

Optical Character Reader & Text To Speech Conversion using Correlations & Speech Synthesis

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Abstract— In the modern era of image processing, recognizing content or information from an image is process of electronic conversion into machine encoded text. Advanced systems that are capable of producing high accuracy for multi-font recognition are now becoming commonplace, and with the support of digital consent formatting. Some programs are able to retrieve formats that are very close to the original page including images, columns, and other non-text items. Proposed system is able to recognize text from an image and convert it into editable text along with speech conversion. System uses Correlation model for OCR (Optical Character Recognition) and Speech Synthesis for TTS (Text To Speech) conversion. Correlation is a measurement of the similarities between two similar objects such as the predefined alphabets and recognizing a combination of those alphabets from an image. Speech synthesis is an artificial expression of human speech. The computer program that has been used this feature is called a speech computer as well as speech synthesizer that can be implemented on the basis of software or hardware primitives. The text-to-speech system (TTS) converts a standard language text into a speech; some programs provide figurative language presentations such as typed text in speech. System is capable enough to acquire high level of accuracy with less false recognition.

Keywords— OCR, TTS, Speech Synthesis, Correlation Model, Machine Encoding, Image Processing.

I. INTRODUCTION

The OCR and TTS visual system based on low vision include: image acquisition module, used to scan the object, as well as image acquisition and removal; the processing module, which includes the OCR character recognition unit, is linked to the image acquisition module and is used to obtain the image and to increase the recognition and recognition of a single character in the image, in order to find the text file associated with the image; a TTS engine unit,

linked to an OCR character recognition unit and used to convert a text file into an audio file; and an output module, which is linked to the processing module and is used to output the text file and audio file respectively. The low-vision learning aid system combines OCR and TTS technology, image acquisition module scans a readable image and captures the module, processes the image, and finally modes the text and associated audio, thus providing the user with a way of learning where listening plays. The main role and gaze play a secondary role, thus achieving the benefits of using simple eye fatigue and reducing it. Compared to the application for obtaining audio for customized audio files, Speech Engine TTS has only a few million sizes, does not require a large number of audio files, can therefore save a huge amount of storage space, and can read aloud even if an unknown statement is in advance. These TTS software applications have to monitor the phone functionality, such as that some broadcasting methods can be used to read a novel or read testimonials, can also read aloud an email, some electronic dictionaries can read a word, and can be used by the Help Center and automatically play information about services etc [1].

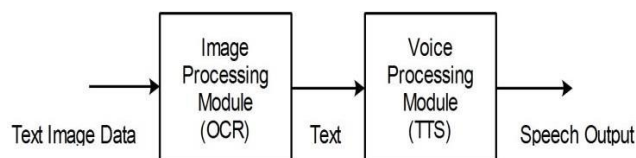


Fig. 1. Process Model

A low-vision visual based OCR and TTS-enabled design learns a program that facilitates vision and is integrated with OCR character recognition technology and TTS speech recognition technology, with image capture module

scanning and image collection, by processing a module image compiled for processing, and finally by using the same display module for reading text that emits compatible audio frequency, thus being read to be professional, the user's visual aid reading method reaches the listener. dried, white line, with black written characters, eye-catching pattern, reduces eye strain, achieving the result that a low-level visual patient, presbyopia crowd and and blind users complete the reading.

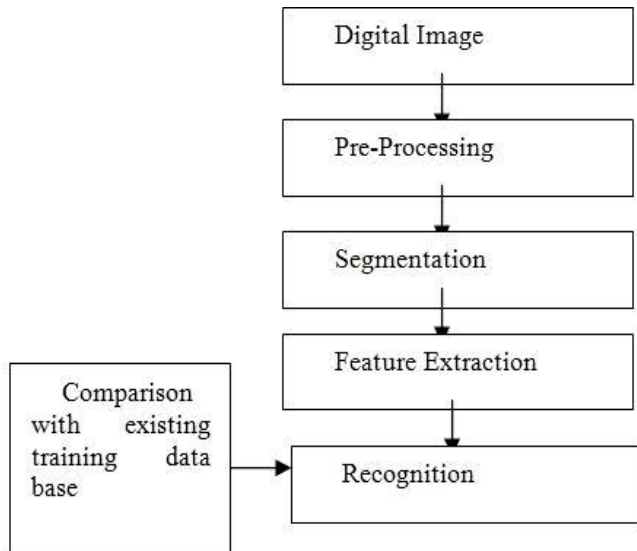


Fig. 2. OCR Components [2]

OCR word recognition unit, linked to image caption module, image acquisition, semantic image input and individual character spacing, find image caption matching image description.

II. RELATED WORKS

A. Related Works

Sneha.C.Madre [3] et al. proposed a system which is based on traditional OCR approach that directly segments the image. This paper shows the actual effort of the text being extracted from the image using Optical character recognition and the known character is converted to sound using the MATLAB environment. This suggested application is cost-effective, efficient and real-time. For this system, read the text in a text, newspaper, E-mail. This program can also be beneficial to people with visual impairments. And the interesting fact is that I'm trying to create a single hardware space where it's MATLAB. But the system can be installed and can be carried everywhere easily. The main purpose of this program is to meet the needs of Hand-Managed people and can interact with people who do not understand sign language. The TTS system can also be used in domain-specific programs such as train announcements. Shimona Gupta [4] et al. proposed a system which is based on Adaptive Neuro Fuzzy Inference System (ANFIS). This paper provides an automated system for finding text in a picture, dividing lines and letters and extracting individual character traits that can be used for character recognition followed by speech structure. In the pre-processing part the image is expanded, filtered and converted to a gray image to facilitate additional work, after

pre-processing, the pre-processed image is activated when the text is found in the image and the lines and characters are removed. The morphological function is used to locate the text in the image. Linear segmentation was performed using the Y histogram and character removal was performed using the BoundingBox property of the linked component analysis. The feature release is the start of a debugging module. Zoning process is used for character extraction of characters; the features of the feature released are provided by the Adaptive Neuro Fuzzy Inference System for character identification that gives the character its identity and transforms it into speech. The overall accuracy achieved for this program is approximately 92.9%.

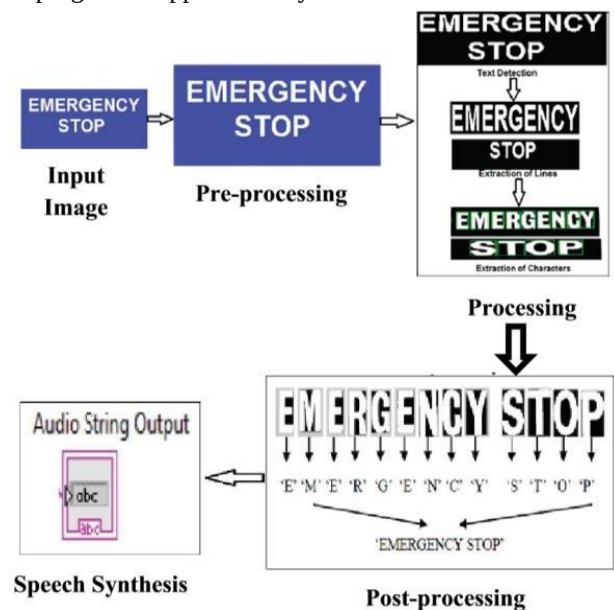


Fig. 3. Overview of the System [4]

Mullani.J.J [5] et al. proposed a system which is based on LABView approach which is Microsoft speech conversion software. This work introduces the OCR based Speech Synthesis System to produce record yields that can be used as a direct means of communication between people. The framework is available in the Lab section to review 7.1. There are two phases of the framework initially by the OCR and then the second by Speech Synthesis. In OCR printed or embedded in character databases it is scanned and the image is acquired using LabA's IMAQ view and then the characters are identified using the classification and composition techniques done in LabVIEW. The content acquired in the Insecon section is converted into speech. The ACTIVE X inferior Communication bed is used to trade information between applications. ActiveX's new design provides a general model in text conversion that different programming languages can operate at different stages. Nidhi Kalidas Sawant [6] et al. proposed a system which is based on Support Vector Machine. In this paper, the method presented provides text on the speech translation of the Devanagari printed machine using OCR. As can be seen from the results we get the Optical Character Recognition correctly using the multiclass SVM classifier. The classifier gives the result of a text stored in a notepad and is also converted into a speech output. This applies to images or documents scanned with a printed Devanagari script. Abhishek Mathur [7] et al. proposed a system which

is based on AI-OCR, An AI-based learning system that uses OCR is an artificial learning system produced using smart phone cameras integrated with OCR (Optical Character Recognition). The program captures the text using the camera and scans the text and converts it to a digital text visualized by the program and displays the translated text and gives a speech effect. To understand the power of a project, a basic idea of what AI and OCR is required. This report describes all the functionality of the Language Translator, as well as a few requirements for using it. Therefore, a visually impaired person can easily use this AI-based learning program as a simple application friendly across the globe.

III. PROPOSED WORK & IMPLEMENTATION

Proposed system is based on correlations and speech synthesis models where OCR recognizes the words effectively with high precision rate along with correct text to speech conversion. System is efficient for separating two closely spaced characters. System pre-processed the data using scaled color mapping with binary thresholding for better recognition then process the model with correlation for recognizing characters from the images and then apply speech synthesis for test to speech conversion effectively. There are two main approaches that system used i.e. Correlation and Speech Synthesizer. Where, correlation is a basic operation that we perform to extract information from images. Correlation is an image processing model which is also known as a filtering technique for enhancing image and detecting edges from an image. It is also useful for image compression, color correction, object recognition & image segmentation. It accepts certain frequencies and rejects the other frequencies for removing background and highlighting the foreground objects. Correlation is a measurement of the similarities between two similar objects such as the predefined alphabets and recognizing a combination of those alphabets from an image.



Fig. 4. Predifined Alphabets



Fig. 5. Recognizing String

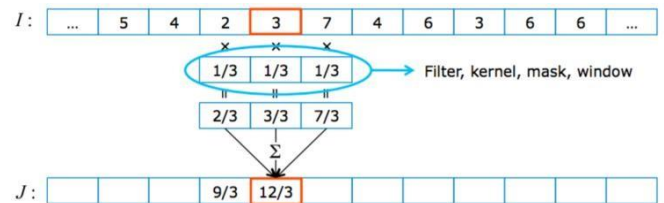
Fig. 4 & 5 both are from similar family but one is the predefined or universal group and another one is composite string that may be a dictionary words or may not.



Fig. 6. Correlation Module

It is an averaging filter and its boundary conditions are –

- Ignore filtered values at the boundaries
- Pad with zeros
- Pad with first/last image values



$$F \circ I(x) = \sum_{i=-N}^{N} F(i)I(x+i)$$

Where $\circ$ (circle) denotes correlation, F has $2N+1$ element with $-N$ to N limit and $F(0)$ is the center element. Gaussian blur as common practice –

$$\text{Log}(x, y) = -\frac{1}{\pi\sigma^4} \left[1 - \frac{x^2 + y^2}{2\sigma^2} \right] e^{-\frac{x^2 + y^2}{2\sigma^2}}$$

The value of σ is 1 for 3×3 matrix and 2 for 5×5 matrix, (x, y) are native pixels.

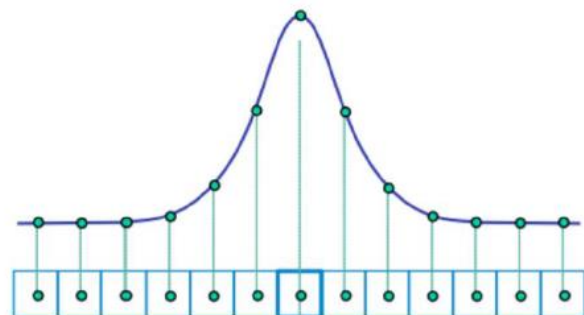
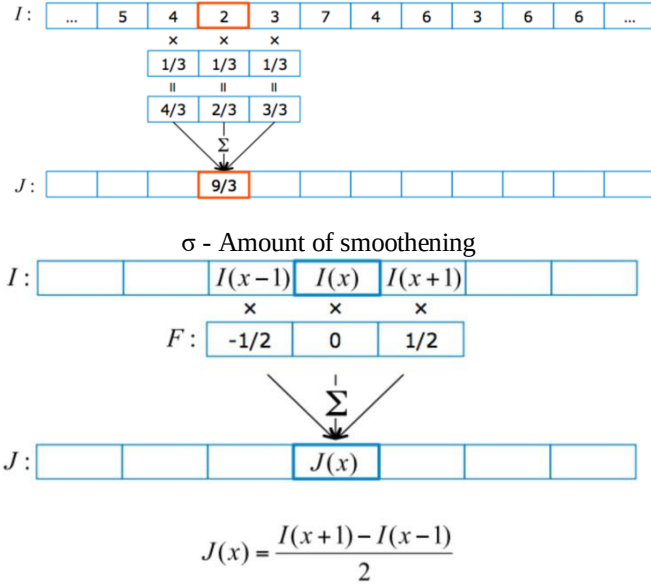


Fig. 7. Normalized Gaussian Filter

Effect of Correlations over an image that highlighted the active frequencies and masks the background and may extract these characters.

A. Correlation Model

Correlation is the process of moving a filter mask that is often referred to as a kernel over the image and calculating the number of products in each area. Integration is a function of filter migration. In other words, the first value of the connection corresponds to the total removal of the filter, the second value corresponds to the single displacement unit, and so on.



B. Speech Synthesis

Speech synthesis is an artificial expression of human speech. The computer program that has been used this feature is called a speech computer as well as speech synthesizer that can be implemented on the basis of software or hardware primitives. The text-to-speech system (TTS) converts a standard language text into a speech; some programs provide figurative language presentations such as typed text in speech. The text-to-speech system (or "engine") is made up of two parts: the front end and the back end.

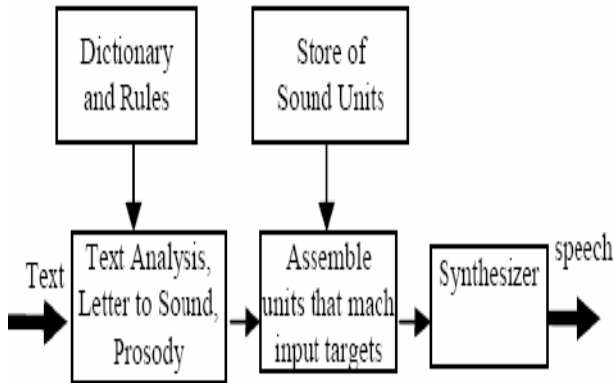


Fig. 8. Block Diagram of Speech Synthesizer

The front-end has two main functions. First, it converts raw text containing symbols such as numbers and abbreviations into the same word and text. This process is often referred to as text typization, pre-processing, or embedding. The front-end then assigns phonetic writing to each word, then splits and tags the text into prosodic parts, such as phrases, phrases and sentences. The back-end is often called a synthesizer and turns the symbolic language representation into sound.

C. Correlational & Speech Synthesizer Algorithm

Input: 2-D Image Matrix

Output: Convolutional Matrix

Step 1: Input 2-D Image Matrix

Step 2: Convert 2-D Image Matrix to Gray Levels with Scaled Color Mapping

Step 3: Thresholding the Gray Scaled Image to Binary Codes

Step 4: Initialize Correlation Function F

$$F \circ I(x) = \sum_{i=-N}^N F(i)I(x+i)$$

Where o (circle) denotes correlation, F has 2N+1 element with -N to N limit and F(0) is the center element.

Step 5: Apply Gaussian Filter

$$\text{Log}(x, y) = -\frac{1}{\pi\sigma^4} \left[1 - \frac{x^2 + y^2}{2\sigma^2} \right] e^{-\frac{x^2 + y^2}{2\sigma^2}}$$

The value of σ is 1 for 3x3 matrix and 2 for 5x5 matrix, (x, y) are native pixels.

Step 6: Convert extracted optical character to speech synthesis i.e. grapheme-to-phoneme

$$P_{\theta}(x) = \sum_{t=1}^T p(x_t | x_1, \dots, x_{t-1})$$

$P_{\theta}(x)$ is phonetic parameter, t-T is the time domain, $p(x_t | x_1, \dots, x_{t-1})$ is the frequency domain with respect to time.

Step 7: Plot energy signal for phonetic time-freq domains

Step 8: End

C. Flow Chart

In flow chart, first of all a 2D image matrix has to be browsed and input for preprocessing the data. Then it will convert it into gray levels as scaled color mapping and segment the image by binarization. Then Correlation filter has been applied once the frame is pre-processed. Then Gaussian filter has been applied for proper smoothing the data for background elimination then optical character can be extracted and speech synthesis can be applied for text to speech conversion.

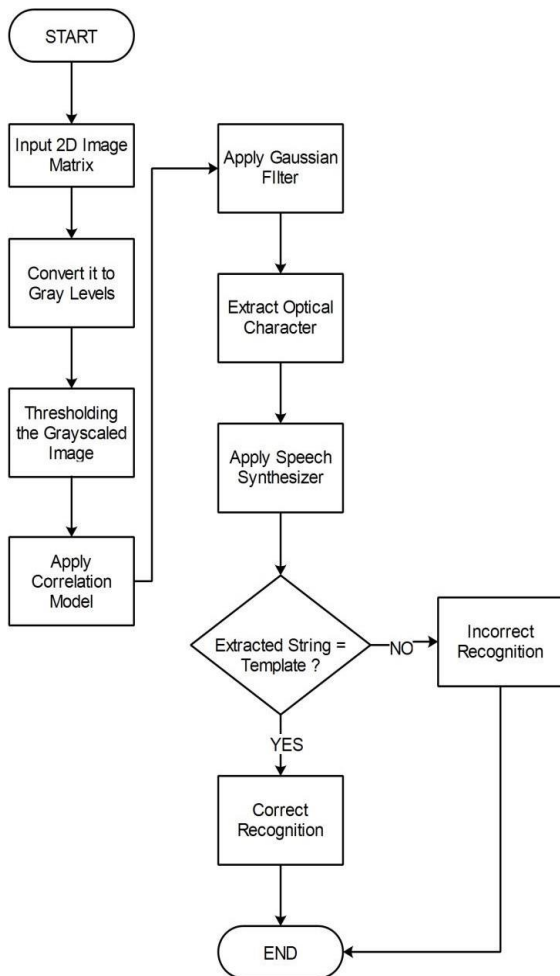


Fig. 9. Flow Chart

IV. RESULT ANALYSIS

A. Result Simulation

There are total no. of 52 frames have been tested and results are obtained accordingly. If a system is able to recognize character that matches with the template then it will be considered as correct recognition otherwise it will consider as incorrect recognition. System obtained 49 correct recognition attempt and 3 as incorrect recognition. So, the accuracy has been computed on the basis of correct recognition and incorrect one which is 94.23 %.

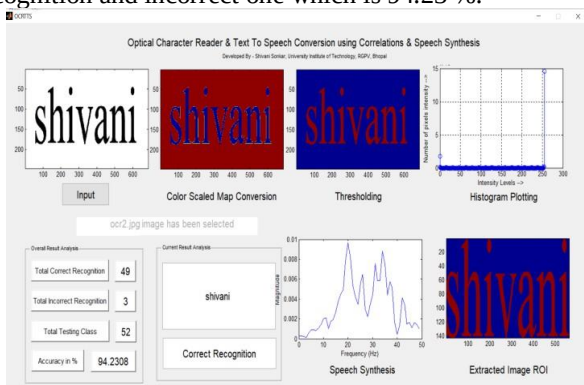


Fig. 10. Proposed GUI

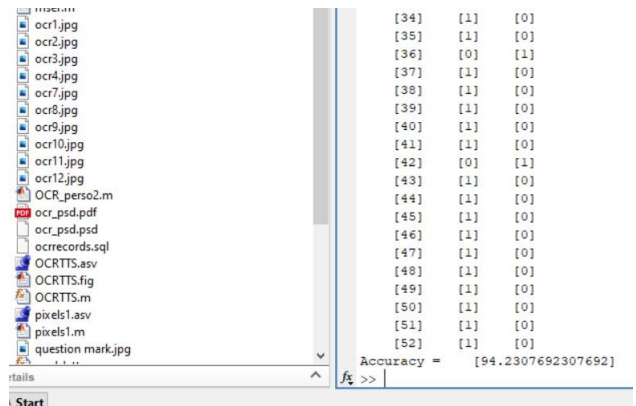


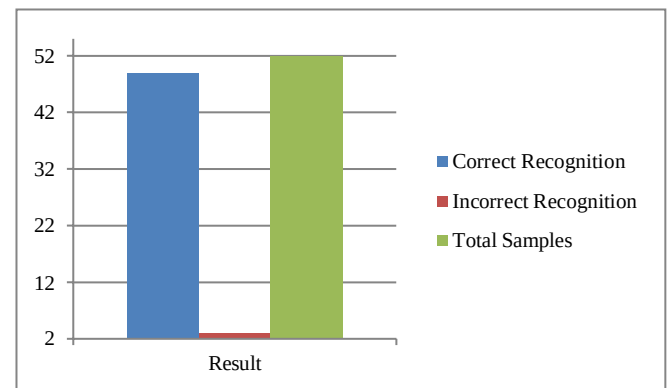
Fig. 11. Simulation Result

Fig. 10 shows the graphical user interface of the proposed system with all pre-processing modules and approaches that have been applied over that. Fig. 11 shows the console result of the system that acquired 94.23 % of accuracy on the basis of 52 testing samples with different font, color, background, noisy image and many more. The obtained outcome is better than the previous one with less false recognition rate.

Table No. I Result Comparison

	Tatulea, Paula [21]	Proposed
Method	Adaptive Neuro Fuzzy	Correlation and Speech Synthesizer
Target Language	English	English
Error Rate	7.10	6.77
Accuracy	92.9	94.23

Graph I Result Analysis



V. CONCLUSION & FUTURE SCOPE

The systems which have been proposed till now are not reliable because those systems are not efficient to extract the useful information. The information is missing the sensitive edges that trail the accuracy in order to achieve the correct recognition. The proposed system is capable enough to efficiently recognize the optical characters with text to speech conversion at real time with high level of accuracy. System uses correlation model and speech synthesizer for

implementing the approach for better enhancement of the system. Accuracy is very important with respect to the correct and incorrect recognition for better outcomes. The technique can be enhanced in future where accuracy depends. Machine learning approach can be used in future for better analysis.

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