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Classification of Rice Grains using Machine Learning Techniques

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Abstract: Classification of rice grains is important for human beings as it directly impacts the human health. Hence there is a great need to measure the quality of rice grains and identifying the adulteration and analysing the grains manually is more time consuming and complicated process and having more chances of errors with the subjectivity of the human perception. In order to achieve the uniform standard quality and precision, machine learning techniques are evolved.Rice quality is nothing but the combination of physical and chemical characteristics grain size, shape and colour are some physical characteristics. This paper obtained all physical features and classification of rice grains using SVM and CNN. By implementing these two and comparing both SVM and CNN outputs, identifyingwhich technique will perform classification efficiently.

1. Introduction

Rice is one of the most staple food in continents like Asia, provides most of the carbohydrates in their food diet. Around 90% of Asian countries prefer rice as their major food, whose demand and economical aspects increasing day by day which is to be considered.The main purpose of the proposed method id to offer an alternative way for quality control and analysis which reduce the required effort,cost and time.The accurate identification of rice is very important when classifying the rice varieties. The identification of the level of purity of rice varieties makes the identification task more difficult and complicated. Commercial value genetic characteristics and quality depend on the rice variety type. The grade and price of rice is decided by this factors. However,even a trained human can perform quality examination only on a few known rice varieties.

Image processing is hastily growing technologies. All types of data has to go through three general phases while using digital image processing techniques which are pre-processing, enhancement, display and information extraction.The purpose of image processing techniques is testing the rice grain. The quality of rice grain is based on several parameters such as grain colour, shape and size. Fragments of the grains are highly effective to the quality of the rice. Machine learning algorithms are used to identify the quality of the grain.Digital image are the key sources of the machine learning algorithm. When the grains are mixed together machine vision system needs to identify the grains mixture. Here the grains are classified according to their colour and size, This paper introduces hoe to filter and classify four types of rice grains in a mixture.

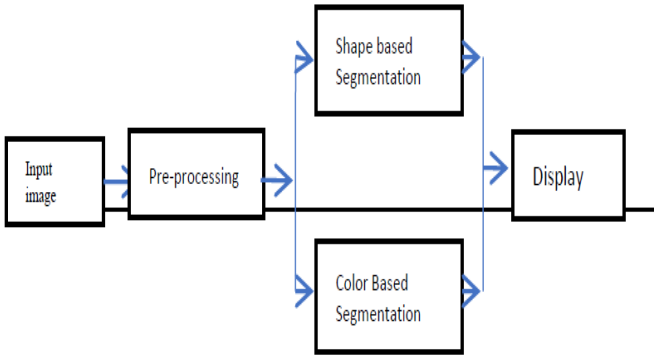

Fig 1: Classification of rice grains

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2. Blockdiagram

SVM algorithm is a most popular algorithm for classification in machine learning. Their mathematical background is quite essential in building the fundamental blocks for the geometrical distinction between two classes. Support Vector Machine works by observing their implementation in MATLAB and finally observe some of the important applications.

To achieve the good results black background was used for the basic operational methods.

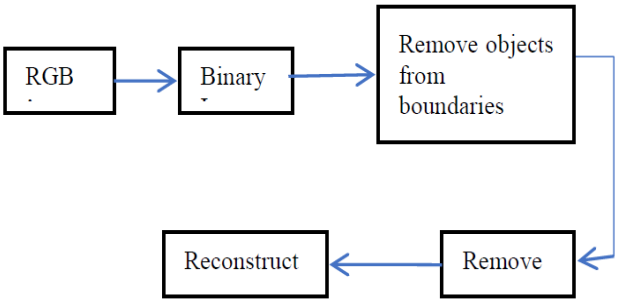


Fig. 2: Pre-Processing

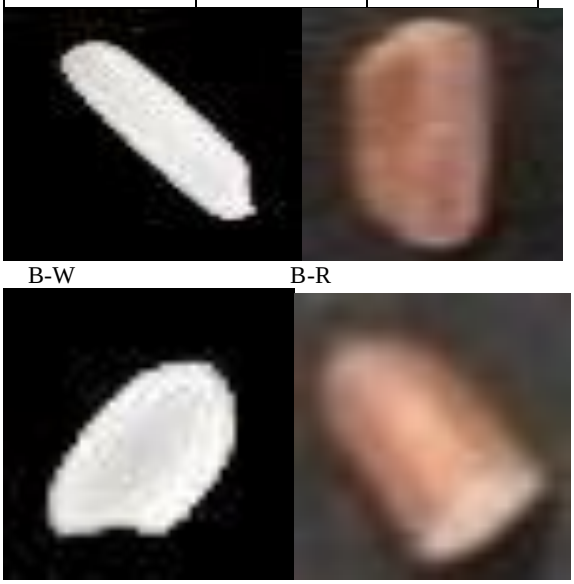
Fig. 3: Input image

Table 1: Types of grains

B-R	Red Basmati
B-W	White Basmati
S-R	Red Samba
S-W	White Samba

Table 2: Number of grains

Type of grain	Count	Percentage
B-R	6	14.28%
B-W	10	23.8%
S-R	15	35.71%
S-W	11	26.91%



B-W B-R

S-W S-R

Fig. 4: Data set

3. Data Base

Here data base is a collection of images which are used to train the classifier that maybe SVM or CNN. These image size of different sizes which are converted into fixed size (16*16). By using the images, the classifiers are trained. Here 8 images are considered as the data base and some of them are shown in fig 4.

Input image consists of different grains which are red and white colours with different types like basmati and samba.

3.1 Pre-Processing

The input image to the system is a colour image. These images are converted to binary images for further processing. Segmentation is an important process in our object recognition system and it highlights the objects present in the image from its background. Here background of the image is subtracted and the intensity of the grains is improved.

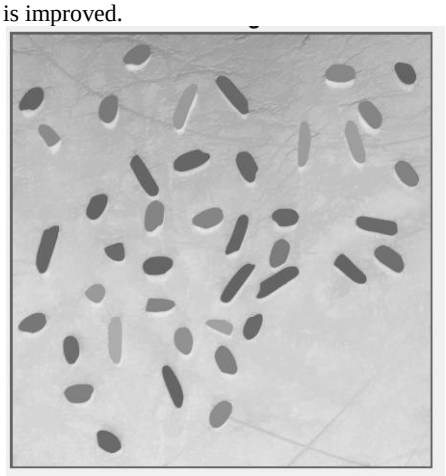
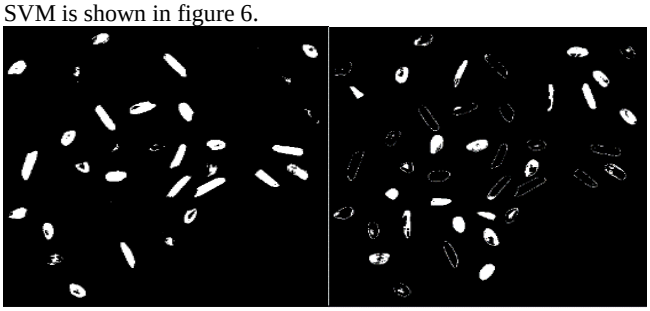


Fig 5: Pre-processed image

4. Colour Classification

The pre-processed image is given as input for the SVM and CNN classifiers. To train the network very large labelled dataset and designed a net architecture that will learn the features and build the model. The results can be impressive, but this approach large amount of training data and to setup the layers and weights in CNN.These features are added to a machine learning model, which will separate these features into the distant categories, then use this information at the time of analysing and classifying new objects. The classifiers are trained using databases based on the colour ranges of the trained images, the grains present in the input image are identified and classified. The colour classified output by SVM is shown in figure 6.



White Colour Grains Red Colour Grains

Fig. 6: Colour classified output using SVM

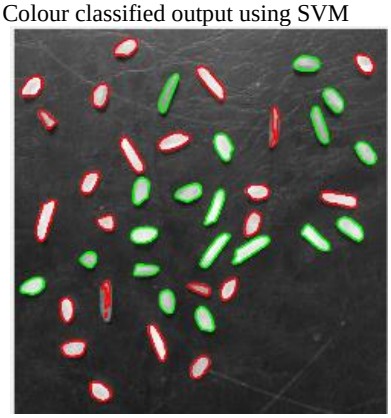


Fig. 7: Colour classified output using CNN

5. Shape Based Classification

Shape is an important visual feature of objects in an image.Shape based representation of objects gives more clarity about the shape of the objects that acts as a more unique and important feature of objects for the further identification of objects. here the input image is first pre-processed to remove some unwanted components,the foreground and back ground are separated in this process and then passed through sharpening filters. The objects that are present in the image are identified and are surrounded with the bounding box.

Fig. 8: Object detected image

The features of the objects present in the image are calculated such as area, major axis length, minor axis length, centroid, perimeter, bounding box, eccentricity.

These features are given as input to the SVM and CNN techniques and the objects are classified based on the training given to the classifiers. The classification of objects done by different techniques by taking threshold value for each feature.Different features are obtained from the objects present in the image. These objects are classified into two classes using SVM and CNN techniques.The classification of based on threshold values objects present in the image using SVM are shown in figure 9.

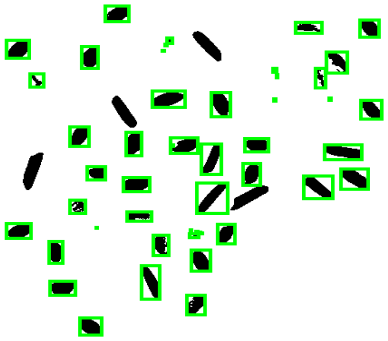


Fig. 9: Shape based segmentation using SVM

By using CNN the objects in the image are compared with the trained objects based on the threshold values taken for the features which are identified from the image are classified using CNN is shown in figure 10.

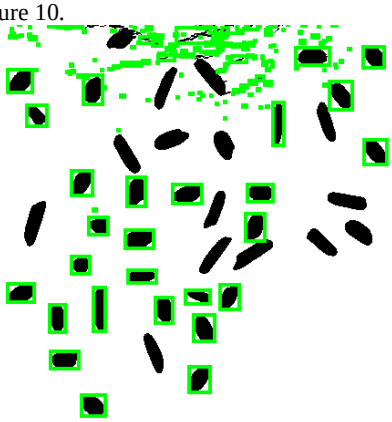


Fig. 10: Shape based segmentation using CNN

Here in both techniques the threshold value is taken as same models.

Table 3: Features calculated using SVM

Parameters	Small Grain	Long Grain
Area	<385	>385
Major axis length	<29.5	>29.5
Minor axis length	<16.3	>16.3
Eccentricity	<0.88	>0.88

Table 4: Features calculated using CNN

Parameters	Small Grain	Long Grain
Area	<485	>485
Major axis length	<33.5	>33.5
Minor axis length	<18.3	>18.3
Eccentricity	<0.88	>0.88

Table 5: Shape classified output

Grain type	SVM	CNN
Small Grains	26	26
Long Grains	16	16

6. Conclusions

Hence, the classification of grains using machine learning techniques such as SVM and CNN. They are trained to perform the classification of grains in both colour and shape. In CNN different encoding layers are used which helps to minimize the number of operations and toperform the classification well compared to SVM technique. It also uses the decoding layers to reduce the number of iterations and gives the output in a simplified manner.

Expand the data base of rice and establish a comprehensive tool for classification system.The data augmentation method will be employed for building a good classifier when the number of samples is insufficient.Study other deep neural network architectures and take full advantage of deep learning algorithms to improve classification accuracy,and enhance the reliability and robustness of rice classification system. In some other cases, also find the stones in the shape of rice grains. They can also be detected along with the grains and shown in the output. To avoid this problem, need to classify the image more accurately.

References

[1] 2nd IEEE international conference on recent trends in electronic information communication technology, 2017.

[2] HMKKMB Herath, WR De Mel. Rice Grains Classification Using Image Processing Techniques department of mechanical engineering, 2018.

[3] Non-Destructive image processing-based system for assessment of rice quality and defects for classification according to inferred commercial value.

[4] Simonvan, Karen, A Zisserman. Very deep convolution network for large scale image recognition.

[5] R Girshick, Jeff Donahue Trevor Darrel, J Malik. Rich feature hierarchies for accurate object detection and semantic segmentation computer vision pattern recognition, IEEE conference, 2018.