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Handwritten Character Recognition Using SIFT Algorithm

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Abstract: *Image processing is the procedure which is used to process various images. In this work, text is extracted from the natural scene images. The natural scene images are those images which are seen daily. In the recent times various techniques has been proposed and among these character detection and make apply grouping on these detected characters for batter recognizing. The daily scene images can oriented on many angles due to which accuracy of text extraction can be reduced. In this work, improvement will be proposed using SIFT algorithm for batter reorganization. The simulation of the algorithm is performed in MATLAB and it is analyzed that proposed algorithm performs well in terms of PSNR, MSE and Accuracy.*

Keywords: *Character Recognition, SIFT, Handwritten*

1. Introduction

Traditional methods that involve the usage of paper and pen are still used by people to store important information even though several technological writing tools have been designed. However, storing and accessing these physical documents is very difficult [1]. Also, searching particular type of data from stored documents is very difficult. Thus, since these documents are not converted into digital form, lots of important knowledge is lost. The new technology has been designed which enables the users to manage the digital text instead of written text with the help of which it is easy to record, access, search and share it [2]. In the recent years, one of the most fascinating and challenging research areas of image processing and pattern recognition is the handwriting recognition. The automation process is advanced through this technology and also the interaction among humans and machines is improved to great extent. For minimizing the processing time and providing higher recognition accuracy, new techniques and methods have been proposed by various researchers. Generally, offline and online handwriting recognition are the two categorizations of all the handwriting recognition techniques can be classified [3]. A scanner is used to capture the writing and an image is provided once writing is completed. However, in the case of online system, the function of time and order of strokes are used to represent the coordinates of two dimensional coordinates. The offline mode basically includes all the printed or type-written characters. The process through

which the characters of a document can be recognized by scanning them from any surface is called the offline handwritten character recognition. The size of storage of scanned documents is huge and it is impossible to search, edit or maintain the content for several applications [4]. The process through which only the handwritten characters can be recognized is called online mode of recognition. Several means are used to capture and store the handwriting. Generally, along with an electronic surface a special pen is used in conjunction. As per the function of time, the two dimensional coordinates of next points are represented based on the mobility of pen across the surface. These coordinates are then stored as well. The popularity of online handwritten recognition is growing with the increase in usage of handheld devices [5]. The users can type on screen by handwriting on a pad through online handwritten recognition. The user and computer communication can be improved by applying online handwriting recognition. Comparably high recognition accuracy levels can be achieved by applying neural networks in offline systems. To perform handwriting recognition certain steps are followed generally. A scanned image is given as input by the recognition system in the initial step called image acquisition. Every image has its own specified format and is generated from a different source like camera, scanner or digital input device. The preparation of characters before giving them as input is done by performing certain changes through pre-processing [6]. The desired region of characters is extracted from the pictorial representation at first. Splitting of alphabets, scaling the segments to a fixed size and achieving the skeletal patterns by thinning the resultant character segments are the steps included within preprocessing. The recognition process is also furnished through the pre-processing step by thinning the alphabets and their skeletons before the extraction of their binary forms by applying several image processing techniques. The image processing techniques also help in cleaning and smoothing the scanned documents [7]. Since the neural networks need the inputs in the binary forms, digitization of segment grids is also done. The segments of character are then recognized in the following step by neural networks using the various network parameters provided by them [8]. For each node of the neural network that is designed to train those segments is then provided with each digitized segments available from total segmented grid. The system can recognize the characters once the network is trained for these segments. It is also possible to differentiate the characters that although look alike but are different [9]. Thus, it is possible to recognize the handwritten characters even when input characters are very close to the printed letters available in the input image.

2. Literature Review

Eko Hari Rachmawanto, *et.al* (2018) proposed a novel approach for the withdrawal of peculiarity and roundedness aspects on the basis of K-Nearest Neighbors (KNN) classifier for the recognition of handwritten characters [10]. Several image preprocessing steps like thresholding, noise sieving and cropping were utilized for the attainment of each handwritten character picture and this procedure also maximized the identification procedure. After this, features were extracted from every picture which was gone through the preprocessing procedure. Some features of retrieved picture like peculiarity and metric were also identified with the help of this approach. After the attainment of these aspects, a training process was executed for the grouping of features on all kinds of alphabet. In the subsequent phase, the KNN classification model was used for the classification of every alphabetical text. The experimental outcomes demonstrated that the projected approach achieved a precision rate of 85.38% for the identification of handwritten font.

Kartik Dutta, *et.al* (2018) proposed a novel customized CNN-RNN amalgam framework [11]. The main objective of this approach was the execution of effectual training with the help of competent initialization of system through artificial information for pertaining, picture normalization for incline alteration and field detailed information alteration and deformation for the learning of significant invariance. The different effectual methods were used for the training of CNNRNN amalgam architecture with the help of artificial information, field explicated picture normalization and expansion. The solitary assistance of every module was also demonstrated for the enhancement of detection values at both line and expression echelon.

Lyzandra D'souza, *et.al* (2018) presented an approach for the identification of offline handwritten arithmetical term. During the recognition of handwritten arithmetical term (HME) written on paper, paper was scanned and then picture was applied to the detection scheme [12]. This approach was noticed by several investigators. Various researchers started working on this subject and utilized different classification models. The researchers projected a strategy for the recognition of offline HME with help of CNN classifier. This idea transformed the HME into latex. This method was proved most appropriate for inaccessible ciphers. The future work will involve the segmentation of amalgamated or linked or connected symbols for the attainment of improved identification outcomes.

Akm Ashiquzzaman *et.al* (2017) proposed a new algorithm which was relied on deep learning neural networks [13]. This approach utilized suitable commencement purpose and regularization layer for the attainment of considerably enhanced accurateness in comparison with the obtainable Arabic number detection techniques. The projected approach showed 97.4 percent precision rate, which was considered the uppermost precision of the data sample utilized in the research. The advancement of the preceding technique was also projected in this research work. The comparative outcomes demonstrated that modified approach gave a superior precision level of 93.8 percent in comparison with traditional approach.

Pritam Dhande, *et.al* (2017) presented a study interrelated to detection of cursive English handwritten characters. The script detection of transcribed cursive English characters was a very complicated task [14]. The texts in a word are related to one another in the cursive English script. Therefore, the segmentation and characteristic withdrawal of cursive English handwriting was proved very tricky. The horizontal and perpendicular protrusion techniques were utilized for segmentation in the presented study. The characteristic withdrawal process was performed with the help of convex hull algorithm and support vector machine classification model was utilized for categorization and acknowledgment. The tests were performed on CCC standard dataset. The tested results demonstrated that proposed approach gave competent outcomes.

Rathin Radhakrishnan Nair, *et.al* (2018) proposed a deep learning network approach which utilized the strategy of transport learning for handwritten character detection process [15]. A data sample named IAM was used for the training of a general mock-up and used the pre-prepared densities for the fine tuning of researcher specified Washington data sample. A generic script characteristic depiction was learned by this scheme during its training beside IAM, which learned client-specific characteristics during the fine-tuning of similar model on the Washington or Moore data sample. The presentation assessment of CER and WER showcased the capability of the mock-up in the learning and adapting of an objective data sample with restricted training sets. The experimental outcomes proved that revealing a mock-up to the profusion of training information, to a definite boundary, did not forever capitulate a comparative presentation enhancement.

3. Research Methodology

The part-based tree structure model was composed. This model was utilized to identify the text characters which are done through Latent-SVM. The recognizable proof of text words from the regions is done under a restrictive irregular field. Highlight coordinating was done through the Scale Invariant Feature Transform (SIFT). The false positive matches were evacuated by voting and geometric confirmations. A word reference is developed which is utilized to enhance the precision of detection and distinguishing proof. Utilizing HOG highlights the character structure was demonstrated.

The primary stage is to build a scale space. This is finished by more than once convolving the contribution of the image with Gaussian Convolution Kernel. This creates a settled arrangement which comprises of progressively obscured variants of the image. The Difference of Gaussian between nearby images is computed. At that point the filtering of conceivably flimsy keypoints which are predominantly in low contrast edges is finished. Subsequent to social affair the stable keypoints, the Gradient orientation histogram is ascertained in the area of the keypoint.

The image is taken for execution and keypoints are ascertained. A text record is produces that has one line for each keypoint with x and y organizes, the scale, the orientation and 128 numbers speaking to the descriptor. After extraction of the elements they can be coordinated utilizing a few =` distinct images by looking at them. The errands are performed by processing geometric changes between images to discover covering territories.

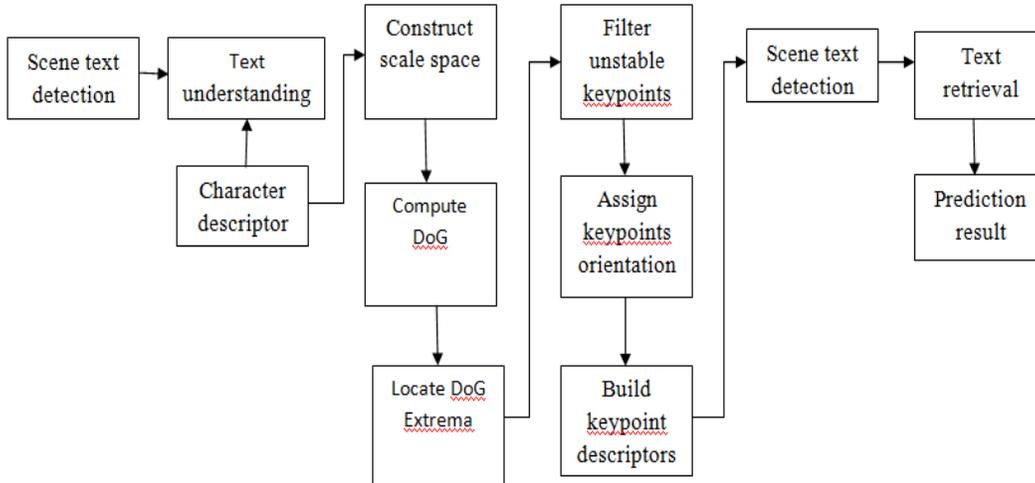


Fig 1 Proposed flowchart

4. Results and Discussion

The proposed methodology will be implemented is implemented in MATLAB by taking authentic dataset. The results are shown in the figures given below.

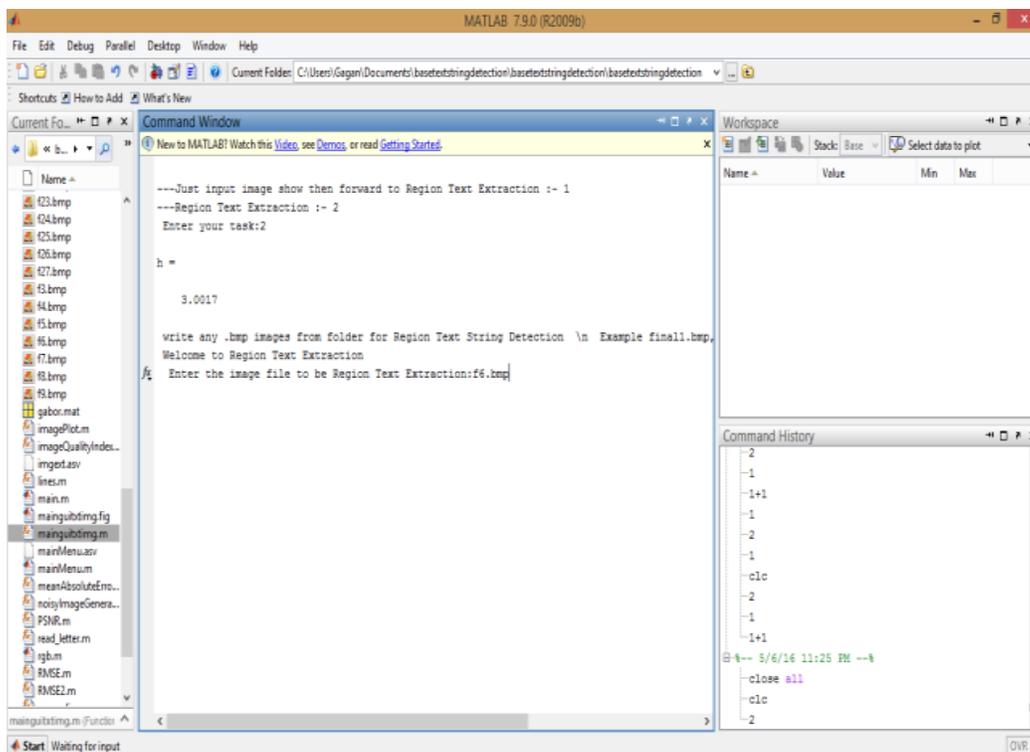


Fig. 2: File name

As shown in the figure 2, there is a command that appears to be on the screen further. This command holds to specify the file name of the image that needs to be extracted. The image that needs to be selected is to be listed out from a particular folder or file name. The file name when mentioned it is easy to identify or narrow the results. These results are appropriate as per the demand.

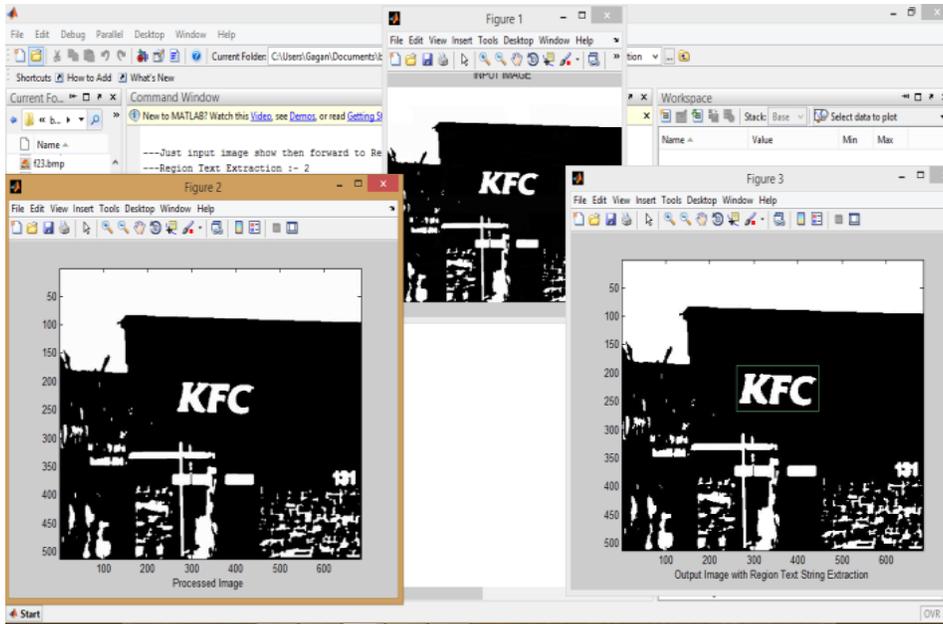


Fig. 3: Images Displayed

As shown in the figure 3, in the wake of specifying the record name the images that match the interest given by the client are shown on the screen. The images are appeared with the text showing above them. These images are the outcomes that are given from the natural scene image text extraction files.

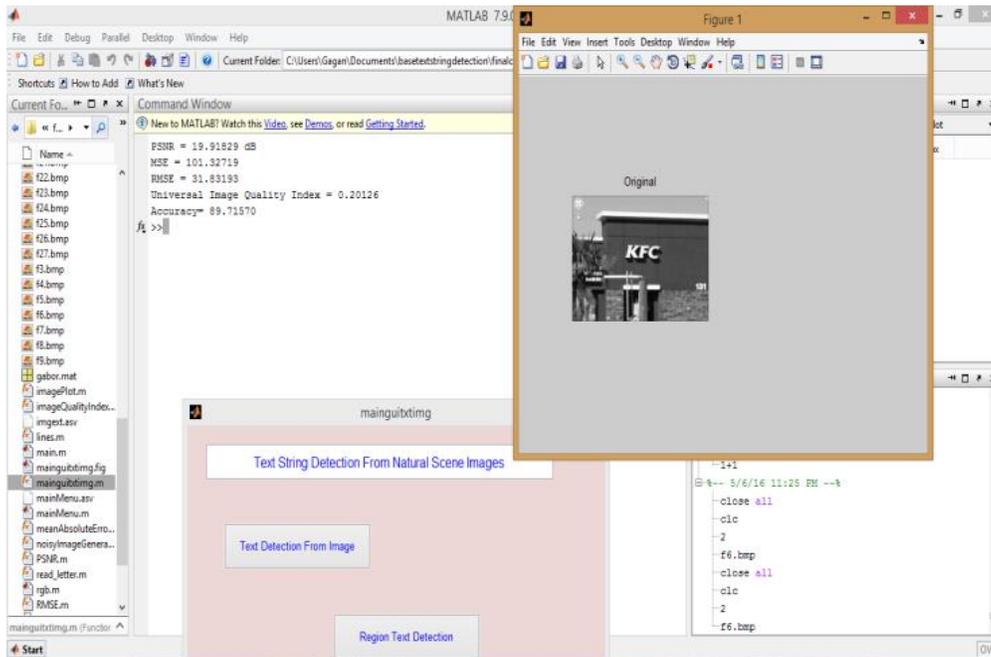


Fig. 4: Final result

As shown in the figure 4, the last image that seems, by all accounts, to be on the screen is the consequence of the removed image strings. The image that shows up on the screen is the last consequence of the procedure. The procedure finishes here after the image is given as yield to the client according to the requests.

5. Conclusion

A speedy and feasible pruning estimation is proposed to evacuate Maximally Stable Extremal Regions (MSERs) as character hopefuls using the procedure of minimizing regularized assortments. Character candidates are collected into substance hopefuls by the connection grouping algorithm, where division weights and bunching limit are discovered naturally by a novel self-training separation metric learning algorithm. A procedure to be specific Scale Invariant Feature Transform (SIFT) strategy is utilized for the extraction and detection purposes. It is been broke down that a portion of the texts stay unrecognized because of wrong orientation of the image. This technique straightforwardly prompts increment in precision of the detection, flaw detection rate and additionally the PSNR value of the image.

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