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An Enhanced Handwriting Recognition Tool for the Visually Impaired

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Abstract
Handwritten text serves as an essential means of conveying ideas and messages. It is often characterized by diverse handwriting styles, variations in character shapes, as well as the presence of overlapping strokes and characters. However, for visually impaired individuals, this poses significant hurdles as existing recognition tools may not reliably provide accurate information. To address this, an enhanced handwriting recognition tool powered by Optical Character Recognition (OCR) is proposed. This tool integrates a Raspberry Pi micro controller and a camera module for image capture, along with a text-to-speech engine to empower the visually impaired. Moreover, the tool employs Artificial Neural Network (ANN) and a hybrid Artificial Neural Network + Hidden Markov Model (ANN+HMM) classification methods to enhance recognition performances. In addition to the functionality test, a series of accuracy and recall rate tests for different handwriting styles was conducted to assess the tool's performance. The results demonstrated the superiority of the hybrid ANN+HMM model over the standalone ANN, achieving an impressive 46.3% improvement in accuracy and a perfect 100% recall rate, particularly for cursive handwriting. This groundbreaking innovation contributes to fostering a more inclusive and accessible world for all. © 2024 IEEE.

Author Keywords
Artificial Neural Network (ANN); Handwriting recognition tool; Hidden Markov Model (HMM); Optical Character Recognition (OCR); Raspberry Pi

Index Keywords
Image acquisition, Image enhancement, Markov processes, Neural networks, Speech enhancement; Artificial neural network, Handwriting recognition, Handwriting recognition tool, Hidden markov model, Hidden-Markov models, Neural-networks, Optical character recognition, Optical-, Raspberry pi, Visually impaired; Optical character recognition

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