Comparative Study of Identification of Similar Appearing Food Grains Using ANN and SVM

[1]Farooq Indikar

[1]Assistant Professor (Contractual)
[1]Department of Computer Science, School of Computer Science,
[1]Central University of Karnataka, Kalaburagi, Karnataka, India

Abstract : This study has been undertaken to determine the recognition rate of identification of similar appearing grains using ANN and SVM. In total 39 color as well as texture features of the grain images are calculated and training and testing is performed using ANN and the results are noted. Similarly using the same features training and testing is carried out using SVM. As per our grains under study SVM provides better results compared with ANN.

IndexTerms **– Food Grains, ANN, SVM, Classification, Identification, Recognition, GLCM, color features, texture features**

I. INTRODUCTION

From the last decade the work on identification and detection of similar appearing grains is the research area of most of the researchers in image processing. The similar appearing grains have been classified using different classifiers like ANN[2] and SVM[9]. This problem area is having vast applications in food industry as well as agriculture. The common method employed by the researchers is as follows:

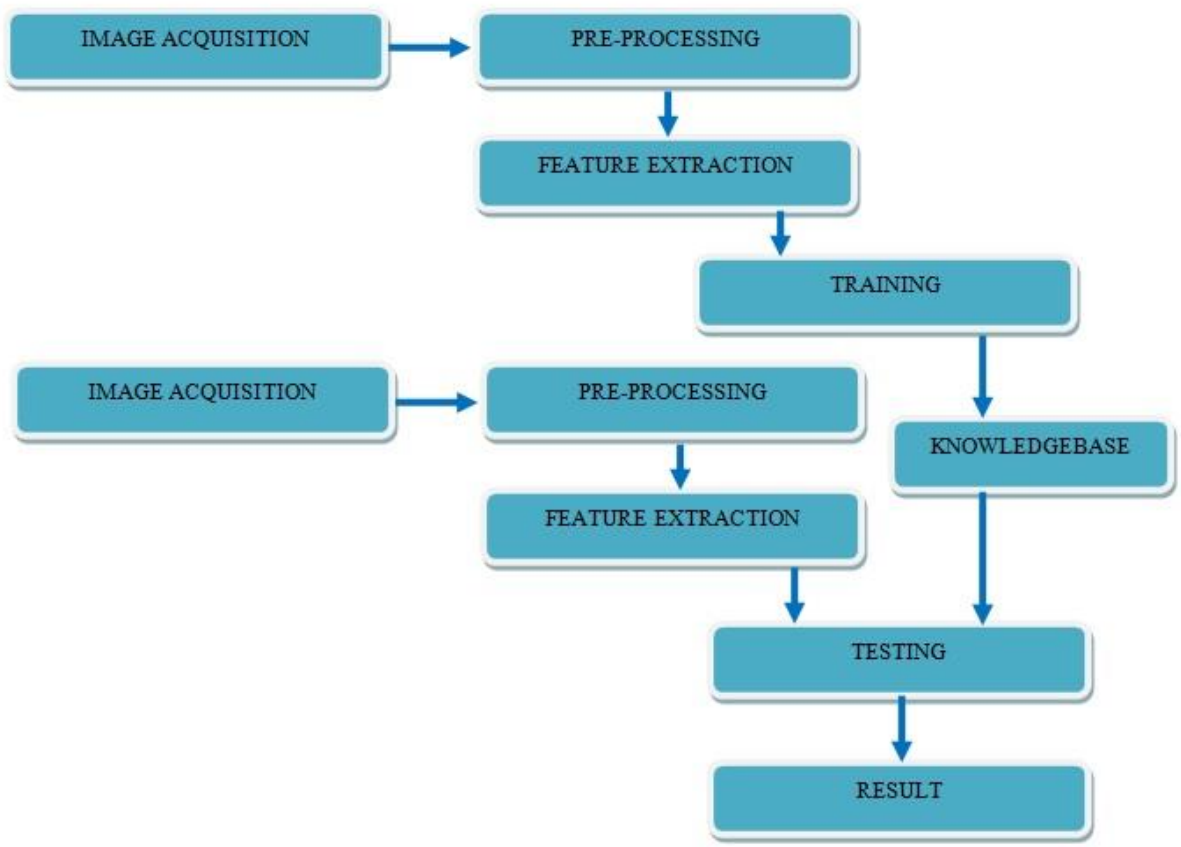

Figure 1: Methodology used for Identification

The first step is image acquisition where in the grain images are acquired using a high resolution camera. The second step is pre-processing of acquired images, the images are enhanced as per the requirement of the study or the sizes of the images are

altered as per the requirement. The third step is features selection and features extraction[1][4][5][7][8], some of the features which are helpful for differentiating the grains from each other are selected from a list of features during features selection. The features of the individual grain images are calculated. The next step is the training of the grain images, after acquiring the images, the images are categorized into two sets: Set-1 for training and Set-2 for testing. The features of Set-1 images are calculated using which the training is performed and a network is created. In the next step of testing, the created network is used to test the grain images of Set-2, and hence the images are classified or detected or identified accordingly.

In this paper Section-II gives the Related Work, Section-III provides the Proposed Work, Section-IV presents Result and Analysis, finally Section-V gives the Conclusion.

II. RELATED WORKS

[Zhong Gao et. al, 2007] have described a novel computerized tongue inspection method based on Support Vector Machine (SVM). First, two kinds of quantitative features, chromatic and textural measures, are extracted from tongue images by using popular image processing techniques. Then, Support Vector Machine and Bayesian network are employed to build the mapping relationships between these features and diseases, respectively. Finally, they present a comparison between SVM and BN classification. The experiment results show that we can use SVM to classify the tongue images more excellently and get a relative reliable prediction of diseases based on these features.

[Aravind K. Mikkilineni, et. al, 2009] , have described the use of image texture analysis to identify the printer used to print a document. In particular they described a set of features that can be used to provide forensic information describing a document. They have introduced a printer identification process that uses a support vector machine classifier.

[Basavaraj S. Anami, Vishwanath C Burkpalli, 2009], have used texture based classification of Bulk Sugary Food Objects.

[Basavaraj S. Anami, Naveen N. M et al, 2015] have demonstrated the behavior of HSI Color Co-Occurrence Features in Variety Recognition from Bulk Paddy Grain Image Samples

[Pushpalatha K. R,et al, 2017] have proposed a method for identification of split grams using GLCM and CGLCM texture features. Canberra and City block distance, Euclidean distance has been used for Matching the features.

The above listed works are some of the examples of the works being carried out in the area of identification and classification. However the aim of our work is to study the efficiency of ANN and SVM classifiers to classify the similar appearing grains.

III. PROPOSED WORK

The Figure 2 below shows the flow of the proposed work:

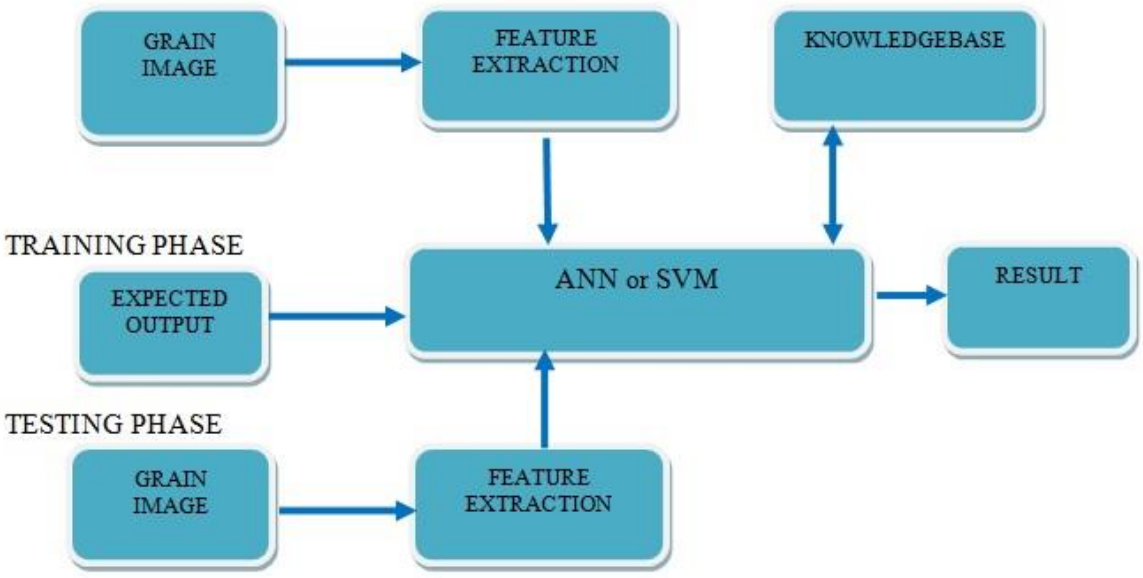

Figure 2: Methodology for Proposed Work

The grain images are taken and their combined features of color and texture are extracted and saved in a text file. After feature extraction there are two phases involved. First phase is the training phase where in we train the network using ANN first and a knowledgebase is created which is further used in testing. The second phase is testing phase where in whenever a new image of a grain occurs first its features are extracted and compared using the ANN and knowledgebase. And finally the results are stored.

Similarly using SVM instead of ANN training and testing is carried out and the results are stored, at the end a comparison is made to find out which classifier work good for the problem under study.

Features used

In color feature extraction the red, green and blue component of the original image are separated and the original image is converted to HSV image to calculate the hue, saturation and value component of the image. The various statistical features of these components are calculated. Totally 18 color features as listed in Table-1 have been taken for the study.

To describe texture features, the most widely accepted models are those that use the co-occurrence and run-length matrices. In this project, some easily computable textural features based on Gray Level Co-occurrence Matrices (GLCM) are extracted. Totally 21 texture features as listed in Table-1 have been taken for the study. In all we have 39 combined features.

Table 1: List of Features used

Sl No.	Color Feature	Sl No.	Texture Feature
1	Red mean	1	Red GLCM Variance
2	Red variance	2	Red GLCM Range
3	Red range	3	Red GLCM Maxprob
4	Green mean	4	Red GLCM Contrast
5	Green variance	5	Red GLCM Idm
6	Green range	6	Red GLCM Homoginity
7	Blue mean	7	Red GLCM SumMean
8	Blue variance	8	Green GLCM Variance
9	Blue range	9	Green GLCM Range
10	Hue mean	10	Green GLCM Maxprob
11	Hue variance	11	Green GLCM Contrast
12	Hue range	12	Green GLCM Idm
13	Saturation mean	13	Green GLCM Homoginity
14	Saturation variance	14	Green GLCM SumMean
15	Saturation range	15	Blue GLCM Variance
16	value mean	16	Blue GLCM Range
17	value variance	17	Blue GLCM Maxprob
18	value range	18	Blue GLCM Contrast
			Blue GLCM Idm
		20	Blue GLCM Homoginity
		21	Blue GLCM SumMean

Grain Image Sample

Figure 3: Grain Image Sample Used in the Study

IV. Results And Analysis

The Figure 4 below shows the recognition rates in percentages:

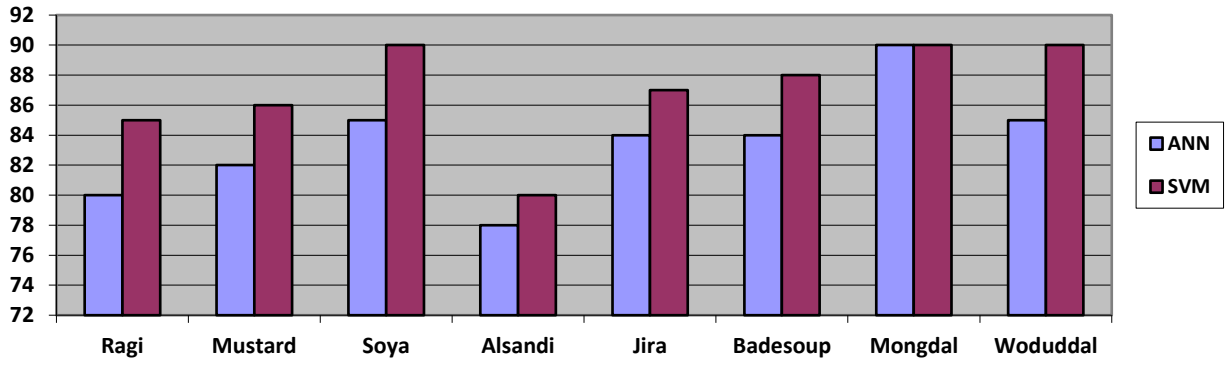

Figure 4: Comparative Recognition rate using ANN and SVM

The overall rate of recognition using SVM was 95.75% where as using ANN it was 92%.

V. Conclusion

According to our work we come to thee conclusion that the use of SVM classifier will give better as compared with the ANN classifier. However the results which we have got are based on the grain images selected and the sample size which we have selected for training and testing, hence it may vary based on the images under study.

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