Telugu Optical Character Recognition

CS 725

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Problem Statement

Motivation

- Telugu OCR it is difficult problem as a single character can be formed by a single vowel or single consonant or it can be compound character consisting of a combination of vowels and consonants.
- Different permutations of the 16 vowels and 37 consonants give rise to approximately 500 unique glyphs.

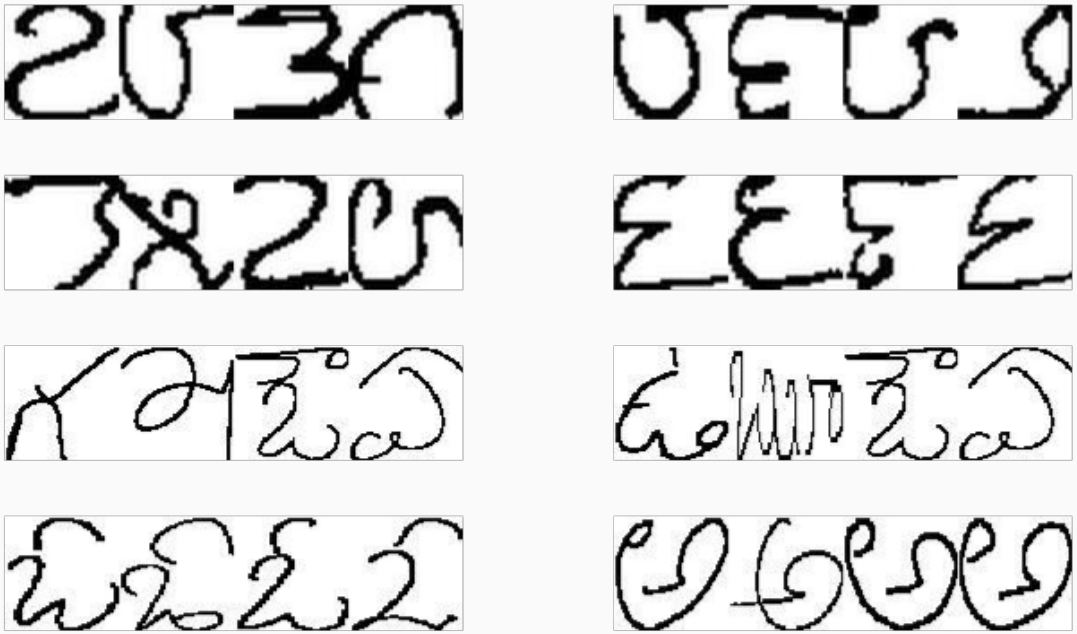
Formulation

- We use techniques like Artificial Neural Networks, Convolutional Neural Network, K-Mean clustering and SVM for recognition
- We take the segmented handwritten telugu numerical data(300*10 numbers) and character data(290*165 characters) and try to formulate a scheme for recognition.
- The class of the image is given by the file name(numbered).

Dataset

Telugu Numerical and Character dataset

Handwritten character data-set was obtained from “HPL Isolated Handwritten Telugu Character Dataset”. Numerical dataset was obtained from ”CMATERdb: The pattern recognition database repository”



Approaches

Approach using ANN, CNN

- Using python libraries: TensorFlow, Keras
- Hyper-parameters of ANN and CNN such as number of layers, filter-dimension, number of filters and stride length are tuned by cross-validation

Approach using K-means clustering and SVM

- Feature Extraction:
  1. Each image is divided into overlapping pieces
  2. K-means clustering is used on these pieces to obtain K centroids which act as features
- Support Vector Machines with appropriate kernel can be used for classification

Progress

Our progress

- All images in the numerical database were of size 32x32. We implemented ANN and CNN on the numerical database using Keras library. We obtained an accuracy of 90.78% using ANN and 91.73% using CNN. Improvements are due.
- ANN architecture:
  - Dense 1024 relu
  - Dense 10 with softmax
  - cross entropy loss function

Our Progress

- CNN architecture:
  - Convolution2D 5x5 30 relu
  - MaxPooling2D 2x2
  - Convolution2D 3x3 15 relu
  - MaxPooling2D 2x2
  - Dense 128 relu
  - Dense 50 relu
  - Dense 10 with softmax
  - cross entropy loss function

Our Progress

- The images in the character database were large and of different sizes
- Dilation followed by resizing(without changing the aspect ratio) to maximum length of 64 was performed on the images
- The images were then padded with white to get 64x64 images

Future work

- K-Means clustering and SVM are yet to be implemented
- Installing CUDA on an NVIDIA machine to speed up the learning process
- Improving Telugu character recognition rate