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Review Paper on Real Time Hindi OCR on Android

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Abstract: Human-computer interaction increasing day by day. There are several ways of interaction with the computer. Handwriting has continued to persist as a means of communication and recording information in the day to day life even with the introduction of new technologies. Due to the growth of technology in India, it becomes important to devise ways that allow people to communicate with computer in Indian languages. Hindi character recognition is the basically conversion of scanned images of hand written text into machine encoded text. This kind of conversion we are implementing on real time Android operating system using PHP and MATLAB Script with HMM model technique. In this project various image pre-processing, features extraction and classification algorithms have been explored and compared, to design high performance Hindi OCR on Android with high accuracy of percentage up to 95% with handwritten.

Keywords- OCR; HMM for recognition; MATLAB; PHP; Android

I. INTRODUCTION

Most OCR systems are developed for text recognition from scanned document images. However, recognition of low resolution text is quite interesting due to wide range of applications and occurrence of low resolution text in screenshots, images and videos. For example, recognition of screen rendered text can facilitate dictionary or language translation tools [1] to provide meanings or translation of text from screen-shots of documents or web images. OCR have very wide applications as a telecommunication aid for the deaf, postal address reading, direct processing of documents, foreign language recognition etc. This problem has been explored in depth for the Latin script. However, there are not many reliable OCR software available for the Indian language Hindi (Devanagari), Hindi is third most spoken language in the world. The objective in this project is to design high performance OCR software for Devanagari handwritten script on android operating system that can help in exploring future applications such as navigation, for ex. traffic sign recognition in foreign lands etc.

In general, handwriting recognition are classified in to two offline recognition and online recognition, taking the actual need of application in to consideration, our study is only aims at online character recognition in Hindi.

II. HMM

Hidden Markov Models (HMMs) have been successfully used in continuous speech, handwritten and cursive script text recognition tasks [3], [4]. The advantage of HMMs in cursive or handwritten text recognition is to recognize connected characters without segmenting them into smaller units. As segmentation of low resolution text is hard due to anti-aliasing, therefore we evaluate HMM based techniques on this specific task. HMMs are statistical models in which system being modeled is considered as a Markov process that have unobserved or hidden states [6]. In a Hidden Markov Model, state is not directly visible but it is associated with a probability distribution over all possible output values. Each state is associated to an input pattern and is modeled by a probability distribution function (pdf). All the experiments for building HMMs are done using Hidden Markov Toolkit (HTK) [7]. HTK is a portable toolkit that is preliminary developed for building speech recognition systems and is also used for optical character recognition tasks. HMMs can model the variability of underlying data as function of one independent variable. In speech processing systems, time is the natural independent variable but in case of images which have 2 dimensions horizontal axis has been taken as an independent variable by most of researchers. A text-line can be considered as sequence of characters and each character can be represented by a sequence of features or observations. After height normalization and feature extraction, as described above, recognition process searches for character models or a sequence of character models that has the highest probability of having generated the given sequence of feature vectors. This search process requires trained character models, a possible word lexicon or dictionary, and a statistical language model.

III. LITERATURE SURVEY

1) One of the methods is template matching which is executed in the optical character recognition (OCR) step of the automatic number plate recognition (ANPR) system by **Abdul mutholib** in paper **Optimization of ANPR Algorithm on Android Mobile Phone.** In previous researches, many researchers are used a high end desktop PC and high resolution

camera to implement the ANPR system. In this paper, the optimization of ANPR algorithm on limited hardware of Android mobile phone is presented. First, various steps to optimize ANPR and OCR block using template matching are described. Our proposed algorithm was based on Tesseract library. For comparison purpose, the template matching based OCR will be compared to Artificial Neural Network (ANN) based OCR. The optimization on ANPR was performed as currently there is no image processing tool available on the standard Android mobile phone. By optimization of ANPR, many advantages could be achieved, such as higher recognition accuracy, less resource consumption, and less computational complexity.

This paper has presented the optimization of template matching for ANPR which is implemented on Android mobile phone. This optimization is only designed for the identification of Malaysian number plates and the system is evaluated over 30 images captured using Android mobile phone's camera. Results showed that the accuracy of the proposed optimization is around 97.46% while the processing time is around 1.13 second. The original ANPR was compared with the optimized ANPR using template matching and ANN. The additional overhead for optimization is negligible compare to the higher recognition rate achieved. Further study could include redesign the proposed algorithm for multinational car license plates and optimize the recognition process.

Fig. 1 ANPR recognition result shown on Android mobile phone

2) Offline handwriting recognition has become one of the hottest in the direction of field of image processing and pattern recognition. It can transform any handwriting to plain text files and it use in cheque recognition, mail sorting, and text recognition for blind and so on. **Zhu den** and **chen Xu** tells about the recognition with back propagation (BP) neural network in **The recognition of handwritten digit based on BP neural network And Implementation On Android.** In this they had done principle component analysis (PCA) for feature extraction purpose. By which they can improve neural network. And then finally after checking the final recognition rate this algorithm is applied to android operating system.

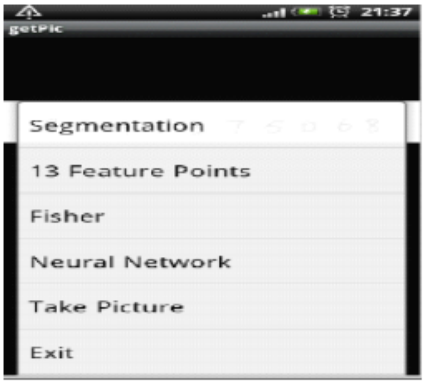

Fig. 2. Recognition by methods

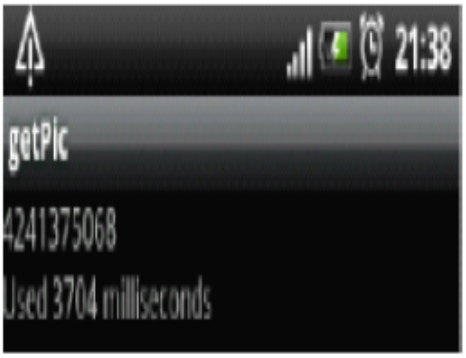

Fig 3. Recognition Result

All kind of image preprocessing is have to be done for feature extraction, by which it can beer low pixel size too. And gives better readability, Its not online method to recognise pattern or digits or alphabets.

3) Again in **OCR-Based Neural Network for ANPR** by **Xiaojun Zhai** tells Optical Character Recognition (OCR) is the last stage is an Automatic Number Plate Recognition System (ANPRs). In this stage the number plate characters on the number plate image are converted into encoded texts. In this paper, an Artificial Neural Network (ANN) based OCR algorithm for ANPR application is presented. A database of 3700 UK binary character images have been used for testing the performance of the proposed algorithm. Results achieved have shown that the proposed algorithm can meet the real-time requirement of

an ANPR system and can averagely process a character image in 8.4ms with 97.3% successful recognition rate. The statistical classifiers can be divided into two sub-classes: single stage classifier and multistage classifier. In the work presented in [10], character features are extracted from the elastic mesh, and the entire address character string is taken as the object of study. This was tested using Japanese NPs and the Support Vector Machine (SVM) integration uses the features to recognise numbers, Kana (Japanese script), and the strings of characters that represent the area. The recognition rates for numbers, Kana and strings of characters are 99.5%, 98.6% and 97.8% respectively. In [8], a two-stage hybrid OCR system is presented to improve the recognition rate. It firstly uses four statistical sub-classifiers to independently recognise the input character and then the results are combined using the Bays method [13]. Secondly, if the recognised character from the first stage belong to the sets of ambiguous characters.

4) **Sheikh Faisal** and **Rashid Faisal Shafait** In the paper **An evaluation of HMM-based Techniques for the Recognition of Screen Rendered Text** Segmentation and recognition of screen rendered text is a challenging task due to its low resolution (72 or 96 ppi) and use of anti-aliased rendering. This paper evaluates Hidden Markov Model (HMM) techniques for OCR of low resolution text–both on screen rendered isolated characters and screen rendered text-lines–and compares it with the performance of other commercial and open source OCR systems. Results show that HMM-based methods reach the performance of other methods on screen rendered text and yield above 98% character level accuracies on both screen rendered text-lines and characters.

5) **Mohamed Attia, Mohsen A. A. Rashwan, Mohamed S. M. El-Mahallawy** In the paper of **Autonomously Normalized Horizontal Differentials as Features for HMM-Based Omni Font-Written OCR Systems for Cursively Scripted Languages**. It explain that font-written Optical Character Recognition (OCR) is highly desirable for numerous modern information technology (IT) applications. over Reliable font-written OCR's for Latin scripts are readily in use since long. For cursively scripted languages, that are the mother tongues of one fourth of the world population, such OCR's are however not available at a robust and reliable performance. In this regard, the main challenge is the mandatory connectivity of characters/ligatures (i.e. graphemes) that has to be resolved simultaneously upon the recognition of these graphemes. Among the various approaches tried over decades, Hidden Markov Models (HMM)-based OCR's seem to be the most promising as they capitalize on the ability of HMM decoders to achieve segmentation and recognition simultaneously similar to
the widely used HMM-based automatic speech recognition (ASR). Unlike ASR's, what is missing in HMM-based OCR's is the definition of a rigorously founded features vector capable to robustly achieving minimal "font type/size-independent" (omnifont) word error rates comparable to those realized with Latin scripts. Here comes the contribution of this paper that introduces such a sound features vector design.

6) **Ying Wen** and **Yue Lu** In the paper of **An Algorithm for License Plate Recognition Applied to Intelligent Transportation System** algorithm for license plate recognition (LPR) applied to the intelligent transportation system is proposed on the basis of a novel shadow removal technique and character recognition algorithms. This paper has two major contributions. One contribution is a new binary method, i.e., the shadow removal method, which is based on the improved Bernsen algorithm combined with the Gaussian filter. Our second contribution is a character recognition algorithm known as support vector machine (SVM) integration. In SVM integration, character features are extracted from the elastic mesh, and the entire address character string is taken as the object of study, as opposed to a single character. This paper also presents improved techniques for image tilt correction and image gray enhancement.

IV. COMPARATIVE STUDY

S.N.	TITLE	EXTRACT OF THE PAPER	ON/OFF LINE DETECTION	THE TECHNOLOGY AND ALOGORITHM USED	SOLVE PROBLENM OF RECOGNITION
1.	Optimization of ANPR Algorithm on Android Mobile Phone	ANPR algorithm is used for recognition by OCR block template matching technique.	Offline	Artificial Neural Network (ANN)	Yes
2.	The recognition of handwritten digit based on BP neural network And Implementation On Android	the recognition with back propagation (BP) neural network, in this recognition all method implemented	Offline	BP, neural network, PCA, thirteen feature, fisher discernment	Yes

3.	OCR-Based Neural Network for ANPR	(ANN) based OCR algorithm for ANPR application is presented in support with SVM.	Offline real time	Artificial Neural Network (ANN) & Support Vector Machine (SVM)	Yes
4.	An evaluation of HMM-based Techniques for the Recognition of Screen Rendered Text	HMM techniques for OCR of low resolution text–both on screen rendered isolated characters and screen rendered text-lines–and compares it with the performance of other commercial and open source OCR systems.	Offline	Hidden Markov Model (HMM)	Yes
5.	Autonomously Normalized Horizontal Differential as Features for HMM-Based Omni Font-Written OCR Systems for Cursively Scripted Languages	OCR's is the definition of a rigorously founded features vector capable to robustly achieving minimal "font type/size-independent" (omnifont) word error rates comparable to those realized with Latin scripts	Offline	Hidden Markov Model (HMM)	Yes
6.	An Algorithm for License Plate Recognition Applied to Intelligent Transportation System	This paper has two major contributions. One contribution is a new binary method, i.e., the shadow removal method, which is based on the improved Bernsen algorithm combined with the Gaussian filter	Offline	Support Vector Machine (SVM)	Yes

V. CONCLUSION

Each scheme mentioned above except all OCR techniques suffer from time lack offline detection reports. That all time of recognition, accuracy and precision is solved by all response based schemes. Future work is to comparatively analyze the simulations of reviewed techniques on basis of various parameters like recognition time, precision and accuracy.

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