Construction of a Character Recognition Program

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***Abstract*—This thesis explores the theory of digital image processing, focusing on character recognition, and delves into neural network theory and fuzzy logic theory. It constructs a simple program for character recognition using MATLAB, achieving a certain level of accuracy. The research covers the theory of digital image processing, neural networks, and fuzzy logic, emphasizing the practical application of these theories in character recognition tasks. The program demonstrates the integration of neural network and fuzzy logic theories, enhancing the flexibility and accuracy of character recognition systems. However, the evaluation of the program's performance is limited, as no specific metrics or benchmarks are provided.**

***Index Terms*—digital image processing, neural networks, fuzzy logic, character recognition, MATLAB**

I. Introduction

The thesis aims to bridge the gap between human and machine intelligence by applying theories of neural networks and fuzzy logic to develop a character recognition program. It highlights the importance of these theories in enhancing the flexibility of systems in image processing tasks. The research covers the fundamental concepts of digital image processing, including image segmentation and feature extraction, as well as the principles of neural networks and fuzzy logic. The program is designed to recognize printed characters, which are common in various applications such as document scanning and optical character recognition (OCR) [1]. Published books on the methods and subject of this project provide context for this English summary [5], [7]. Related earlier ICTU undergraduate theses provide context for this English summary [6]. Published articles on the methods and subject of this project provide context for this English summary [8], [9], [10], [11].

II. Methods

The research covers the theory of digital image processing, neural networks, and fuzzy logic. It includes the design and implementation of a character recognition program using MATLAB. The program utilizes image preprocessing techniques such as thresholding and edge detection to enhance the quality of the input images. Neural networks, specifically the Perceptron and Kohonen networks, are employed for character recognition. Fuzzy logic is applied to handle the uncertainty in character recognition, particularly in cases where the input images are noisy or partially occluded. The program is implemented in MATLAB, a popular software for image processing and machine learning tasks [1].

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III. Results

The thesis constructs a character recognition program with a certain degree of accuracy, utilizing the theories of digital image processing, neural networks, and fuzzy logic. The program successfully recognizes printed characters from various fonts and styles. However, the evaluation of the program's performance is limited, as no specific metrics or benchmarks are provided. The implementation includes functions for image preprocessing, feature extraction, and classification using neural networks and fuzzy logic. The program demonstrates the practical use of these theories in real-world scenarios, such as document scanning and OCR [1].

IV. Discussion

The application of fuzzy logic theory in the program enhances its flexibility in character recognition tasks. The program demonstrates the practical use of these theories in real-world scenarios, such as document scanning and OCR. The integration of neural network and fuzzy logic theories significantly improves the flexibility and accuracy of character recognition systems. However, the evaluation of the program's performance is limited, as no specific metrics or benchmarks are provided. Future work could involve improving the accuracy of the program by incorporating more advanced machine learning techniques and expanding the training dataset [1].

V. Conclusion

The thesis concludes that the integration of neural network and fuzzy logic theories significantly improves the flexibility and accuracy of character recognition systems. The program successfully recognizes printed characters from various fonts and styles. However, the evaluation of the program's performance is limited, as no specific metrics or benchmarks are provided. The research highlights the importance of these theories in enhancing the flexibility of systems in image processing tasks and demonstrates their practical application in character recognition tasks [1].

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