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A METHOD OF IDENTIFICATION OF FOOD GRAINS OF INDIA AND ITS QUALITY USING PATTERN CLASSIFICATION

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Abstract- The main purpose of this project is to find the quality and purity of food grains by using image processing techniques to reduce the manual work. In the present system, grain type and quality are assessed by visual inspection. This evaluation process is tedious and time consuming. This also affects the eyes of the visual inspector. So, automating this process, we used digital image processing and neural network. A back propagation neural network based to identify the unknown grain types. The morphological and color features were presented to the neural network for training purposes. The trained network was then used to identify the type of grain and also the purity of the grain. By using this method, we can reduce the time consumed and is also cost effective.

Keywords- Grains, Digital Image Processing.

I. INTRODUCTION

Food is one of the basic requirements of every living being on earth. Food grain is the main source for our country's farmers to increase their agricultural income. Testing of grain is very important for grading the quality. There can be two ways of testing the quality namely, manual and automated. In the present system, grain type and quality are assessed by visual inspection. This evaluation process is tedious and time consuming. This also affects the eyes of the visual inspector. The automation level of testing food grains quality is low and most work is done by manpower. The workload is challenging and it will lead to have sample testing experience. It also makes the testing more costly, long and affecting to the health.

During grain handling operations, information on grain type and quality is required at each stage before the next course of operation can be determined and performed. The varietals purity is one of the factors whose inspection is more difficult and complicated. In the present system, grain type and quality are rapidly assessed by visual inspection. Sometimes the variety of rice looks so similar that differentiating them becomes a very tedious task when carried out manually. The health of the grain inspector is harmed. Hence, these tasks require automation and develop imaging systems that can be helpful to identify rice grain images, rectify it and then being analysed.

In earlier days of machine vision application to grain quality detection, researches suggested some pattern recognition techniques for identifying and classifying grains. Machine vision is widely used in the field of agriculture for identifying the varieties of various food crops and their quality as well. A machine vision system (MVS) provides an alternative to the manual inspection of biological products. It makes use of Machine algorithms and digital images. These images are obtained with the help of digital camera and are then stored in the computer for further process. In a machine vision system, the camera acts as an eye and the computer acts as the brain. Digital images stored in the computer are processed by image processing algorithms. They extract the features from digital images and use them to generate pattern. These patterns are input to the machine algorithms based on which the objects are classified into their respective classes. Such machine algorithms used for classifying objects referred to as pattern classifiers. In this project a model of quality testing and identification is built which is based on appearance features such as shape, and color with technology of image processing and neural network.

II. LITERATURE SURVEY

- **"Image Analysis of Bulk Grain Samples Using Neural Network" N.S. Visen, J. Paliwal, D.S. Jayas and N.D.G. White (2004).**
  In this paper the developed algorithms were used to extract over 150 color and textural features. A back propagation neural network-based classifier was developed to identify the unknown grain types. The color and textural features were presented to the neural network for training purposes. The trained network was then used to identify the unknown grain types. The technique here used was statistical pattern recognition. Hence classification accuracy of over 98% was achieved.[1]

- **"Improved Method for Identification and Classification of Foreign bodies mixed Food Grains Image Samples" B.S. Anami and D.G.Savakar (2005).**
  The paper presents an improved method for identification and classification of foreign bodies mixed food grain image samples using a neural network approach. Any matter other than major food grains was considered as a foreign body in this work, such as stones, soil lumps, plant leaves, piece of slums and other type grains etc. the amount of foreign bodies decides the purity of food grains. The colour and textural features were presented to the neural network for training and identification of unknown grain types mixed with foreign bodies.[2]

- **"Method of Identification of basmati rice grain of India and its quality using Pattern Classification" H.S. Gujjar and Dr.M.Siddappa (2013).**
  An algorithm was developed to identify varieties of rice seeds based on morphological features and colour features. A neural network was used to classify the rice seeds. Classification accuracy of over 95% was achieved.[3]

- **"Review on analysis and grading of rice using image processing" Abhishek gudipalli, Amutha Prabha N, Pradeep Reddy (2016).**
  This review paper presents the recent developments of image processing and machine vision system in an automated rice grading system. Image processing techniques were implemented to automate the process which overcomes the drawbacks of manual process. Here, various procedures were reviewed to obtain the percentage, quality of rice grains based on its size.[4]

- **"A Survey on Food Grain Identification Techniques Harini" S, Dr Saritha. C and Dr. Krishnamurthy.G.N (2018).**
  In this paper, a study of the various techniques adapted till date to identify food grain is done. The process of food grain identification includes image acquisition, pre-processing, data reduction and classification.[5]

III. PROBLEM STATEMENT

PROBLEM IDENTIFICATION

- Time consumed in manual work to find purity of food grains.
- Affects the health of the grain inspector.

PROBLEM STATEMENT

In the present system, grain type and quality are rapidly assessed by visual inspection. This evaluation process is tedious and time consuming. The decision making capabilities of a grain inspector can be affected by his/her physical condition such as fatigue and eyesight, mental state caused due to work pressure, and working conditions such as lighting, climate etc .Hence this task requires automation and develop image system that can be helpful to identify purity of grains using neural network.

IV. METHODOLOGY

BLOCK DIAGRAM OF PROPOSED WORK

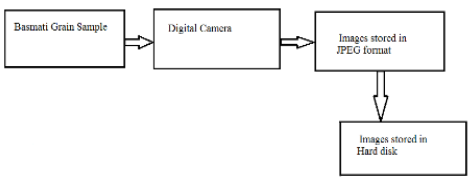

Fig: Basic Block Diagram

The block diagram illustrating the procedure for recognition and classification of grain image samples is shown in Figure 1 and methodology is given Algorithm 1.

Algorithm 1: Recognition and Classification of food grain image samples.

Input: Original 24-bit Color Image

Output: Classified food grains

Start

Step1: Acquire the food grain images.

Step2: Crop individual rice grain and scale it.

Step3: Enhance image to remove noise and blurring.

Step4: Do the image segmentation.

Step5: Extract Color, morphological and Texture features.

Step6: Use these features to recognize and classify the food grain image samples using Feed-Forward Neural network.

Stop

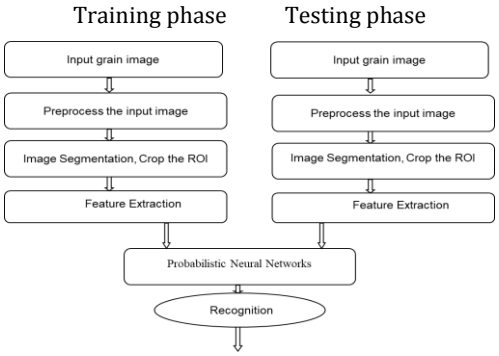

Fig: Block diagram of proposed work

FUNCTIONALITIES OF THE PROJECT

- Image Acquisition
- Image Pre-Processing
- Identifying Region of interest
- Image Segmentation
- Feature Extraction
- Training and Testing

V. RESULTS AND DISCUSSION

The project "A METHOD OF IDENTIFICATION OF FOOD GRAINS OF INDIA AND ITS QUALITY USING PATTERN CLASSIFICATION" has been made into a prototype which can be used to identify quality and purity of food grains using neural network. This method reduces the time consumed by manual work of finding the quality of food grains. More than 150 Images were used to test the system and it was found that accuracy of identifying grain and its grade is 100%. Quality testing of each grain type was 80-90% accurate.

Grain Type	Grain Grade	Total Images Tested	Total Images Correctly Classified	Accuracy %	Grains identified
RICE	BASMATI	20	17	85	100
RICE	SONAMASURI	20	16	80	100
WHEAT	GUJRATWHEAT	20	18	90	100
WHEAT	KHAPLI	20	17	85	100
CORN	ORANGE	20	18	90	100
CORN	YELLOW	20	17	85	100
HORSE GRAM	BROWN GRAM	20	16	80	100
HORSE GRAM	WHITE GRAM	20	17	85	100

Fig: Consolidated results of all grains with accuracy of testing

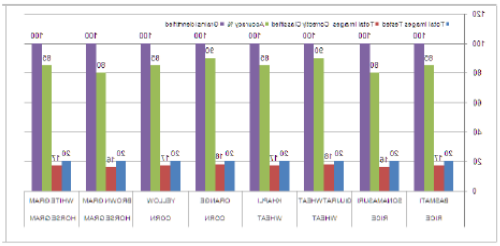

Fig: Consolidated graph of all grains with accuracy of testing

SUMMARY

CONCLUSIONS

- More than 150 Images were used to test the system and it was found that accuracy of identifying grain and its grade is 100%. Quality testing of each grain type was 80-90% accurate.
- A model of quality testing and identification is built which is based on features such as the shape, and color with technology of image processing and machine learning.
- Here, we conclude that purity percentage of rice samples can effectively be done by using the image processing techniques. With our Mat lab code, we can calculate that how pure is our sample.
- The setup used is also very easily available. This is also more accurate than the human visual inspection.

FUTURE SCOPE

This work can be carried forward by using machine algorithms, which have better accuracy and has less computational cost, other than used in this research work. Moreover, research can be done on different variety of wheat and different feature set can be used.

This work can also be further modified so as to identify the purity and quality of grains in bulk using various other algorithms.

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