

A CNN-Based Intelligent Framework for Modi Script Character Recognition

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Abstract - Modi Lipi, an ancient script historically used in Maharashtra for administrative and literary purposes, has become largely obsolete and inaccessible to the general public. This paper presents a Modi Character Recognition and Translation System designed to preserve and digitize this script using advanced technologies such as Optical Character Recognition (OCR), deep learning, and Natural Language Processing (NLP). The proposed system processes scanned images of handwritten and printed Modi text through image preprocessing techniques including grayscale conversion, noise removal, binarization, and segmentation. A Convolutional Neural Network (CNN)-based model is employed for accurate character recognition. The recognized text is then transliterated into Devanagari and translated into modern languages such as Marathi, Hindi, and English. Additionally, the system integrates Text-to-Speech (TTS) functionality for audio output and a chatbot interface to enhance user interaction and accessibility. The results demonstrate high accuracy in character recognition and effective translation, making the system useful for researchers, students, and historians. This approach contributes significantly to cultural preservation and improves accessibility to historical manuscripts.

Key Words: CNN, image-preprocessing, text-to-speech, modi character Recognition, multilingual transliteration

1.INTRODUCTION

Modi script is an ancient script used for writing Marathi in historical and administrative documents. Due to its decline, many valuable manuscripts have become inaccessible to common users. This paper presents a Modi Script Character Recognition and Translation System using Optical Character Recognition (OCR) and deep learning techniques. The system processes scanned images through preprocessing steps and uses a

Convolutional Neural Network (CNN) for character recognition. The recognized text is transliterated into Devanagari and translated into modern languages such as Marathi, Hindi, and English. Additionally, Text-to-Speech (TTS) is used to generate audio output. This system helps in preserving cultural heritage and improving accessibility to historical documents..

2.BODY OF PAPER

2.1 LITERATURE SURVEY

1. Solley Joseph and Jossy P. George proposed a hybrid model using CNN autoencoder for feature extraction and Support Vector Machine (SVM) for classification. Their approach improved recognition accuracy and handled variations in handwritten data effectively.

2. Isha Apurv Kibe developed a Modi script recognition system using deep learning with VGG16 architecture. The system showed strong performance for both printed and handwritten characters.

3. Kulkarni Sadanand et al. used Zernike moment-based feature extraction techniques for offline Modi character recognition. Their method achieved an accuracy of around 84%, highlighting the effectiveness of geometric feature extraction.

4. Shruti Chavan et al. proposed a machine learning-based approach for recognizing ancient Modi script, focusing on handling variations in handwriting and improving dataset quality.

5. Shweta Kolte and Dr. Brijendra Gupta reviewed advancements in Modi OCR systems and highlighted the importance of hybrid models and transfer learning for improving performance.

2.2 FEASIBILITY STUDY

The proposed Modi Script Character Recognition System is feasible in multiple aspects.

Technical feasibility is ensured by the use of established technologies such as OCR, CNN, and NLP,

implemented using Python, TensorFlow, and OpenCV.

Operational feasibility is achieved through a user-friendly interface that allows image input, translation, and audio output.

Economic feasibility is maintained as the system relies on open-source tools and standard hardware, making it cost-effective.

The system focuses on recognition and translation of Modi script from images. Its key functionalities include image preprocessing (grayscale conversion, binarization, segmentation), CNN-based character recognition, transliteration into Devanagari, translation into modern languages, and Text-to-Speech (TTS) output.

The system requires image input, preprocessing, character recognition, translation, and audio generation as core functions, while ensuring performance, scalability, usability, and reliability during operation.

2.3 SYSTEM ARCHITECTURE

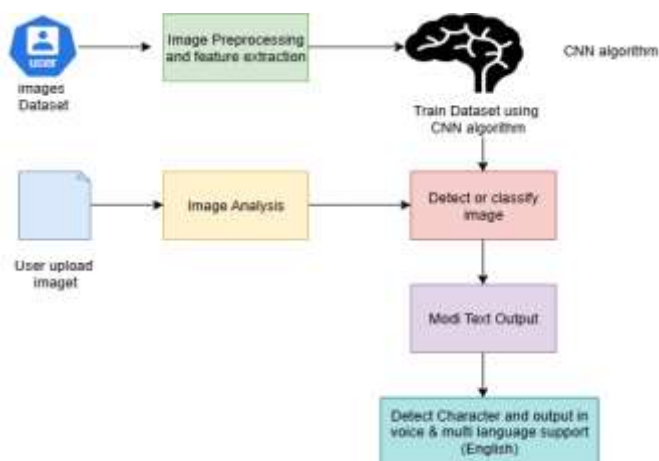


Figure: 2.3.1 System architecture for Modi Script Character Recognition

The system consists of multiple stages starting from image input to final output generation. Initially, the dataset is used to train the Convolutional Neural Network (CNN) model. The input images undergo preprocessing and feature extraction to enhance quality and improve recognition accuracy.

During execution, the user uploads an image containing Modi script. The system performs image analysis and passes the processed data to the trained CNN model for character detection and classification. The recognized characters are then converted into textual output. Finally,

the system provides translated text along with voice output and multilingual support.

2.4 IMPLEMENTATION

3. CONCLUSIONS

In this paper, a Modi Script Character Recognition and Translation System has been presented to address the challenge of preserving and accessing historical Modi manuscripts. The system utilizes Optical Character Recognition (OCR) along with deep learning techniques, particularly Convolutional Neural Networks (CNN), to accurately recognize characters from scanned images.

The recognized text is further transliterated into Devanagari and translated into modern languages such as Marathi, Hindi, and English, making it accessible to a wider audience. Additionally, the integration of Text-to-Speech (TTS) enhances usability by providing audio output.

The proposed system demonstrates effective performance in recognizing and translating Modi script, thereby contributing to cultural preservation and digital accessibility. Future work can focus on improving accuracy, expanding the dataset, and developing mobile-based applications for wider usability.

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