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An investigation on feature and text extraction from images using image recognition in Android

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ABSTRACT

In today's era, there is a huge rise in demand for the data and information available in a printed medium. To resume time, cost, and energy, we have been developing numerous technology. One of them, convert JPG, JPEG, or PDF softcopy into text, this process calls Text extraction. Identification of characters and detection of words and texts is again an upfront challenging task. This paper is focused on an investigation of feature and text extraction from images using image recognition in Android. In this era of Research and Technology, Image processing has become one of the most critical fields. Using a number of researchers' papers, we are going to study appropriate methods or algorithm, their accuracy, a key feature of each paper. All research papers going to study in the context of Android technology.

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1. Introduction

The technologies that currently exist for text extraction, have a limitation that text extraction is possible against clean backgrounds only. Henceforth, we need such a system that can extract text from general backgrounds. There are numerous applications where text extraction can be applicable for various useful applications such as digital libraries, information retrieval systems, Geographical Information systems, Multimedia Systems. The primary task for text detection is to discover the image regions consisting only text that can be fed into an Optical Character Reader module for recognition or directly highlighted to the user [1].

Each time humans study every other word, our eyes and brain take outside optical character recognition routinely at ways that generally seems to become relegated for people. We comprehend many algorithms, methods or techniques like Artificial Neural Network (ANN), Automatic number plate recognition (ANPR), Binarization technique, Canny's edge map, Adaptive Thresholding, Kohonen Algorithm, Neural Network, stroke width transform

(SWT) approach, Adaptive Thresholding, and histogram of projection have been using for Text Extraction [2]. Text extraction is developed in Machine Learning Algorithms & using embedded systems also but there is a new area of research [3,4].

Fig. 1 shows, two options are available. Either user can capture the images or borrow from mobile gallery. After that on input images, pre-processing will be occurred, with use of API or Proposed algorithm images or PDF will be converted in to final result.

2. Literature survey

In January 2013, Divakar Yadav, Sonia Sanchez-Cuadardo and Jorge Marato, developed text extraction from images for Hindi language using Artificial Neural Network. Even the pre-processing tasks are employed from the literature for assorted considerations like the transformation of grey colored pictures in to binary graphics, correction of images, along with segmentation of this textual substance of this record to lines, columns, provisions, and also at the additional degree of the basic logos. The Fundamental symbols got because the basic component for your segmentation procedure are known from the neurological classifier. Authors have found that the input matrix of size 48×57 gives better results than others with application of different methods such as Featured

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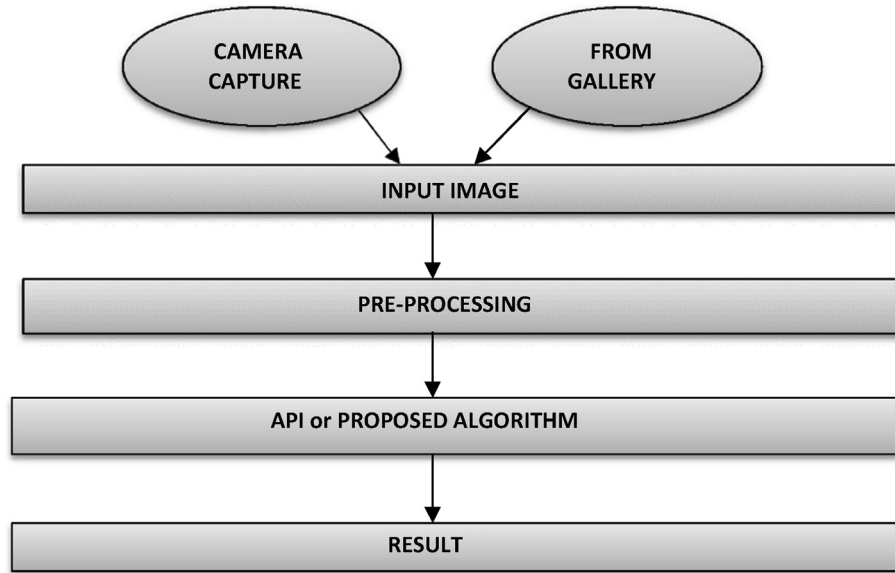


Fig. 1. Text Extraction Flow.

Extraction Methods, Classification Tools using Artificial Neural Network. As a result, it is found that optical character recognition with the real Hindi document is quite higher than others. In this experiment a test set of 77 characters of five different types of fonts is used and characters have been enclosed in a bounding area of a set scale. While that might not necessarily be the case, focus is drawn to the reality that pure form-based acknowledgement does not always work well. Various font families reflect the same character differently and the interaction of related characters differs from font to font. Such early work has allowed us to concentrate our efforts on these topics. Issues for developing effective character recognition may be examined. In Accordance with the literature additional prospective enhancement will work with dictionary of phrases to fix the output [5].

In November 2013, Abdul Mutholib, Teddy S. Gunawan, Jalel Chebil, Mira Kartiwi proposed Optimization of ANPR Algorithm on Android Mobile Phone. In this paper for optimization of template fitting, ANPR has been executed and also shown on mobile phones. An optimization was created just for identification of Malaysian number plates and also the machine will be assessed within 30 pictures that are captured utilizing an Android cell-phone's digital camera. The precision accomplished from the projected optimization is 97.46% and also the processing period is somewhere around 1.13 min. Utilizing template fitting and ANN, the initial ANPR was contrasted with all the optimized ANPR. The greater popularity speed accomplished, at which the extra overhead for optimization is more minimal. Redesign of this suggested algorithm is employed for multi-national vehicle license plates and also maximize the recognition. The procedure can possibly be comprised in additional examine. Even the ANPR technique performs in five measures: image acquisition, picture preprocessing, number-plate localization, character segmentation, and optical character recognition (OCR) to comprehend that the respective character using the assistance of a database preserved for every single character. Since we all can catch just the number-plate working with an Android cellphone's camera also gets rid of the number-plate localization measure. ANPR can be a smart device that's eliminating the demand for individual participation. It succeeds to truly own a top accuracy level. You can find quite a lot of factors which are crucial for obtaining a top precision of this range plate recognition. By way of instance, daily time, climate, and angles and also the permit

plates. Android is now an extremely favorite portable operating platform plus gets got the ability to match all those factors. Android delivers an open development environment that's made to the open-minded Linux kernel. Obtaining the components tools is currently offered to any or all software throughout the API libraries. The native and third-party applications are assembled together using the very exact APIs and implemented at an identical time period. Programmers may remove and Substitute virtually some other Indigenous program using another programmer Substitute [6].

In March-April 2014, Savita Borale, Minal Thobde, Reshma Hore, Shraddha Shinde, presented Adaptive thresholding method for Text Extraction. Different methods used such as Text Stroke Edge Pixel Detection, Contrast Image Construction, Local Threshold Estimation, Noise Detection and Post Processing which are good for handling different types of degraded images. Authors have also found the F-measure of the different methods like Adaptive thresholding for maximum and minimum, Adaptive degraded documented method, Adaptive logical method, Bensen's Adaptive Method, Savoula's Adaptive Method, and Otsu's global Method [7].

In January- 2015, Mayuri B. Gosavi, Ishwari V. Pund, Harshada V. Jadhav, Sneha R. Gedam, have used the Kohonen Algorithm to Extract Text from Different Images using Android with neural networks. For first, the text area is checked properly, then the characters are segmented. After this preprocessing is completed, the image is extracted. So it is eventually recognized in the course of recognition. Then the English text will be translated to Marathi language in the translation process. Neural networks have been introduced to recognition patterns and various classification. They applied a number of steps like Scanning, Segmentation, Pre-processing, Feature Extraction, Recognition and for boundary detection, they used neural networks. In the generalized scenario, the neural network training process falls within the categories of supervised training that is carried out by supplying the neural network with a sample data set. The most common form of neural network training is supervised training and this is mainly meant for individuals who are unable to interpret text documents of any type. This utilizes smart cell phones on the Android network [8].

In February 2016, Akshay Parwar, Akansha Goverdhan, Apurva Gajbhiye, Prajcta Deshbhratar, Roshan Zamare and Prasanna Lohe took help Tesseract Algorithm to Extract Text from Different

Images using Android. They applied number of steps like Load Image, Process Image, Crop Image, Extract Text, finally text can copy or speak. if the user cannot read the text properly so the user can select the speak option to listen to the extracted text. With Tesseract the text is extracted from captured image or saved image [9].

In September 2016, Miss. Pooja Chavre, Dr. Archana Ghotkar, worked on the real-time problem, an application called “travel mate” has been planned and built in this paper. Extraction process is done using the stroke width transform and connected component-based strategy here. Code introduced it supports visitors when travelling in foreign countries. Researchers have used different methods for implementation, stroke width transforms, scene text extraction, connected component, cluster connected component, scene text recognition and translation, android app name ‘travel mate’ for extraction with the use of stroke width transform and connected component-based approach. The proposed SWT is capable of extracting text components from the image of the event. This extraction is done using a stroke width transforms (SWT) approach and study of the connected component. SWT is an image operator that determines the width of the most possible stroke containing the pixel for each pixel. Scene text extraction is a new area of study in the world of computer vision. The difficulty in the information management area is primarily attributed to the various styles of text patterns such as fonts, colors, proportions, orientations; and the prevalence of contexts identical to text characters such as windows, bricks. It’s useful to distinguish text from the other aspect of the scene. Stroke can be described as a continuous unit with almost constant duration. The system output is evaluated on the basis of the extraction rate. Nearly all text in horizontal for the planned application direction extracted right, thus real-time output the images differ with the lighting situation and the resolution of the sensor [10].

In May 2016. Soumen Bhowmik, Alope Kumar Mondal, compared various techniques and methods of text information extraction in images. They compared Regional Based, Texture Based, Edge Based, and Morphological Based Technique. The performance evaluation of this technique is based on precision and recall rate. According to the authors, there is no single method available, which can provide satisfactory performance in all the applications due to the large variations in character font, size, texture, color etc. Performance assessment and comparison of the different text extraction techniques addressed in this paper. Morphological Based has the highest Precision rate (%) in this research paper [11].

In April 2017, G.R. Hemalakshmi, M. Sakthimanimala, J. Salai Ani Muthu proposed Extraction of Text from an Image and its Language Translation Using OCR, According to them, Researchers have applied number of steps like Scanning, Pre-processing, Segmentation, Feature Extraction, Recognition, Post Pre-processing and Generate PDF. Bind Translated API services used to translate words into known language. This Optical character recognition methods for converting text from foreign language text into a recognized language. The technology has the potential to identify characters with a precision approaching 90% of the limit. Good thing of the program is that it is conveniently compact and versatile, and can recognize number of languages and can help to convert text into multiple languages. Good recognition relies primarily on the essence and consistency of the content to be interpreted. There are three stages to this method. First Catch a photograph image of an unknown language that Adding text from pdf format Character recognition (OCR) technologies that’s utilized to extract text out of a hand written or printing. Second Utilize Tesseract open-source ocr, whereas the google API and also Bing API are employed for speech translation. 3.PDF format with translation text [12].

In 2017, Mohammadreza Nazar Ahari M, Vahid Ezzati Chahar Ghale, used various methods like Connected Components, Prepro-

cessing, Numbering, Noise Cancellation and Eliminating non-character connected components. Assessing spatial Subject One of Characters, Adapting algorithm. How Big advantage of This System Is It May be used for Pulling Brighter and Darker text Compared to Desktop Computer, at a Graphic at an Identical Moment [13].

In May 2018, Prasantha Pratim Bairagi worked on OCR for Hindi, applied different steps like Printed Binarized Image of a as a input, Extract the pixel information from image, find skeleton of that character based of pixel information and the last try to find out geometrical shape. Feature extraction process contains Detection of Horizontal, Vertical and Cross lines as well as curves and loops and simultaneously. Database has been prepared to store each and every character [14].

In October 2019, Muhammad Ahmed Zaki, Sammer Zai, Muhammad Ahsan, Urooba Zaki, used different methods Gray-scale Conversion, Binarization, Segmentation, Text Recognition, Display output also gives Accuracy Computation of all the method for accuracy. According to them Gray Scaling got the highest accuracy 98%. An accuracy is calculated from Recognition Rate(R). R has an Accurate Character of output divided by Total character; the answer is multiplying by 100. Here with Recognition Rate(R) is used for comparative study among different results.

In 2020, Prof. Vaibhav. V. Mainkar, Ms. Jyoti A. Katkar, Mr. Ajinkya B. Upade, Ms. Poonam R. Pednekar, developed an android application for editable handwritten text. Implementation of android application for character recognition is a wide area of research. As per OCR technology, it converts images into text. Here developers have focused on handwritten text and compared both text of handwritten and printed. OCR Algorithm is used for Image Acquisition, Preprocessing, Segmentation, Feature Extraction, Post-processing. Five important steps are followed consecutively, the first step is an Image assertion with the help of android cameras. In the second step the asserted images are going to be Load.

Third step is Image Preprocessing. Fourth is Image Extraction and feature extraction tasks. Where the fifth and final step is, conversion of recognized data into text format using OCR technique. After the final output user can edit text and copy & paste into other formats. Research is carried out on two types of text, handwritten & printed. High accuracy is realized, with printed text. For handwritten various images of total 221 characters, from those recognized characters are 208. For printed text various images of a total 221 characters are used, from those recognized characters are 221. Accuracy of handwritten and printed text has respectively 94.12% and 100%. Handwritten output determines text that has to be written by the user. After working on the number of color and black & white images final accuracy is achieved of 90%. [15].

Table 1 shows Accomplishment of feature and Text Extraction. From this table, an individual may predicate, which algorithm or method acceptable as each demand.

3. Result and discussion

One problem has many solutions- it’s a very useful and challenging part of this survey cum investigation. Because when we have only one solution, we have no option. We have to manage with that solution. Here, with the use of twelve papers, we get an idea about past and one year ago work regarding feature and text extraction. After 2012, feature and text extraction work have been touch approximately 85% to 88% accuracy with the use of strategies and algorithms suggested earlier. Android is popular from the first day, so with the use of the android application, this investigation takes more authentic work. Suggested, Simple flow of text extrication is a key feature of survey cum investigation.

Table 1
Accomplishment of feature and Text Extraction.

Sr. No.	Year & Author	Method or Algorithm or Techniques	Accuracy	Key feature
1.	January 2013, Divakar Yadav, Sonia Sanchez-Cuadardo and Jorge Marato [5]	Artificial Neural Network (ANN), histogram of projection based on pixel value, histogram of projection based on mean distance, vertical zero crossing	90%	Adequate for extract features of distorted characters/symbols.
2.	November 2013, Abdul Mutholib, Teddy S. Gunawan, Jalel Chebil, Mira Kartiwi [6]	Automatic number plate recognition (ANPR)	97.46%	Lofty recognition accuracy, lower resource consumption, & lower computational complexity
3.	March-April 2014, Savita Borale, Minal Thobde, Reshma Hore, Shraddha Shinde [7]	Binarization technique, Canny's edge map, Adaptive Thresholding.	93.9%	Simple, robust and least parameter tuning
4.	January- 2015, Mayuri B. Gosavi, Ishwari V. Pund, Harshada V. Jadhav, Sneha R. Gedam [8]	Kohonen Algorithm, Neural Network.	95.67%	Facilely trained and having properties topological ordering & generalization
5.	February 2016, Akshay Parwar, Akansha Goverdhan, Apurva Gajbhiye, Prajkt Deshbhratar, Roshan Zamare and Prasanna Lohe [9]	Tesseract Algorithm	92%	Tesseract works in clean black text on solid white background, accuracy efforts in horizontal with text height being 20 pixels
6.	September 2016, Miss. Pooja Chavre, Dr. Archana Ghotkar [10]	Connected component analysis, stroke width transform (SWT) approach	88%	Output is available with windows & bricks images.
7.	May 2016, Soumen Bhowmik, Alope Kumar Mondal [11]	*Performance Evolution Paper	44% (Average)	*Performance Evolution Paper
8.	April 2017, G.R. Hemalakshmi, M. Sakthimanimala, J. Salai Ani Muthu [12]	Optical Character Recognition (OCR),	90%	It can translate text in various languages.
9.	2017, Mohmmadreza Nazaraharim, Vahid Ezzati Chahar Ghale [13]	Adaptating algorithm, eliminating non-character connected components, Noise Cancellation, Investigating spatial discipline among characters	99%	Output occurred in noisy & busy images with many character sizes
10.	May 2018, Prasantha Pratim Bairagi [14]	Detection of Horizontal words & lines, Vertical and Cross lines in curves and loops and simultaneously	99.45%	Here, prototype implementation Recognition accuracy is promising.
11.	October 2019, Muhammad Ahmed Zaki, Sammer Zai, Muhammad Ahsan, Urooba Zaki	Gray-scale Conversion, Binarization, Segmentation,	98%	Get an idea about Recognition Rate(R)
12.	2020, Prof. Vaibhav. V. Mainkar, Ms. Jyoti A. Katkar, Mr. Ajinkya B. Upade, Ms. Poonam R. Pednekar [15]	OCR Algorithm, feature extraction, pre-processing, post-processing, and segmentation.	90%	Handwritten text recognition

4. Conclusion & future work

The survey is carried out for an android application based on the Text Extraction procedure for the recognition of text from the images. Text extraction is a very useful process to reduce time for extraction of the data. This survey offers a comprehensive analysis of the numerous text extraction strategies and algorithms suggested earlier. Here, An Android Application Flow is exposed with the growing solution of its advantages and limitations. So from this paper we say that, although there are several numbers of algorithms and API available, there is no standardized solution that is suitable to all applications. It's depend on as per requirements. The future work hardly fully potent on emerging an algorithm for accurate and quickly text extraction from an image. In coming day, useful algorithms may extend it next level. Also, with more investigation, get more future predication of feature and text extraction.

CRedit authorship contribution statement

Brijeshkumar Y. Panchal: Conceptualization, Methodology, Writing - original draft. **Gaurang Chauhan:** Data curation, Visualization, Investigation. **Sandipkumar R. Panchal:** Writing - review & editing. **Urvashi M. Chaudhari:** Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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