intelligence and so on. In order to complete this experiment, a large amount of target data was collected, but in the field of target recognition, it is very difficult to obtain large-scale effective data. This is also the primary problem that hinders the application of deep learning in the field of image recognition. To this end, it is necessary to find a more effective way to carry out manual data expansion based on the original database, so that deep learning can be effectively applied. Data in life is ubiquitous, but tagged data is not common. Similarly, it is easier to collect data in the field of image recognition, but manually collecting the collected data is a time-consuming and labor-intensive task. To this end, unsupervised learning algorithms are also the focus of research in deep learning, such as generating confrontational network models. In the correction process of the license plate, this paper mainly focuses on the linear information provided by the framed license plate. If the license plate location module provides a license plate without a frame, then a targeted algorithm should be developed. At the same time, in view of the control of the generalization accuracy of the classifier in the license plate character recognition, this paper combines the genetic algorithm with the optimal solution search tool which is better than the exhaustive method to solve the global space of the weight of the neural network.

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