**CHAPTER 1**

**INTRODUCTION**

**1.1 Chapter Section**

Image processing is a technique to convert an image into advanced frame and to perform numerical calculations on it, by performing such operations we can get enhanced image and also some useful information can be extracted from an Image. It is one of the type of signal dispensation in which an image is an input like video frame or photograph and that results to processed image or properties that are associated with that image. This framework will apply mathematical computations using already set signal processing methods to images which treats image as two-dimensional signals.

Image processing is considered to be highly efficient and one of the rapidly growing and most challenging technology, it has applications in a variety of businesses. It is also considered to be one of the core technological research area in the engineering and computer science streams.

The below mentioned three steps can be followed to perform image processing.

1. Use an optical scanner or a digital photography device (preferably a high resolution camera) to get the image/picture.
2. Identify, analyse and manipulate the obtained picture where compression of data and enhancement of the picture is being performed to spot such patterns similar to satellite pictures.
3. In the last stage, an output is generated that can be an altered/changed picture or a detailed report that is obtained as the result of the analysis.

**1.1.1 Chapter Sub Section**

The below mentioned points would give a high level view of the purpose of image processing:

1. Visualization - Identifying the objects which are not in the visible range of human eye.
2. Image sharpening and restoration – An image with better pixels is created.

ause of these curves, angles, strokes and holes in the characters and the numerals, researchers will have to face many challenges during the process of recognition and even it differs from the writing style from individuals to individuals and many more.

Before performing the character recognition, there are so many steps to be followed. Initially the handwritten documents has to be scanned and must be transformed into a machine understandable format for the purpose of processing. The preprocessing step includes few methods of processes to make the document image ready for the recognition of the characters in the document accurately. The pre-processing steps are described below:

* **Binarization:** this process involves thresholding which is the conversion of the gray scale image to the black and white image. Usually thresholding is used to get the foreground image from the background image. To identify the local gray scale value of the contrast image, Histogram based thresholding is used which helps in the extraction of the textual information from the poor documents.
* **Noise reduction:** Digital images have tendency to have many types of noises. The noise will be due to the resolution of the images or poorly photocopied images. There are different filtering methods to remove the noise from the document and few of them are: Median filtering, Wiener filtering, morphological operations. The intensity of the characters are replaced by using Median filters and smoothening of the images can be done by Gaussian filters.
* **Normalization:** This involves transforming the random sized images into standard size. The different types of normalization techniques used are bicubic interpolation, java image class and linear sized interpolation. Usually the input images are normalized to 40\*40 after cropping the handwritten image.
* **Skew correcting, Thinning, Slant removal:** Thinning is a technique in which the handwritten character is pre-processed to produce a single pixel wide image which helps in the recognition of the character. This is performed iteratively to get only one pixel wide representation of the image which has the character. The products that can be used for thinning purpose are Cumulative Scalar Product (CSP) of windows text lock with Gabor filters, Morphology based thinning algorithm and many others.

**CHAPTER 4**