

Touchless Written English Characters Recognition using Neural Network

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Abstract—Touchless written English character recognizer (TER), a new touchless approach to write and an intelligent approach to recognize English characters has been proposed in this paper. In TER, the inputs of English characters have been taken by touchless fashion i.e. by sensing specific color object with a moving hand tracking in front of a webcam. Then they have been recognized by efficient Artificial Neural Network (ANN). Like the application of other traditional computer input devices such as mouse or keyboard, TER can be extended to write and recognize English words and sentences by adding characters one by one to the text editor. Proposed TER has been applied for several different forms of touchless writings, namely 26 English characters and 10 English digits. Here for training, ANN with Scale Conjugate Gradient (SCG) method has been used that converges the training time faster and recognizes with good generalization ability. TER can be useful for the disabled persons.

Keywords— Scale Conjugate Gradient, Back Propagation, Principal component analysis, Character recognition.

I. INTRODUCTION

Character recognition has become an acute research area in recent years for the ease of access of computer applications. Numerous approaches have been proposed for character recognition and considerable successes have been reported. Traditional handwritten character recognition techniques enable a computer to receive and interpret intelligible handwritten input from sources such as papers, documents, touch-screens or pictures [4]. Herein, usually they extract some defined characteristics called features to classify an unknown handwritten character into one of the known classes.

Until now, it is still a difficult task for a machine to recognize human handwritings with significant accuracy, especially under variable circumstances such as variations in writings, variable sizes, different patterns for different people etc. To recognize the handwritten characters of different languages, usually the existing approaches take inputs from sources like pictures, papers etc. Touchless screen has been rarely used in this purpose. None of the inputs of the existing approaches have been taken from other sources like using a webcam. An approach like this can help the disabled people who knew to write, but later on unable

to write on paper by using hand because of some difficulties.

Some works have been done to recognize handwritten English characters [1], [2], [3], none of them are touchless writings i.e. these are written using pen or pencil on a white paper. Touchless written English character recognition is necessary for those people who use to write English using mouth movement holding an object on it. Therefore, touchless written English character recognizer (TER) has been proposed in this paper.

The outline of this paper is as follows: Section II describes existing character recognition techniques. Section III presents the proposed TER. Experimental studies have been discussed in Section IV. Finally, concluding remarks are explained in Section V.

II. EXISTING WORKS

Various approaches already have been proposed for handwritten character recognition. A typical handwriting recognition system consists of several steps, namely: preprocessing, segmentation, feature extraction, and classification. Several types of decision methods, including statistical method, artificial neural network (ANN), structural matching and stochastic process (Markov chain) etc have been used along with different types of features [15]. Many recent approaches mix several of these techniques together in order to obtain improved reliability, despite wide variation in handwriting. Most widely used approach is based on back-propagation (BP) ANN [10]. Here the ANN architecture is trained by a set of training data and then the input is classified by the trained ANN. Linear classification is also used to recognize handwritten characters [5]. Here the background basis of ANN has been implemented as a classification function.

The works of linear classification is very similar to ANN because the mapping of ANN cell or the one layer of ANN cell is equivalent to the linear discrimination function. Therefore if the ANN is two-layer i.e. consisting of an input and an output layer, it can act as a linear classifier. Multilayer ANN (MLANN) usually employs the BP algorithm and is also widely used in face recognition. In case of implicit segmentation approach [20], the words are recognized entirely without segmenting them into