

SCREENING OFF GRAINS AND GRAIN QUALITY ANALYSIS BY GRADING SYSTEM

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Abstract: The assessment of grain quality is a major problem in the agriculture industry. In the food sector, quality control is critical because, after harvesting, food items are categorized and graded according to quality requirements. Manual grain quality examination takes a long time, has inconsistent findings, and is expensive. Using image processing methods, grain quality may be analyzed to overcome these restrictions and shortfalls. Wheat and barley are inspected and graded by grain inspectors to assess their quality. Nearly 80% of the grain quality is accurately matched, and the grade of grain is then sorted. Moisture, protein, siftings, inadequate seeds, infections of mold, and hazardous grains are among the properties that are examined. After that, the grains are broken down into smaller pieces according to on their quality.

Keywords— Grain Quality Evaluation (GQE), Grain Grader, Time Consuming, Grain Quality.

1. INTRODUCTION

Today quality analysis is a complicated one. Most of the analysis is done under human supervision. They are only based upon visual inspection. This sometimes causes mistakes or wrong analysis may be done. When this quality analysis comes into the agriculture field it is a challenging one. The defects that can be seen while analyzing quality would be physical appearance, broken grains, color, and intensity of those seeds or grain. Analyzing quality is essential to know whether the product or grains are consumable for humans. There is a chance of fault that can occur during human quality analysis. Other than Physical factors we cannot analyze the internal factors such as area, length, breadth.

All these can be avoided by implementing “Screening Off Grains and Grain Quality Analysis by Grading System”. This system uses image processing techniques which is an advancement in technology. It is a non-destructive method. It can analyze based on internal factors. It does not consume more time. This system analysis gives more accuracy than that of analysis by human supervision. It is very much helpful in the agriculture industry. Since we grade the quality of the grains wise, the grains can be sold at the right price. Screening off grains involves scanning the grains with the camera and obtained image is analyzed with the help of the image processing technique. Since images are captured with a high-resolution camera the analysis of the grains makes it easier for quality grading. Many internal factors are analyzed and graded hence the high quality of a seed or grain is known and marketing them

would be less complicated. This system can be used for all types of grains and seeds quality analysis. The image Processing technique helps to differentiate the grain with high quality and grain which has low quality.

2. ARCHITECTURE

CAMERA INTERFACE

Digital cameras are connected to PCs and laptops in the hardware design. To get a more detailed and crisper picture, you'll need a digital camera with pixels larger than 13 megapixels. 16 megapixels is the resolution of the digital camera we utilized in our project. The Universal Serial Bus (USB) is used to connect the digital camera to the computer/laptop.

DATABASE UPDATION

The database is created for storing the sample image and the graded images. The current sample image is captured using the digital camera and is further processed for database updating. The sample image taken must be in [300x300] as pixel size and must be stored in Joint Photographic Experts Group (JPEG) format. This sample image is compared with each graded image with its matching percentage and with its area. The sample is categorized under the grade, which has its nearest matching percentage value.

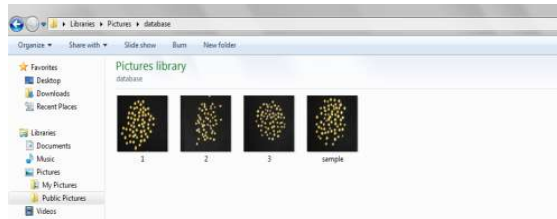


Fig 1. Database with standard images

GRAIN SAMPLE

The grain sample that we use as a sample for our project is the dhal(pigeon dhal). The dhal is placed over a black surface and the image is captured for better resolution. The Grade A sample contains perfect-sized dhal, Grade B contains the dhal that is partially infected and not in the perfect shape and the Grade C contains the dhal that is half broken and fully infected.

In Toor dhal, the parameters such as area of a sample of grains are determined and analyzed. The sample is compared with a standard value of area of grains, with those obtained values the average is compared and grading of quality is done.

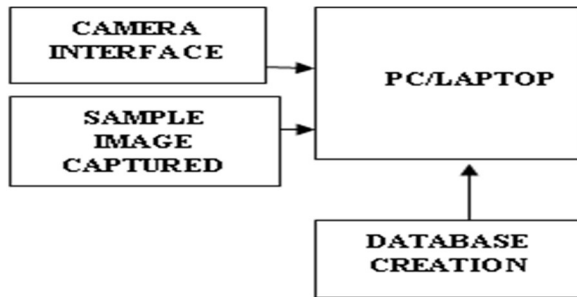


Fig 1. The architecture of the Proposed System

3. METHODOLOGY

The methodology of the system is shown in the above figure, in which the sample is captured using the camera and processed. The function of each process is discussed below:

SCANNING THE SAMPLES

The Graded images and the sample images are captured using a digital camera and then is sent to the personal computer. These images are stored in a separate folder thus creating a database for further process. The images are taken on a black surface for clear resolution of images.

PRE-PROCESSING OF IMAGE

The images that are stored in the database are pre-processed for converting the RGB image to a grayscale image.

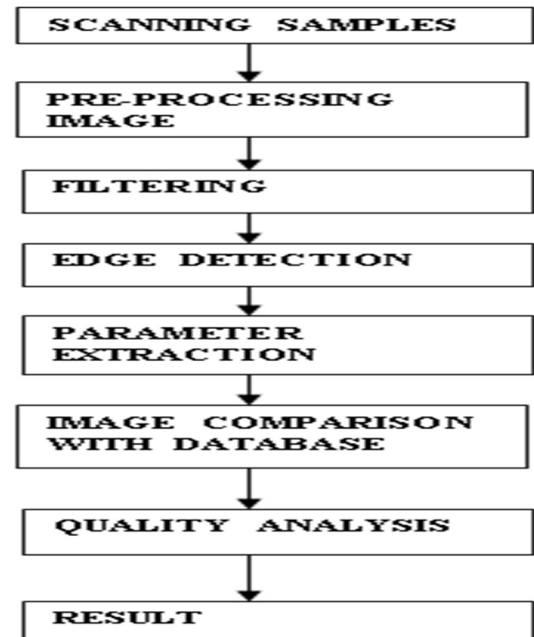


Fig 2. Flow Diagram of Proposed System

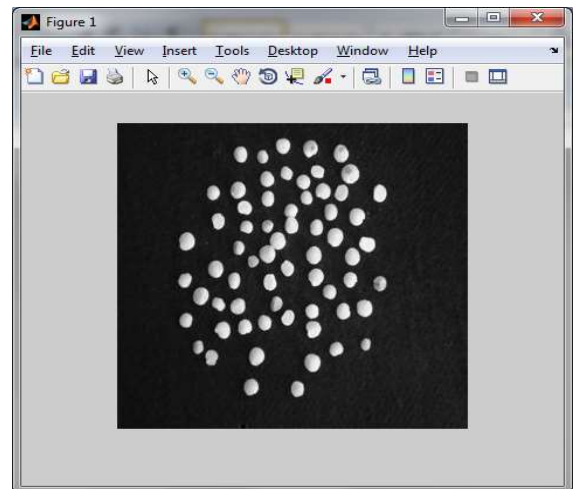


Fig 3. Grayscale image of the sample

EDGE DETECTION OF IMAGE

The pre-processed images are then subjected to an edge detection algorithm where the edges are detected from the stored images from which the boundaries are detected. The filtering is also done using median filters for removing the noise from the image.

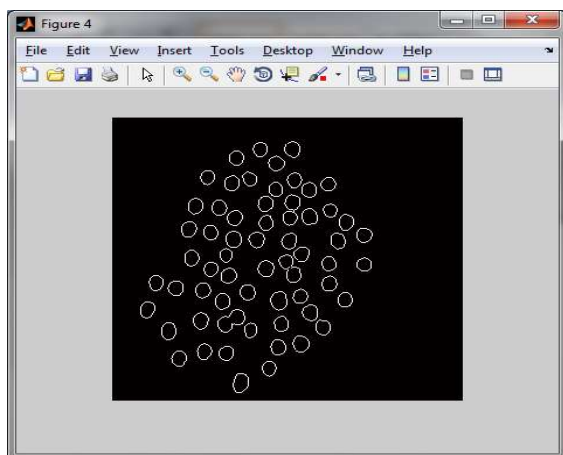


Fig 4. Edge detected image of grains

PARAMETER EXTRACTION

The edge detected images are then processed for parameter extraction. The parameter that is considered in our proposed system is the area of grains. The area of grains is calculated by considering the radius of grain by which the area is calculated of each grain. The average area of grain is then calculated. Thus, the grains can be graded according to the area.

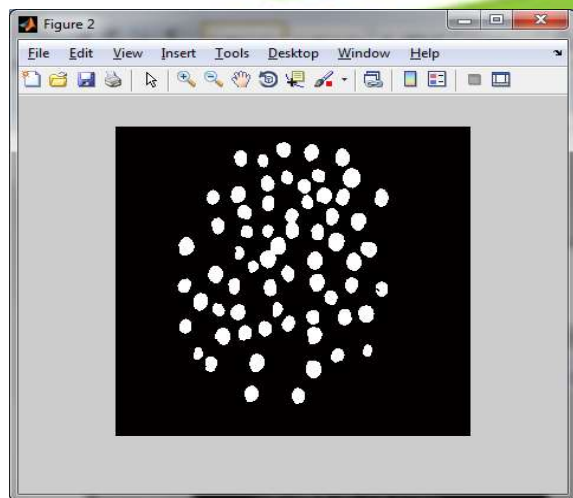


Fig 5. Threshold algorithm image to determine area

IMAGE COMPARISON WITH DATABASE

With the help of obtained area and edge detection from the sample, it is compared with the database. Depending upon the data obtained it is compared with the area that is already stored in the database. It is an important step to classify the grain quality wise.

QUALITY ANALYSIS

The grains are separated according to the grade by considering their physical features. The matching percentage of each grade is compared with the sample percentage and the highest matching value is mapped to the respective grade.

RESULT

The matching percentage and the area matching output are displayed using MATLAB software. Through this output, the grains are graded quality-wise as mentioned in the proposed system.

```
Average area of image sample
154.1778

grade 2
4.7286

process completed
4.9112

process completed
3.4582

process completed
4.9112

matching percentage of image 2 and sample is higher
Quality Grade 2
```

Fig 6. The output obtained of the sample

CONCLUSION:

Our project 'SCREENING OFF GRAINS AND GRAIN QUALITY ANALYSIS BY GRADING SYSTEM' presents a solution for quality evaluation and grading using image processing techniques. From this, we can overcome the problems faced which are non-destructive and cost-effective methods. We determine the matching percentage of whole sound grain in each sample. For the parameter extraction, the area is considered, and its quality is evaluated. In our analysis, the time taken to grade the quality takes place within a few seconds. The resulting system gets easily adapted for grading other kinds of grains like dhal, coffee seeds. Thus, by our analysis, the overall accuracy in grading grains is increased and can be extended to meet further agricultural needs.

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