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A THREE LAYERED MODEL TO PERFORM CHARACTER RECOGNITION FOR NOISY IMAGES

¹Neha, ²Anil Saroliya, ³Varun Sharma

^{1, 2, 3}Amity School of Engineering & Technology, Amity University Rajasthan, Jaipur, INDIA

Abstract- Digital character recognition is one of the traditional pattern recognition. But because of the huge usage and its participation in many real time applications, there is the requirement to obtain more accurate recognition. The recognition system becomes more challenging when the input image is not appropriate and having some scan time problems such as noise. In this work, a noise effective approach is defined to provide effective recognition for digital character. The presented approach combines the KNN and ART network approach to perform character classification and recognition. In this paper, the algorithm approach and the model associated is presented.

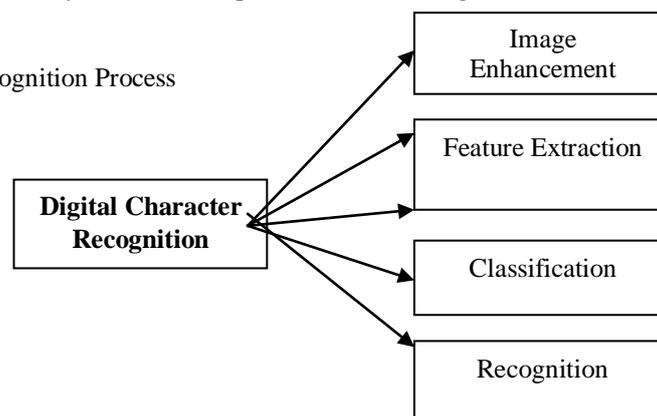
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I. INTRODUCTION

To provide automation to the routine activities and to speed up the process, the digitization of these routine applications is done. One of such fully digitize area is the vision and image processing. This area of computer science work in same scenario as a person view the outer world and extract the information points from it. Most of the human work is done in the form of some written work that is now been performed using the computer system. This application area has grown in application area such as to read the RFID tag price, reading the cheque signs, reading the traffic number plates, reading the electricity meter reading etc. The major broad areas associated with digital character recognition includes the reading the digital characters from printed media and to convert it to textual form, the recognition of characters, verification of signature or hand writing, identification of fonts and textual information present on printed media, enhancing the digital representation of characters. The application areas of the digital character recognition and identification having various real time applications so that there is the requirement of more accurate recognition process.

The presented work is focused on digital character recognition under noise vector. As the image is extracted from some camera or scanner or some extraction device, the extracted image can have some noise vectors included in it. In such case, there is the requirement of some approach to clean the image so that the effective recognition process will be performed. In this work, four main aspects of image processing are discussed respective to digital character system. These aspects are shown in figure 1.

Figure 1: Aspects of Recognition Process



A) Enhancement

One of the most effective image processing activity is to improve the image features or attributes so that various associated will work effectively over the images. The associated operations performed over the image can be performed in spatial domain. It means, the pixel level operation in such operations is considered mostly. These operations can be applied in each image processing operation initially or it can be performed on some image part. To perform these kind of operations there are number of groups. Image enhancement can be performed via various available tools or toolkit. These tools include the basic feature formation methods so that the image level improvement will be obtained. The problems associated with image include the noise, blurring, bad illumination etc. To improve the image under different infections, different operations can be applied over the image. These operations are about to improve the image features and to improve the image. The associated filters with image processing include the information preservation and the structural analysis can be performed over the image. These features can be performed to improve the feature level improvement by dividing the image in further.

B) Feature Extraction

After the improvement on image features, the next work is to perform the object identification over the image. The particular image analysis is defined to perform the image processing part analysis so that effective object identification and object area identification will be performed. The effectiveness of the image processing operations such as recognition or classification depends on the segmentation process defined by the algorithm. The ROI based extraction over the image is performed to identify perform the selective information based recognition or classification. There are number of associated filters that allow to analyze the image under spatial filters so that the image object recognition will be performed and the dimension level extraction will be performed.

C) Classification

Just after extraction of image features, the next work is to perform the classification of images based on the feature analysis. The classification is the process to categorize the input image in particular sub category so that the object identification will be done. The classification is performed either on complete image analysis or based on the image features. The feature based classification is more appropriate as it improves the efficiency without affecting the accuracy. To perform the classification there are number of available classifiers such as neural network, SVM, KNN etc.

D) Recognition

The final stage to perform the effective digital character recognition is to identify the input object image from the image pool. The distance based or feature based match is performed to identify the most similar image. The image that is having the maximum similarity is identified as the recognized image.

In this paper, an effective recognition model for digital character is defined. This recognition model is having the benefit to provide the recognition for noisy and disrupted images. In this section, the basic stages of recognition model are explained. In section II, the work defined by earlier researchers for recognition of digital characters is defined. In section III, the proposed research model is explained. In section IV, the conclusion obtained from the work is defined.

II. EXISTING WORK

In this present work, an effective digital character recognition system is defined. Lot of work is already done by different researchers in this area. Some of the work defined by earlier researchers in same area is discussed in this section.

III. RELATED WORK

Image processing is having its valuable importance in the OCR based applications. These applications include the character identification and classification. The work already done by different researchers in this area is discussed in this section.

M. Egmont-Petersen [1] has defined a work on image processing neural network approach. Author presented a survey based work under different neural network approaches such as Kohonen feature map, hophel neural network etc. Author performed a recognition process under different image processing approaches such as segmentation, image encoding, feature extraction, object recognition, optimization etc. Author defined different levels of image processing including the pixel level, feature level, structure level, object level and scene level. Author defined six different type of poses under neural network approach. The condition based analysis is performed under application area. Author also presented a future scope of neural network so that further development in same area will be performed. Anna Bosch [2] presented a work on image classification using Random foreset and ferns. Author explores the problem of classifying images by the object categories they contain in the case of a large number of object categories. To this end Author combine three ingredients: (I) shape and appearance representations that support spatial pyramid matching over a region of interest. S. Mikrut [3] has defined a neural network approach to automate the recognition process. Author defined a fragmented approach for classify the images under different neural network approaches. Author defined the usability of the work for sub image election using Kohomen neural network approach. Author defined log polor and log Hough transformation approach for effective image processing.

Giorgio Giacinto [4] has defined a work to design a neural network architecture for image classification for digital character recognition. In the field of pattern recognition, the combination of an ensemble of neural networks has been proposed as an approach to the development of high performance image classification systems Therefore, the fundamental need for methods aimed to design ensembles of "error-independent" networks is currently acknowledged. In this paper, an approach to the automatic design of effective neural network ensembles is proposed. Given an initial large set of neural networks, Presented approach is aimed to select the subset formed by the most error-independent nets. Reported results on the classification of multisensory remote-sensing images show that this approach allows one to design effective neural network ensembles. Dan C. Cirestan [5] has defined a flexible and high performance neural network approach for image classification. Author presents a fast, fully parameterizable GPU implementation of Convolutional Neural Network variants. Presented feature extractors are neither carefully designed nor pre-wired, but rather learned in a supervised way. S.Nagaprasad [6] has presented a data mining based neural network model for soil image classification and processing. In this paper Author implemented, spatial image processing mining for soil classification using diversified domains like Digital Image Processing, Neural Networks, and Soil fundamentals. The three most important algorithms used in implementation are Back Propagation Network (BPN), Adaptive Resonance Theory 1 (ART) and Simplified Fuzzy ARTMAP for soil classification as well as spatial image recognition. Further Author are working on Presented research by combining the visual data mining with spatial data mining algorithms, such as spatial clustering, spatial association rules, a self-organizing map etc. in order to try to detect patterns in the data in an even more effective way. Chergui Leila [7] has defined a neuro fuzzy approach or Arabic character recognition. This paper provides an Arabic off-line handwritten recognition system based on new classifiers: Fuzzy Neuro Fuzzy which is a type of neural network. The proposed system employs the Tchebichef geometric moments as features which are novel in the domain of Arabic recognition system. The Tchebichef moments provides better feature representation capability and improved robustness with respect to image noise, over other types of moments. Presented system which is based on a holistic method includes four steps.

P Dan Cirestan [8] has defined a deep neural network approach for image classification. Presented biologically plausible, wide and deep artificial neural network architectures can. Small (often minimal) receptive fields of convolutional winner-take-all neurons yield large network depth, resulting in roughly as many sparsely connected neural layers as found in mammals between retina and visual cortex. Only winner neurons are trained. Several deep neural columns become experts on inputs preprocessed in different ways; their predictions are averaged. Graphics cards allow for fast training. Yuanqing Lin [9] has defined a adaptive feature extraction and recognition approach using SVM for large scale image classification. There are two main reasons for the limited effort on large-scale image classification. First, until the emergence of Image Net dataset, there was almost no publicly available large-scale benchmark data for image classification. Jana Machajdik [10] has presented a feature based classification approach for psychology and art theory. Author investigates and develops methods to extract and combine low-level features that represent the emotional content of an image, and use these for image emotion classification. Specifically, Author exploits theoretical and empirical concepts from psychology and art theory to extract image features that are specific to the domain of artworks with emotional expression.

Kamal R. Al-Rawi [11] has defined an improved learning mechanism using neural network approach. A new artificial neural network (ANN) architecture for learning and classifying multivalued input patterns has been introduced, called Supervised ART-II. It represents a new supervision approach for ART modules. Robert L. Harvey [12] has defined a general image recognition model using neural network approach. As part of Lincoln Laboratory's research on neural network technology, a general purpose machine vision system that can learn to recognize diverse objects has been designed. Author tested the system on two disparate classes of objects-

military vehicles and human cells-with video images of natural scenes. These objects were chosen because large databases were available and because most researchers judged the two types of objects unrelated. Sabine Barrat [13] has defined a neural network based adaptive approach for extension of images using baysian network approach. Author considers especially the problem of classifying weakly-annotated images, where just a small subset of the database is annotated with keywords. In this paper Author present and evaluate a new method which improves the effectiveness of content-based image classification, by integrating semantic concepts extracted from text, and by automatically extending annotations to the images with missing keywords.

IV. Proposed Approach

In this paper, an effective recognition model is presented for character recognition. The presented hybrid model is defined at three layers. In first layer, the input image enhancement is been performed to improve the image features so that the effective recognition rate will be achieved. The layered based work is defined here in figure 2.

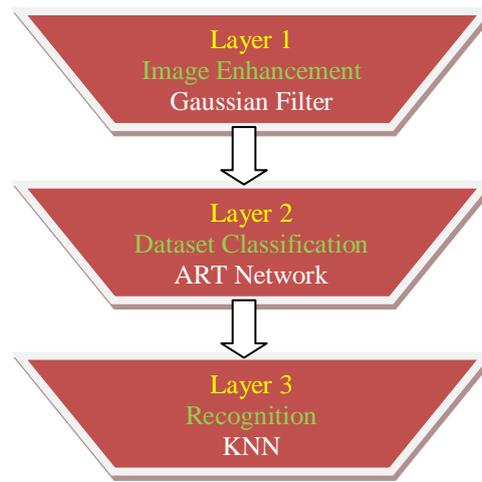


Figure 2 : Proposed Model

In second stage of model, the training set will be classified using ART network. The classification is here done to divide the available dataset in set of images. The classification is here done based on the vigilance ratio identification. The images available in the dataset having same vigilance ratio will be maintained in same class. Once the classification will be done, the next work is to perform the recognition based on distance analysis. To perform this distance analysis, the KNN based mapping is done. The recognition process defined in this work is shown in the form of algorithm shown in table 1.

Table 1: Recognition Algorithm

1.	We have a Trained Art Network with N Classes
2.	Input Image img
3.	Define Vegilience Vector V
4.	$matchratio=0;$
5.	$p=null$ /* initialize the match image*/
6.	for $c=1$ to N
7.	{
8.	$img1=GetImage(c)$
9.	Find Feature Difference $Diff=img1-img$
10.	$M=Matchingratio(img,img1)$
11.	if $Differecne \geq V$ and $M < matchratio$
12.	{
13.	$matchratio=M;$
14.	$p=img1;$
15.	}

```
16.    }
17.    if(p==null)
18.    {
19.    Print "No Match Image Found"
20.    }
21.    else
22.    {
23.    Print "Image Detected "+ p
24.    }
25.    }
```

V. CONCLUSION

In this paper, an effective recognition model is been presented using ART network and KNN based hybrid approach. The work is presented as a three stage model to recognize the noisy character image. The paper has presented the model and relative algorithm.

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