Chapter 8
Light Weight Structure Texture Feature Analysis for Character Recognition Using Progressive Stochastic Learning Algorithm

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ABSTRACT

Handwritten character recognition is a challenging task in the field of image processing and pattern recognition. The success of character recognition systems depends heavily on the feature extraction methods used to represent the character images. In this chapter, the authors propose a novel feature extraction method called progressive stochastic learning (PSL) algorithm. The proposed work is based on the texture and structural features of the character image and is designed to extract discriminative features that capture the essential information of the characters. The PSL algorithm is used to classify the extracted features into their respective character classes. Experimental results demonstrate that the proposed method achieves a recognition accuracy of 92.6% for correct characters predicted and 91.3% for correct words predicted. Moreover, the proposed method outperforms several state-of-the-art methods in terms of recognition accuracy, computation time, and memory requirements.

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INTRODUCTION

Handwritten character recognition is critical in various fields, such as banking, healthcare, and government agencies, where handwritten documents are still prevalent (Anand et al., 2023). However, the process of manually recognizing handwritten characters is both time-consuming and error-prone (Angeline et al., 2023). Therefore, developing an automated system that can recognize handwritten characters accurately and efficiently is significant (Arslan et al., 2021). The Handwritten Character Recognition project using CRNN is a deep learning-based project that aims to automate the process of handwritten character recognition (Aryal et al., 2022). The project uses an architecture that includes convolutional and recurrent neural networks (Awais et al., 2023). This architecture is well-suited for sequence recognition tasks, making it an ideal choice for recognizing handwritten characters (Bansal et al., 2023). The project involves preparing a dataset of handwritten characters, including images of handwritten characters, and manually labeling them with their corresponding characters (Bansal et al., 2022). The dataset is then divided for different use cases (Jain et al., 2022a).

Next, the model is fitted using backpropagation, manipulating weights to minimize loss (Bhardwaj et al., 2023a). The model learns and maps the input images' patterns to their respective symbols (Ogunmola et al., 2021). Validation of the model is done to avoid overfitting (Bhardwaj et al., 2023b). Once the trained model is ready to recognize new input images of handwritten characters (Das et al., 2022). The input image is first pre-processed to remove noise and normalize the size and orientation of the characters (Jain et al., 2022b). The pre-processed image is then fed into the CRNN model, which outputs a sequence of characters (Paldi et al., 2021). If necessary, the sequences can be post-processed to remove duplicates and perform error correction (Bhardwaj et al., 2023c).

The Handwritten Character Recognition project using CRNN has practical implications in various fields (Rajasekaran et al., 2023). For example, in banking, the project can automate the process of check processing, where checks are scanned, and the handwriting on them is recognized (Gunturu et al., 2023). In healthcare, the project can be used to digitize medical records, which can then be used for analysis and research (Kumar Jain, 2022). In government agencies, the project can be used to automate the processing of handwritten forms (Kosuru & Venkitaraman, 2022). The Handwritten Character Recognition project using CRNN is well recognized when the project can automate the recognition of handwritten characters accurately and efficiently, which has practical implications in various fields (Regin et al., 2023). The development of this project has the potential to save time and reduce errors, making it a valuable and relevant project (Sharma, Kumar & Sharma, 2023).

RELATED WORK

Text recognition has a long way to go with deep learning techniques and the availability of large datasets. This section includes some influential studies published in the past years.

Wei et al., (2020) comprehensively reviewed various features and algorithms used for scene text recognition. The authors highlighted the challenges associated with text recognition in the wild, including font, size, orientation, and lighting variations.

Vasek et al., (2020) proposed a convolutional sequence modeling approach for text recognition in the wild, which resulted in the best benchmark. The paper describes a sequence modeling method that considers the inter-character dependencies and context information.