Text Extraction, Real Time Face Detection And Image Processing Using Matlab

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Abstract- *This paper presents detailed review in the field of Optical Character Recognition, real time face detection & recognition and image processing.Selection of a relevant feature extraction method is probably the single most important factor in achieving high character recognition with much better accuracy in character recognition systems without any variation.*

Given an arbitrary image, the goal of this project is to determine whether or not there are any faces in the image and detection of eyes, mouth and nose. While this appears to be a trivial task for human beings, it is very challenging task for computers. The difficulty associated with face detection can be attributed to many variations in scale, location, view point, illumination, occlusions, etc.

This paper also provides an overview of some possible usage of the software MATLAB for image quality improvement, distortion simulations, objective and subjective quality assessment and other ways of image processing techniques such as gray scale conversion, noise removal, sharpening, edge detecting, image segmentation, etc. that are applied for the captured prawn image by using Matlab source code and displaying the results.

Image acquisition is a very essential and primary work for any image classification. A digital image is produced by several image sensors, which besides various types of light-sensitive cameras. Depending on the type of sensor, the resulting image data is an ordinary 2D prawn image, or an image sequence. The image pixel values typically correspond to light intensity in one or several spectral bands (gray images or color images), but we can also be related to various physical measures of structure, such as depth, absorption or reflectance of sonic or electromagnetic waves, or nuclear magnetic resonance. It has been studied extensively in computer vision and photogrammetric camera lens which may be used to focus light so that objects may be viewed brighter.

Keywords- MATLAB, OCR, Image quality evaluation, image processing, Face Detection, Neural network, Digital image, gray scale, Noise removal, Sharpening, Segmentation.

I. INTRODUCTION

OCR:

Character recognition techniques associate a symbolic identity with the image of character. In typical OCR systems input characters are digitized by an optical scanner. Each character is then located and segmented, and the resulting character image is fed into a pre-processor for noise reduction and normalization. Certain characteristics are the extracted from the character for classification. The feature extraction is critical and many different techniques exist, each having its strengths and weaknesses. After classification the identified characters are grouped to reconstruct the original symbol strings, and context may then be applied to detect and correct errors.

The goal of Optical Character Recognition (OCR)[1] is to classify optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters. The process of OCR involves several steps including segmentation, feature extraction, and classification.

IMAGE PROCESSING:

It is very essential need to reduce the time involvement in image processing for the initial work of capturing the images which are very much used to implement the image processing techniques. Now a day's photographic cameras can deliver photographs in various formats, these formats are delivered in a required format simply by applying pre-processing techniques. In this process we analysis that our camera is connected to a Frame Grabber which retrieves the image, converts it to RGB, changing it to a scale of grays and subsequently carries out the necessary processing by applying image processing techniques. The pre-processing techniques of an image start by image acquisition system.

In image processing image acquisition is defined as the action of retrieving an image from some source as prawns. In image processing image acquisition is the first step in the task implementation because, without an image, no processing is possible. this processing may remove noise, improve the

contrast of the image i.e., sharpening, remove blurring caused by movement of the camera during image acquisition, it may correct for geometrical distortions caused by the lens.

FACE DETECTION:

In the past 10 years, there has been an exponential development in the field of image processing. Face detection [2] is also a part of the object detection. Face detection can be classified into two classes (face and nonface).

These applications are needs to locate the position of the face in the image or video. Moreover, it has added a much-needed aspect of security in the recent years. Someof the key implementations of face detection are the Biometric systems, a front sided camera (selfie) of a smart phone, human presence detection. Basically, face detection senses the presence of the facein a 2D frame. Several methods and approaches are developed for the face detection. The objective was to design and implement a face detector in MATLAB that will detect human faces in an image similar to the training images has been studied extensively. A wide spectrum of techniques has been used including colour analysis, template matching, neural networks, support vector machines (SVM), maximal rejection classification and model-based detection. However, it is difficult to design algorithms that work for all illuminations, face colours, sizes and geometries, and image backgrounds. As a result, face detection remains as much an art as science.
Our method uses rejection-based classification. The face detector consists of a set of weak classifiers that sequentially reject non-face regions. First, the non-skin color regions are rejected using color segmentation. A set of morphological operations are then applied to filter the clutter resulting from the previous step. The remaining connected regions are then classified based on their geometry and the number of holes. Finally, template matching is used to detect zero or more faces in each connected region.

II. LITERATURE SURVEY

In the research paper by G Nagalakshmi and SJyothi [3],different Prawns with clear and accurate Prawn structure are captured using DSLR Cameras. These captured prawns are than used for implementing various image processing techniques like converting original image into gray scale converting, image sharpening, image noise removal, and identifying the Prawn image edges by applying canny and sobel edge detection their result in Matlab is also shown.
Over the years many contributions were done to the field of face detection and recognition. G.Yung[4] came with multiresolution rule method. This is the knowledge-based method and it is used to detect the face by using the structural nature of the face.[4] Feature based method uses the facial features, skin color [5] and it is combined with the multiple features of the face for better accuracy and detection speed, the accuracy is sacrificed. Template matching method was employed. For this steady and uniformly scaled image are used. Predefined face templates and deformable templates were introduced which was completely a predefined structure without using learning. Appearance based methods gives faster and more accurate results that could distinguish a face from a non-face in any environmental conditions. For getting desired results Neutral networks models [6] are commonly used.[7]

APPROACH:

OCR:

The Classification Process:

There are two steps in building a classifier: training and testing. These steps can be broken down further into sub-steps.

1. Training:a. Pre-processing – Processes the data so it is in a suitable form for…
b. Feature extraction – Reduce the amount of data by extracting relevant information—Usually results in a vector of scalar values. (We also need to NORMALIZE the features for distance measurements!)
c. Model Estimation – from the finite set of feature vectors, need to estimate a model (usually statistical) for each class of the training data

2. Testing

a. Pre-processing
b. Feature extraction – (both same as above)
c. Classification – Compare feature vectors to the various models and find the closest match. One can use a distance measure.

Interest in digital image processing methods stems from two principal application areas:

1. Improvement of pictorial information for human interpretation
2. Processing of scene data for autonomous machine perception

In this second application area, interest focuses on procedures for extracting image information in a form suitable for computer processing.

Examples includes automatic character recognition, industrial machine vision for product assembly and inspection, military recognizance, automatic processing of fingerprints etc.

IMAGE PROCESSING:

Am image refers a 2D light intensity function f(x, y), where(x, y) denotes spatial coordinates and the value of f at any point (x, y) is proportional to the brightness or gray levels of the image at that point. A digital image is an image f(x, y) that has been discretized both in spatial coordinates and brightness. The elements of such a digital array are called image elements or pixels.

A simple image model:

To be suitable for computer processing, an image f(x, y) must be digitalized both spatially and in amplitude. Digitization of the spatial coordinates (x, y) is called image sampling. Amplitude digitization is called gray-level quantization.
The storage and processing requirements increase rapidly with the spatial resolution and the number of gray levels.
Example: A 256 gray-level image of size 256x256 occupies 64k bytes of memory.

Types of image processing

- Low level processing
- Medium level processing
- High level processing.

Low level processing means performing basic operations on images such as reading an image resize, resize, image rotate, RGB to gray level conversion, histogram equalization etc,. The output image obtained after low level processing is raw image.Medium level processing means extracting regions of interest from output of low-level processed image. Medium level processing deals with identification of boundaries i.e. edges.This process is called segmentation. High level processing deals with adding of artificial intelligence to medium level processed signal.

Fundamental steps in image processing are

1. Image acquisition: to acquire a digital image
2. Image pre-processing: to improve the image in ways that increases the chances for success of the other processes.
3. Image segmentation: to partitions an input image into its constituent parts of objects.
4. Image segmentation: to convert the input data to a from suitable for computer processing.
5. Image description: to extract the features that result in some quantitative information of interest of features that are basic for differentiating one class of objects from another.
6. Image recognition: to assign a label to an object based on the information provided by its description.

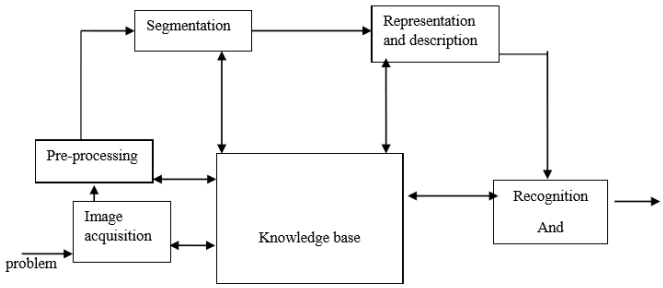

Fig 1: *Fundamental steps in digital image processing*

FACE DETECTION:

Face detection is a computer technology that determines the location and size of human face in arbitrary (digital) image. The facial features are detected and any other objects like trees, buildings and bodies etc. are ignored from the digital image. It can be regarded as a specific case of object-class detection, where the task is finding the location and sizes of all objects in an image that belong to a given class. Face detection, can be regarded as a more general case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one). Basically, there are two types of approaches to detect facial part in the given image i.e. feature base and image base approach. Feature base approach tries to extract features of the image and match it against the knowledge of the face features. While image base approach tries to get best match between training and testing images.

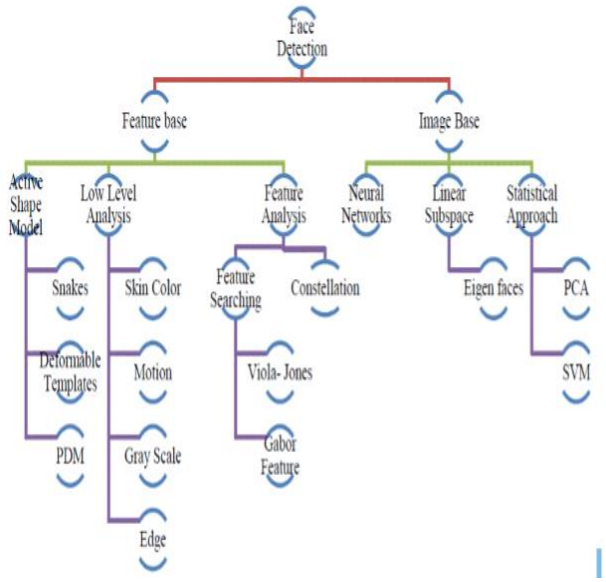

Fig 2:*Detection methods*

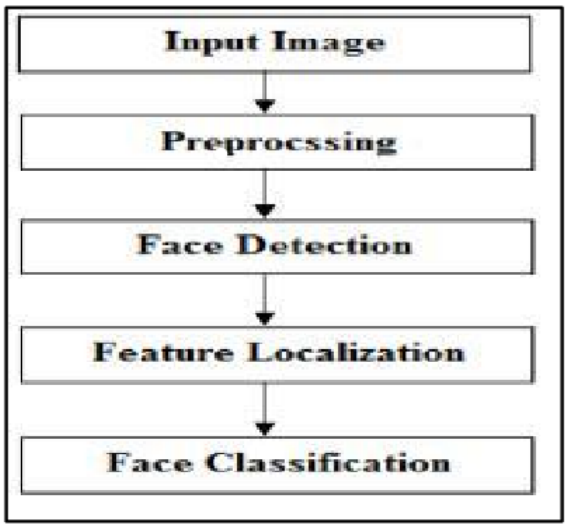

Fig 3:*Proposed algorithm*

The face detection system can be divided into the following steps:

1. Pre-Processing: To reduce the variability in the faces, the images are processed before they are fed into the network. All positive examples that is the face images are obtained by cropping images with frontal faces to include only the front view. All the cropped images are then corrected for lighting through standard algorithms.

2.Classification: Neural networks are implemented to classify the images as faces or nonfaces by training on these examples. We use both our implementation of the neural network and the Matlab neural network toolbox for this task. Different network configurations are experimented with to optimize the results.

3. Localization: The trained neural network is then used to search for faces in an image and if present localize them in a bounding box. Various Feature of Face on which the work has done on: - Position Scale Orientation Illumination.

REAL-TIME FACE DETECTION:

Real-time face detection [8][9] involves detection of a face from a series of frames from a video capturing device. While the hardware requirements for such a system are far more stringent, from a computer vision stand point, real-time face detection is actually a far simpler process than detectinga face in a static image. This is because unlike most of our surrounding environment, people are continually moving. We walk around, blink, fidget, wave our hands about, etc. Since in real-time face detection, the system is presented with a series of frames in which to detect a face, by using spatiotemporal filtering (finding the difference between subsequent frames), the area of the frame that has changed can be identified and the individual detected.

III. GUI IMPLEMENTATION IN MATLAB

Graphical user interface(GUI): The real-time face detection program is developed using any higher version of MATLAB. A graphic user interface allows users to perform tasks interactively by using controls likes switches and sliders. GUI can be created easily and can be run in MATLAB or be used as stand- alone application.

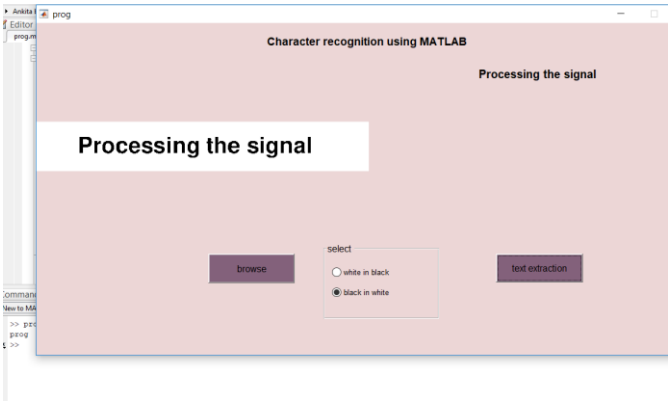

Fig 4: *OCR USING MATLAB GUI*

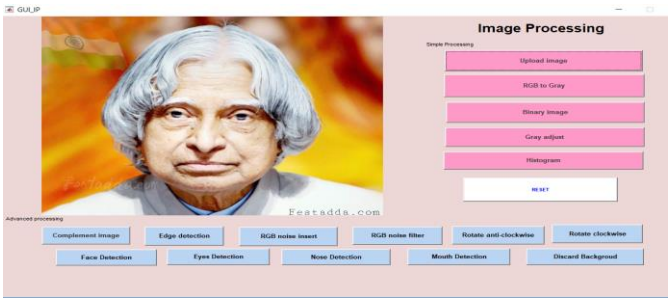

Fig 5: *IMAGE PROCESSING USING MATLAB GUI*

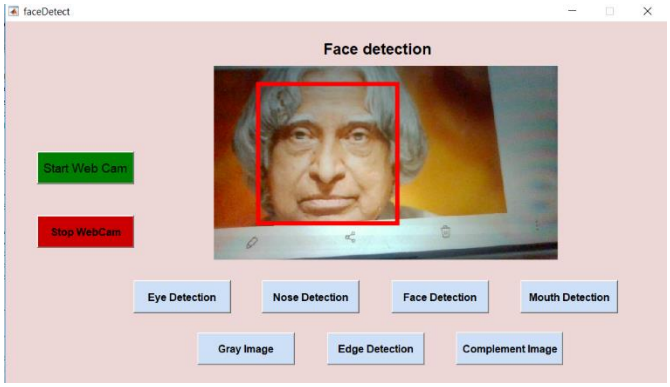

Fig 6: *REAL TIME FACE DETECION USING MATLAB GUI*

IV. OUTPUTS

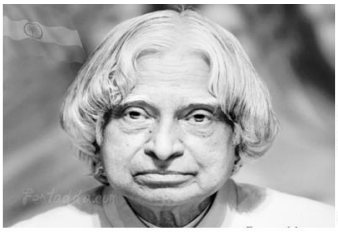

FIG: RGB to Gray

FIG: RGB to Binary

FIG: Gray Adjust

FIG: Edge detection

FIG: Face Detection

FIG: Face Detection

V. CONCLUSION

Optical Character recognition can be used to convert text character into the audio signal. The text is pre-processed and then used for recognition by segmenting each character. Segmentation is followed by extraction of the letter and resizing of the file containing the text. This Text file is then converted into the audio signal.

This paper completes the description of the MATLAB-based applications for image processing and image quality assessment and in future work could be aimed to extend the set of applications to cover even more areas of image and video processing.

The topic chosen was a digital system on facial detection and facial recognition. Initiallyobjective of the project was to represent a digital system in a simple yet effective way, to successfully simulate a facial detection and recognition program, to learn more about the functions that MATLAB has to offer, and to increase their knowledge on the various applications that digital communication has. Facial recognition can bring security, convenience, and even accuracy to society. It can bring security by being a safety feature in securing a person's prized items or personal information.

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