

**“Hand-Written Character Recognition
With
Image Super Resolution”**

***Mid-Semester Report of
5th Semester Mini Project***

FOR THE DEGREE OF

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

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UNDER THE SUPERVISION OF

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**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY,
LUCKNOW**

September, 2018

Supervisor’s Signature: _____

MOTIVATION

As the world becomes more and more digitalized, the incompatibility of handwritten text with computers becomes a greater problem. A great quantity of data is only saved in formats inscrutable to digital processing; this makes it difficult to access and also means it can't be easily searched, stored, shared and analyzed. Handwriting is also commonly used in applications such as taking notes filling in forms due to the fact it is often easier than dealing with technology. There is a growing divide between the increasing usefulness of digitalization and the plethora of undigitalized text. An accurate algorithm for converting from handwriting to computerized text would help make a whole new set of data accessible and have applications from analyzing historical texts to improving note taking.

ABSTRACT

Handwriting recognition (HWR) is the ability of a computer to receive and interpret intelligible handwritten input from sources such as paper documents, photographs, touch-screens and other devices.

Current model produces more error rate due to low image resolution. In this project we are planning to increase the accuracy of current Hand Written Character Recognition model by using different techniques to convert low resolution images into high resolution images so that our model produces better results.

DECLARATION

We hereby declare that the work presented in this project report entitled “Hand-Written Character Recognition With Image Super Resolution”, submitted as mid-semester report of B.Tech. (IT) at Indian Institute of Information Technology, Lucknow, is an authenticated record of our original work carried out from September 2018 to November 2018 under the guidance of **Dr. Vishal Krishna Singh**. Due acknowledgements has been made in the text to all other material used. The project was done in full compliance with the requirements and constraints of the prescribed curriculum.

Place: Allahabad
Date: 13 September 2018

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CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Date: 13 September 2018

Dr. Vishal Krishna Singh

Place: Allahabad

IIIT-Lucknow

ACKNOWLEDGEMENT

This satisfaction that accompanies the successful completion of any task would be incomplete without the mention of few people whose ceaseless cooperation made it possible; whose constant guidance ,inspiration and constructive suggestions that were helpful to me and my group in the preparation of this project.

A very special thanks to **Dr. Vishal Krishna Singh**, our project supervisor, for motivating and inspiring all of us. We are grateful to his for the strong support, guidance, inspiration and constructive suggestions that helped us a lot in the preparation of this project.

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INTRODUCTION

Handwriting recognition has been one of the active and challenging research areas in the field of image processing and pattern recognition. It has numerous applications which include, reading aid for blind, bank cheques and conversion of any hand written document into structural text form.

Handwriting recognition (HWR) is the ability of a computer to receive and interpret intelligible handwritten input from sources such as paper documents, photograph, touch-screens and other devices.

Handwriting recognition principally entails optical character resolution.

Basic Terminology

Low-Resolution(LR):

– It offers less details because of its small pixel density within an image.

High-Resolution(HR):

– It offers high details because of its high pixel density within an image.

Super-Resolution(SR):

– It's the technique of obtaining a HR image from one or multiple LR-images.

PROBLEM DEFINITION

Given the ease of Handwriting and large quantity of existing handwritten text converting handwriting to computerized text is a problem of great importance with many applications.

Current Hand-Written Character Recognition produces more error rate due to Low Resolution of the input Images because Low resolution images present a challenge to OCR because it is virtually impossible to do character segmentation independently from recognition. Hence it is important to have a high resolution image for better results.

Presently, 88% accuracy has been achieved using Deep Learning.

OBJECTIVES

Our Objective is to enhance the current Hand-Written Character Recognition model to produce less error rate and produce better results so that true negative rate is minimized and true positive rate is enhanced.

LITERATURE SURVEY

➤ Super Resolution Reconstruction For License Plate Image in Video Surveillance System.

1-Journal/Conference:

IEEE Conference (Communications and Networking in China) 2015

2-Objective:

To improve the registration accuracy of license plate image and to reconstruct a HR image from LR Images.

3-Methods:

Fourier Mellin Transform (FMT), Vandewalle's and POCS.

4-Challenges's Dealt:

Considered Scaling, Rotation and Translation.

➤ Real-time automatic license plate recognition for CCTV forensic applications

1-Journal/Conference :

Journal of Real-Time Image Processing Springer-2011.

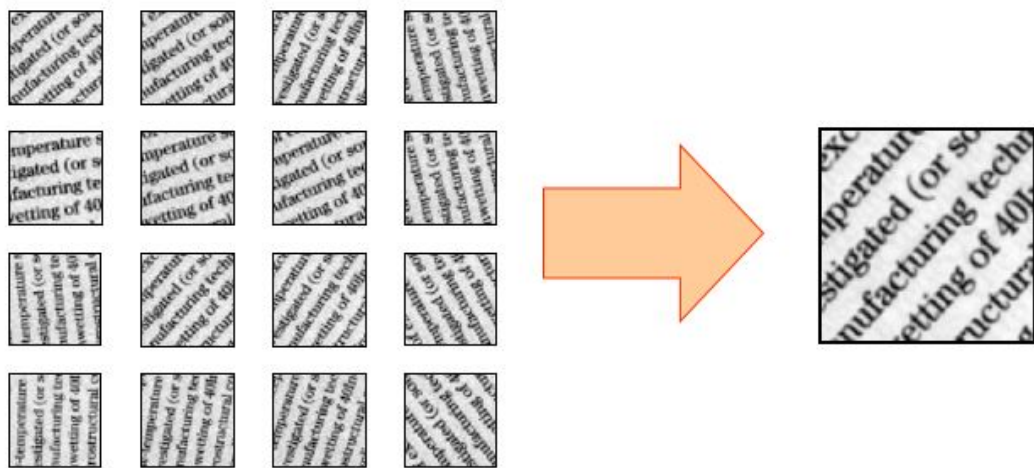
PROPOSED APPROACH

Basic Idea:

Given:

A series of images of a document which hand written or printed characters.

Required:



(A)

(B)

(a) Low Resolution Images

(b) High Resolution Images

TRAINING :

1-Preprocessing (Black VS White Densities).

2-Fitting and finding accuracies to find hyper parameters.

3-Finally training our model of best accuracy we have found.

INPUT : A series of Low resolution Images of hand-written or printed documents.

RECOGNIZING : 1-Preprocess Image.

2-Segmentation.

3-Send To Classifier.

4-Send Output.

IMAGE SUPER RESOLUTION

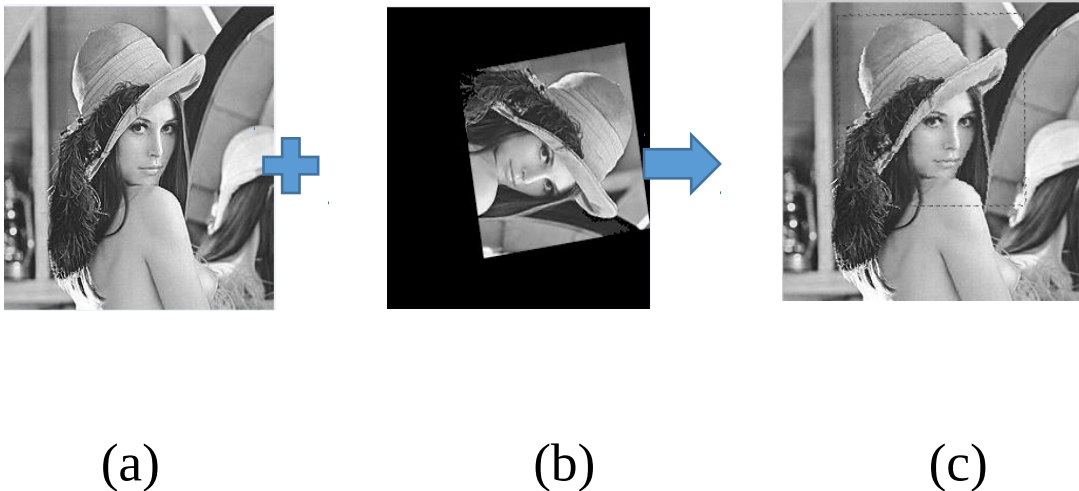
Super-resolution (SR) technique reconstructs a higher-resolution image or sequence from the observed LR images.

Super-Resolution methods involves two steps

- 1) Image Registration
- 2) Image Reconstruction

Image Registration:

It is a technique used to align multiple images of the same scene with some differences in a single integrated image. It helps to overcome issues like scaling and rotation while overlying images.

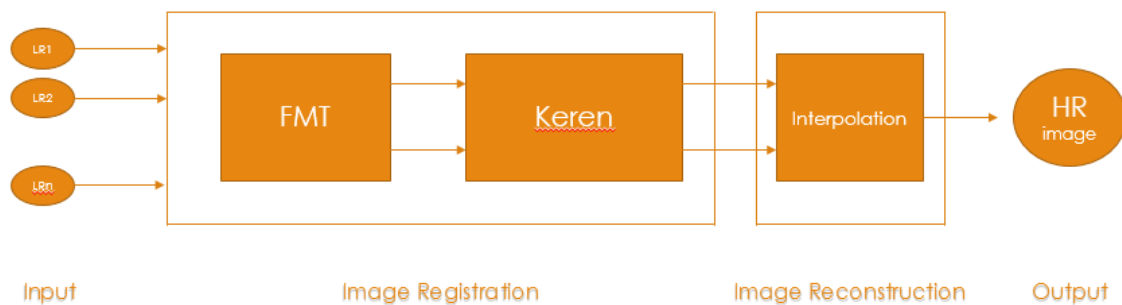


(a)Original Image (b) Image to be registered (c) After Registration

Image Reconstruction:

It is a technique used to reconstruct an image using the details obtained from the low resolution images.

- Flow Chart Of Proposed Methodology



In image registration, several low resolution images which differ by rotation, scaling, translation are taken as input.

Fourier Mellin Transform (FMT) is used for scaling estimation between the low resolution images and Keren method is used for rotation and translation estimation. In **keren method**, there is no scaling estimation so we are considering FMT for scaling estimation. Keren is a better method when compared to FMT as keren method is able to find motion estimates even when there is subpixel shifts between the images.

HARDWARE AND SOFTWARE REQUIREMENT

Programming Tools:

Python3

keras tensor-flow as back-end

open-CV

Dataset:

NIST special database of 800,000 characters of total 62 classes.

Dataset Link:

https://s3.amazonaws.com/nist-srd/SD19/by_class.zip

ACTIVITY TIME CHART

TIMELINE	Phase – 1 (Mid August to Late August)	Phase – 2 (Early September to Mid September)	Phase – 3 (Mid September to Mid October)	Phase – 4 (Mid October to Mid November)
Literature Survey	Basic Review			
		Problem Identification		
		Possible Approach		
Implementation			Problem Solution and Implementation	
Validation and Enhancing results				Verification and Enhancement of Model

REFERENCES

- [1] Xiaole Yan, Qiu Shen, Xin Liu, “Super-resolution Reconstruction for License Plate Image in Video Surveillance System” in 10th International Conference on Communications and Networking in China-2015.
- [2] M. S. Sarfraz , A. Shahzad , Muhammad A. Elahi ,M. Fraz , I. Zafar , E. A. Edirisinghe, “Real-time automatic license plate recognition for CCTV forensic applications” , Journal of Real-Time Image Processing Springer-2011.
- [3] http://cs230.stanford.edu/files_winter_2018/projects/6910235.pdf

CONCLUSION

We have surveyed various research papers and observed that they have some limitations and if we succeed to implement our proposed approach then it may be a new stepping stone in the world of Optical Character Resolution. Our approach will help in getting better results than the current model.

SUGGESTIONS OF BOARD MEMBERS