DISEASE DETECTION AND CLASSIFICATION IN CORN GRAIN USING DIGITAL IMAGE PROCESSING

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Abstract: Grains and cereals are an essential food group in our diet, as they provide us with a good proportion of our energy requirements and nutrients. Corn grain quality is increasingly important as more grain is used for processing and other specialty end uses**.** Determining the quality of the grain and resistance to prevalent diseases manually is critical.The purpose of this paper is to classify corn grain according to its quality. This inspection approach based on image processing uses Binary Decision Tree algorithm which uses supervised learning classifying the patterns into two different classes as damaged area and non-damaged area.The quality is determined based on its shape and color feature analysis respectively.

Keywords: Corn Grain diseases images, Binary Decision Tree, Digital Image Processing

INTRODUCTION

Corn kernels are the fruits of maize. Maize is a grain, and the kernels are used in cooking as a vegetable or a source of starch. Quality of corn kernels is as important as other grains. It is an important requirement to protect consumers from sub-standard products as well as traditional food, animal feed, and industrial raw materials, which plays an important role in agricultural production. The quality grading of corn kernels is not only related to the yield and quality of corn production, but also has an important impact on breeding. Developing a fast and effective method to assess the quality of corn kernels has important practical significance for safeguarding the safety of stored grain. Yield is the most noticeable characteristic to farmers while the crop is in the ground and when it reaches the market ,quality becomes the key determinant of its sale-ability.Their quality may go unnoticed by the farmers who are unaware about various fungal diseases which can invade and cause damage to corn grains. It has the disadvantage of time-consuming, inefficiency, and high error rate. Fungi invade the seeds before harvest while the crop is still in the field. Field fungi may affect the appearance and quality of seed or grain. Fusarium ear rot is an insidious disease of corn caused by the fungus Fusarium ear rot. The fungus can infect corn seedlings and developing kernels, and grow for a time in the ear without producing disease symptoms. Usually damage caused by field fungi occurs before harvest, can be

detected with the help of digital image processing selecting and identify good quality with less effort and make shure does not continue to increase in storage if grain is stored at the proper moisture content and temperature. Machine vision has been used to scan pixel by pixel based on special features such as color ,internal damage and size features. Analysis of an image of corn grain broken into 3 steps i.e. Browse ,Feature Extraction and Classification using Binary Decision Tree. BDT making it very effective for operational use to classifies into two classes afftected region and non - affected by examining every pixel values to generate accuracy and quality parameters respectively.

MOTIVATION

Grains are important sources of many nutrients, including fiber, B vitamins and minerals but majorly of proteins. All are part of our daily healthy diet. One of them is corn which is one of the most widely consumed cereal grains. As a good source of antioxidant carotenoids, such as lutein and zeaxanthin, yellow corn may promote eye health. It's also a rich source of many vitamins and minerals. These healthy nutrients totally depend on several factors includes growing practices ,time and type of harvesting ,pre and post –harvest handling ,storage and transportation maintenance. In order to control major fungal diseases and infections, proper utilization of pesticides and examining their post effects also play major role to maintain the degree of nutrient quality quotient. By considering such work flow, taking important stage to evaluate the post effects of pesticides and its nutrient values which might go in the market without being noticed by the farmers. Various types of diseases ,infected kernel, discoloring seed coat can degrade its quality.This is often seen in today's market due to rapid change in weather conditions.However,there is no convenient method of technology used to identify such diseases as early as possible.Hence, analysis of corn grain and classification could be used by using image processing technique effectively.

OBJECTIVE

The objective of this work is to develop an application system to recognize the affected corn kernels by measuring its color, texture and classifying its quality parameters. The system implements 5 major step by step work flow to get the accurate results. To execute we browse an image ,perform pre-processing using spatial and frequency filter ,detect color features and shape features. Store the training dataset samples in .csv file .Build Fit Binary Decision Tree algorithm in order to classify the training dataset and its quality. Test the application system by giving at least 10 images as input and examining its accuracy and quality performance respectively.

LITERATURE REVIEW

A particular sets of previous research papers are studied under the context of identification and classification of food grains based on various approaches and providing further extended modifications in order to have more efficiency and reliability in the proposed system.

- *QUANTIFYING AND ANALYSING MAIZE SEED VARIETY USING*

IMAGE PROCESSING Pavankumar Naik, 2 Rajeshwari S, 3Rekha M, 4 Sharada K, 5 Shreya P © 2017 IJEDR

In this project system designed to recognize a variety of seed one has to go through all the image processing phases.The research has been done for food handling industry, grading of granular food materials which are subjected to adulteration and quality has became a major issue in health care. This proposed system reduces the efforts of farmers, students and professors for identification of seed verities. To find the best food quality digital imaging is recognized as an efficient technique to extract the features from seeds in a non-contact manner. Images are acquired for rice using camera. Conversion to gray scale, Median smoothing, Adaptive thresholding, Sobel edge Detection, Canny edge detection, Morphological operations, Extraction of quantitative information are the checks that are performed on the acquired image usin g image processing technique. This work has been done to identify the relevant quality category for a given seed sample based on its parameters. **In future your proposed work can be extended to make a proposed system as complete automation with other feature extraction technique like color, texture, depth etc. with these techniques we can extend your dataset with more verities of maize seed which helps us to identify the more verities of maize seed**.

- *Classification and Quality Analysis of Food Grains* Megha R. Siddagangappa1 , Asso.Prof. A. H. Kulkarni 2IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 16, Issue 4, Ver. III (Jul – Aug. 2014)

In this survey system designed a grain recognition and quality analysis system using its color geometrical features, which classifies the type of grain and its quality and grade for Rice. For implementation, we have considered 12 different types of grains, i.e. rajma, corn, cowpeas, rice, etc. For quality analysis of rice we have considered three quality of rice namely basmati, delhi and boiled rice, and each can be categorized into three grades, i.e. Grade1, Grade2 and Grade3. Classifying the given grain type and its quality and grade in case of rice as per the definition. To do so we capture the grain image from the digital camera. Store them in the database. Read an image from the database, preprocess the image. Perform segmentation in order to extract the ROI i.e. each individual grain from the image sample.Extract the color and the geometrical feature from each ROI, store the extracted features in feature vector for training. Build the PNN for training and recognizing the grain type and its quality. Finally, test the system by giving different type of grain images as input. **The present work could be extended for remaining food grains also and few other features can also be extracted to increase accuracy. Also various infections on food grains like fissures can also be identified further.**

- *Review on Identification and Classification of Grains Using Image Processing* Sneha S. Kausal1 , S.V.More2 International Journal of Science and Research (IJSR) Volume 4 Issue 4, April 2015

In this research system designed to identify the type of rice grain being provided. By referring the previous work done an automated system is introduced which is used for grain type identification and classification of rice quality (i.e. Basmati, kolam, Indrayani) using Digital Image Processing. This paper proposes a model that uses color and geometrical features as attributes for classification. A good classification accuracy is achieved by using features as, HSB colors and geometrical features.

- "*Classification of corn kernels grades using image analysis and support vector machine*" Ang Wu, Juanhua Zhu, Yuli Yang, Xinping Liu, Xiushan Wang, Ling Wang, Hao Zhang, Jing Chen article first published online: December 22, 2018; Issue published: December 1, 2018

In this survey system classifying the quality of corn kernels in an affordable, convenient, and accurate manner, a method based on image analysis and support vector machine is proposed. A total of 129 corn kernels with Grade A, Grade B, and Grade C are used for the experiments. Four different classifiers are applied and compared: SVM- GA, SVM- PSO, SVM- GS, and BP neural networks. Experimental results show that the support vector machine and back-propagation neural networks without parameter optimization have the same classification accuracy rates of 92.31%. The classification accuracies are improved using the support vector machine optimization algorithms. The average correct classification rates of support vector machine-genetic algorithm and support vector machine-particle swarm optimization are all 97.44%, while the correct classification rate of support vector machine-grid search achieves 94.87%.

PROPOSED METHODOLOGY

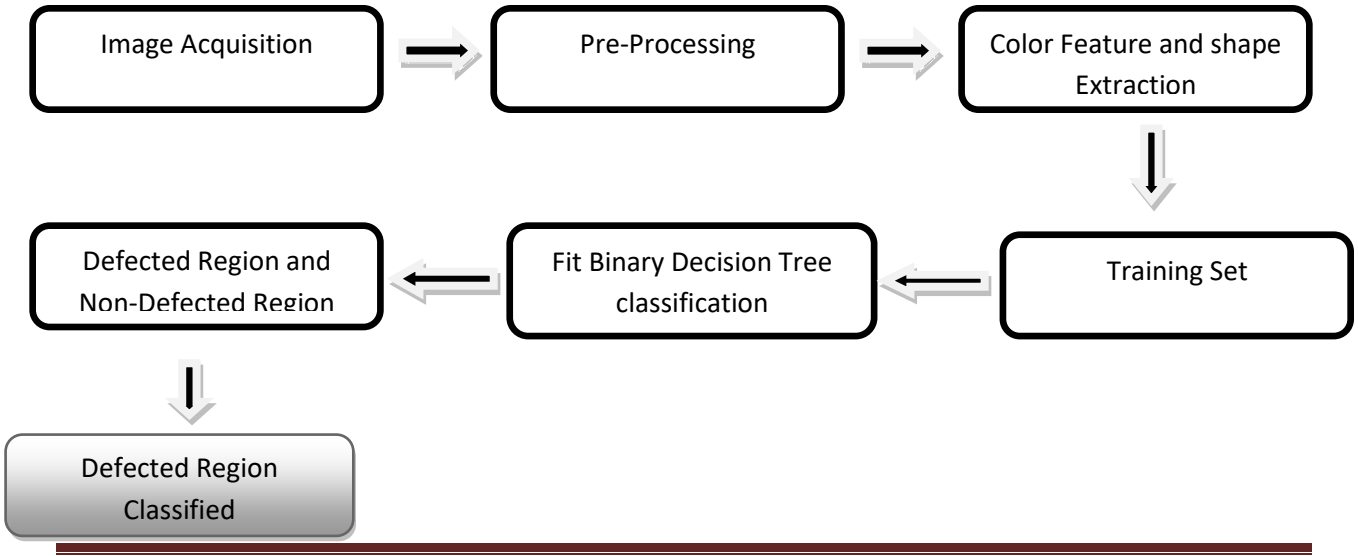

Image Acquisition –The first step in image processing which is defined as the action of retrieving an image from the dataset of digital image samples**.** Image acquired is completely unprocessed.Stored in hard-disk.

Pre-processing- Data preprocessing is a data mining technique that involves transforming raw data into an understandable format. Performing smoothing filter to smooth noisy data is often incomplete, inconsistent, and/or lacking in certain behaviors or trends, and is likely to contain many errors.Showing spatial and frequency filter.

Color feature and shape extraction- Feature analysis based on the color pigments and kernel texture to identify defected corn kernels from non-defected ones. In this certain features are calculated for each pixel. Selected corn grain image Background subtraction is done then use Morphological Opening to Estimate the Background. Get the Black and white Image of it as a output image where it replaces all pixels in the input image with luminance greater than 0.17 level. Then, remove small objects fewer than 30 pixels from binary image. This cell of codes plot the pixel locations. Once it is completed, process with an input image, for which classification should take place, to specify defected corn grain pixels .

Training set -Our dataset has its samples of features along rows and columns stored in .CSV file.Selection of all pixels are classified into two classes. Number of pixels are present in three consecutive rows presenting as X1,X2,X3 and one column of Y1 where pixels are categorized in 0's and 1's.It automatically get saved in your toolbox and test sets are created in order to measure the accuracy.

Fit Binary Decision Tree – Once training set is achieved , tree algorithm which uses supervised learning classifying the patterns into two different classes as damaged area and non-damaged.In this Decision tree, each branching node is split based on the values of a column of Table classes = fitctree(X , Y) returns a regression tree based on the input variables X and the output Y . The returned tree is a binary tree where each branching node is split based on the values of a column of X.

Classified Defected Region- Values tend to grow trees for average training sample sizes and classify the desired image. The testing can be done with a separate testing set which is created while creating training set and based on that desired classification accuracy calculated using proper method.

RESULT ANALYSIS

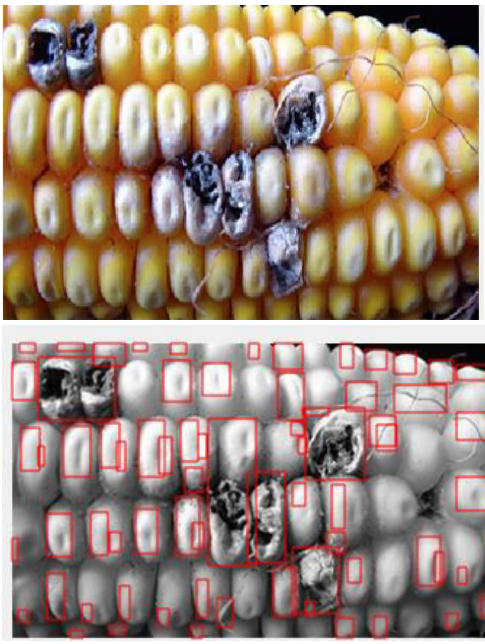

Fig.1- Image before Feature Extraction
Fig. 2-Image after Feature Extraction

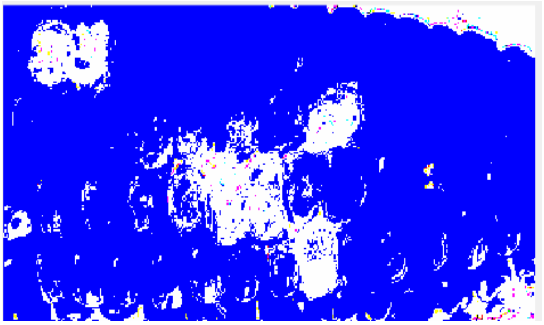

Fig. 3- Image before Classification
Fig. 4- Image after Classification

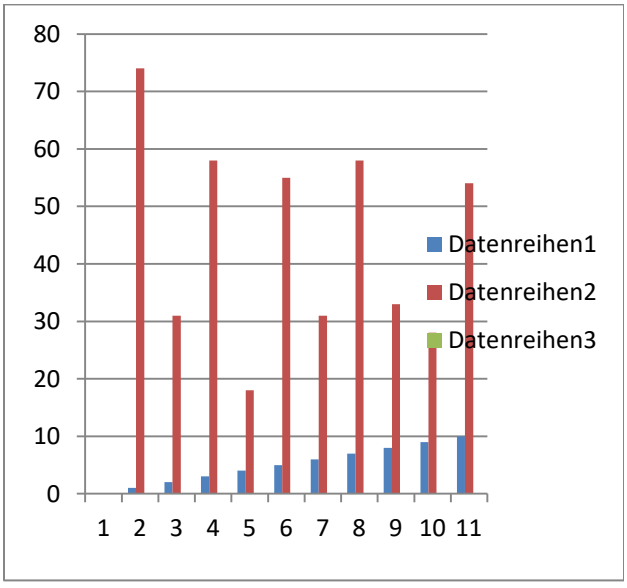

Fig. 5 Graph of the effected corn grains with *Fusarium* ear rot disease.

CONCLUSION-

The project "Disease Detection and Classification in Corn Grain using Digital Image Processing" is implemented using matlab software. This proposed system reduces the efforts of farmers, students and professors for identification of fungal disease corn grains. A corn grain quality has been recognised based on its color , kernel texture and overall shape features. In this paper Fit Binary Decision Tree has been used for classifying corn grain images and measured the damaged corn grain .The total calculated results showed 45 -50% corn grains are effected by the *Fusarium* ear rot disease.

FUTURE ENHANCEMENT

In future your proposed work can be extended to make a proposed system as a complete dynamic automation with other feature extraction techniques like texture, depth ,statistical parameters etc. We can extend your dataset with more varieties of seeds and which helps us to identify more number of related diseases like bacterial ,virus and various infections like bunt , loose smut in wheat can also be identified further .

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