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Review on Identification and Classification of Grains Using Image Processing

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Abstract: ***Quality of grains is an important requirement to protect consumers from sub-standard products. Sensory pleasure, healthy eating, value and convenience the consumer trends are driving the food industry today. Rice delivers on all of these. Rice is the primary dietary staple for more than half the world's population. It is the most popular grain globally, supplying energy, carbohydrates, protein, fibre, essential vitamins and minerals and beneficial antioxidants. In the last 30 years, rice consumption all over the world has more than doubled. Proposed system helps to identify the type of rice grain being provided.***

Keywords: Rice, Edge Detection, HSB, Mate Background, MATLAB

1. Introduction

Now-a-days quality of grains is an important requirement to protect consumers from sub-standard products. Yield is the most noticeable characteristic to farmers while the crop is in the ground, but when the product of the crop, the milled rice, reaches the market, quality becomes the key determinant of its sale-ability. However, the governments impose price control for essential commodities in order to protect the consumers from black marketing and inflated prices. As a result some traders unethically release sub-standard products to the consumer market. Because of such practices there are so many inferior quality grains arriving to the market day by day.

To avoid such fraud with the customers a system is designed which will help the customers to get the correct type of grain. The grain will be distinguished based on the shape analysis, texture analysis and edge detection of the grain.

2. Contribution by the Previous Researchers

Here different papers are studied based on the approaches used by the different researchers and modifications are made to provide more reliability in the proposed system.

L.A.I.Pabamalie, H.L.Premaratne "A Grain Quality Classification System" IEEE 2010.

Approach used here is focused on providing a better approach for identification of rice quality by using neural network and image processing concepts. Today a great deal of effort is focused on the development of neural networks for applications such as pattern recognition and classification. Neural Networks, with their remarkable ability to derive meaning from complicated or imprecise data can be used to extract patterns and detect that are too complex to be noticed by either humans or other computer techniques. This research has been done to identify the relevant quality category for a given rice sample and it was based on texture and color feature extraction are used to measure the quality of a rice sample.

Yong Wu and Yi Pan "Cereal Grain Size Measurement Based On Image Processing" IEEE 2010.

Approach used here is measurement of grain size using image processing. In older to measure the cereal grain size rapidly and objectively, a measurement method based on digital image processing technology was proposed. Firstly, the grain images acquired by a scanner were pre-processed by using the methods of image enhancement and morphological reconstruction. Finally, through image analysis technology the grain size parameters were measured, including grain number, area, size, roundness and size distribution etc. This paper presents a cereal grain size measurement method based on image processing, measuring the cereal number, area, size and size distribution etc parameters so that the grain quality can be evaluated more correctly.

D. M. Hobson, R. M. Carter, Y. Yan "Characterisation and Identification of Rice Grains through Digital Image Analysis" IMTC 2007.

In the present work a digital imaging approach has been devised in order to investigate different types of characteristics to identify different rice varieties. Eight different common rice varieties were used in tests for defining features. These include existing standards for grain length and aspect ratio features, but also successfully show the effectiveness of compactness as a feature. A novel texture feature is also shown to be able to distinguish brown and milled rice in greyscale images. All of these techniques are employed in an inexpensive imaging system that is non-intrusive and non destructive. A highly effective yet simple imaging setup and processing system is established, permitting image acquisition, image processing, and feature extraction. Features are assessed using unsupervised clustering techniques, showing the dissimilarity between different varieties to a degree that would allow successful identification. In this the rice is characterized and identified whether it is worth to use or not by checking the parameters such as shape analysis, texture analysis, edge detection, using digital image processing.

R.Kiruthika1, S.Muruganand2, Azha Periasamy3 "Matching Of Different Rice Grains Using Digital Image Processing" IJAREERE 2013

Approach used here is that different type of rice grain varieties is studied using image processing techniques. In the present work a digital imaging approach has been devised in order to investigate different types of characteristics to identify the rice varieties. Two different common rice varieties were used in tests for defining. These include existing standards for rice length, area and aspect ratio features of rice. It successfully shows the effectiveness of compactness as its features. When the data base of this work can recognize the rice, which has been trained the data in number of time; and hence it has been identified.

Megha R. Siddagangappa1, Asso.Prof. A. H. Kulkarni 2 " Classification and Quality Analysis of Food Grains." ISOR 2014

Approach used is that the present grain-handling scenario, grain type and quality are identified manually by visual inspection which is tedious and not accurate. There is need for the growth of fast, accurate and objective system for quality determination of food grains. An automated system is introduced which is used for grain type identification and analysis of rice quality (i.e. Basmati, Boiled and Delhi) and grade (i.e. grade 1, grade 2, and grade3) using Probabilistic Neural Network. This paper proposes a model that uses color and geometrical features as attributes for classification. The grading of rice sample is done according to the size of the grain kernel and presence of impurities. A good classification accuracy is achieved using only 6 features, i.e. mean of RGB colors and 3 geometrical features. The total success rate of type identification is 98% and total success rate of quality analysis and grading of rice is 90% and 92% respectively.

Hua Gao, Yaqin Wang, Pingju Ge "Analysis of Rice Granules using Image Processing and Neural Network Pattern Recognition Tool" IJOC 2014

Approach used is that Based on image processing technology, the detection, classification and feature extraction for plant grain shape are performed in this paper. Taking rice grain as an example, the shape detection and description method of similar round object are studied firstly. Then a grain shape description method based on 8 feature points of rice grain boundary is proposed. Aiming at rice seed detection, a simple image size calibration method based on black-white grid is put forward too. Finally, an extraction algorithm for 8 feature points is presented.

3. Proposed System

In the present grain-handling scenario, grain type and quality are identified manually by visual inspection which is tedious and not accurate. There is need for the growth of fast, accurate and objective system for quality determination of food grains. 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.

4. Block Diagram

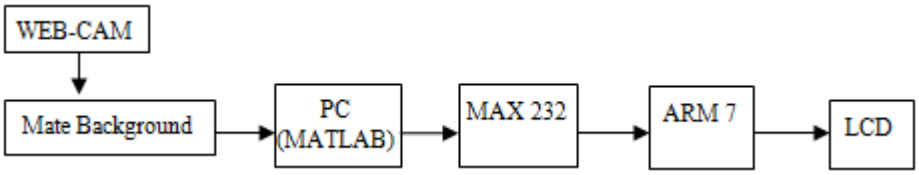

Figure 3.1: Block diagram

5. Flow-Chart

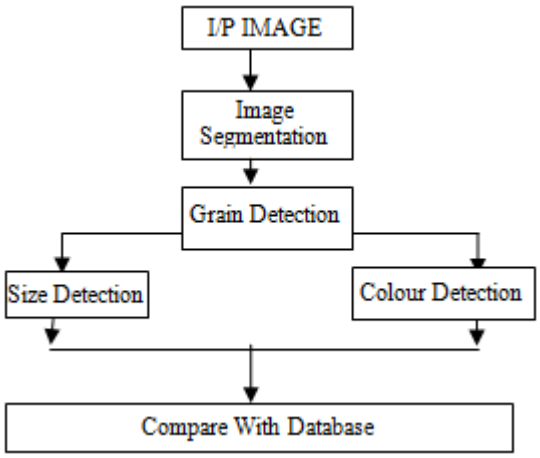

Figure 3.2: Flow-chart

6. Image Types

There are several ways of encoding the information in an image.

1. Binary image
2. Grayscale image
3. Indexed image
4. True color or RGB image

1)Binary Image

Each pixel is just black or white. Since there are only two possible values for each pixel (0, 1), we only need one bit per pixel.

2)Grayscale Image

Each pixel is a shade of gray, normally from 0 (black) to 255(white). This range means that each pixel can be represented by eight bits, or exactly one byte. Other gray scale ranges are used, but generally they are a power of 2.

3) Indexed Image

An indexed image consists of an array and a colour map matrix. The pixel values in the array are direct indices into a colour map. By convention, this documentation uses the variable name X to refer to the array and map to refer to the color map.

4) True Color Or Rgb Image

Each pixel has a particular color; that color is described by the amount of red, green and blue in it. If each of these components has a range 0–255, this gives a total of 2563 different possible colors. Such an image is a "stack" of three matrices; representing the red, green and blue values for each pixel. This means that for every pixel there correspond 3 values.

6.1 Image Segmentation

Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

6.2 Geometrical Features

The geometric parameters give us the basic information regarding the size and shape of the grains.

6.3 Area

This refers to the amount of pixels in the region, i.e. the pixels with level "1". The function region properties in MATLAB were used to measure the rice area of a selected region of an image in pixel count. Before applying the function region properties, the actual image is converted into a binary image .The Region properties instruction is used to estimate area enclosed .The area is the actual number of pixels in the selected region. The pixel count of the processed image depends on the distance between the camera and the object when the picture is taken, smallest distance and larger pixel counts. A reference object is an object with known area, needed to translate the pixel count area.

Average Length (La): It is the simplest feature considered. Using the per pixel length of the image it is possible to determine the absolute length of each grain. This per pixel area and length is determined through calibration. La is determined from the image by measuring the Euclidean distance between the two most distant points on the perimeter of the rice grain.

Aspect Ratio (Ra): An Aspect Ratio (Ra) feature is defined as the ratio between the shortest (dmin) to the longest (dmax) diameters:

$$Ra = \frac{dmin}{dmax}$$

Shape Factor (Sf): Shape Factor (Sf) is defined as;

$$Sf = \frac{drms.d}{dmean}$$

where dmean is the mean diameter of the grain with rootmean-square deviation (drms.d):

$$drms.d = \sqrt{\frac{(dmax - dmean)^2 + (dmean - dmin)^2}{2}}$$

Compactness Ratio (Rc): Compactness Ratio (Rc) returns values from 0 to 1 for shapes that are elongated to perfectly compact (spherical):

$$Rc = 4\pi \frac{A}{P^2}$$

Where A and P represent the area and perimeter length of the grain, respectively. The specifics of this function compensate for scale variance of the area/perimeter ratio. When interpreting perimeter length from the chain code, recognition of diagonal perimeter connectivity is important. Straight connectivity is approximated as distance 1, with diagonal connectivity approximated as the square root of 2.

Roundness: That is the circular degree of the cereal grain, defined as:

$$m = \frac{4\pi S}{P^2}$$

If grain shape closer to round, its value is closer to 1,on the contrary, m is close to 0.In the formula, S and P represent the cereal grain area and perimeter respectively.

6.4 Color Feature Extraction

Color features were extracted based on both RGB and HSV color spaces. RGB stands for the three primary colors Red, Green, and Blue. All other colors are perceived as a combination of these three colors. Hue, Saturation and Value are the three components of the HSV color space. Hue represents color; saturation indicates the range of grey in the color space and Value represents the brightness of the color. RGB defines the color in terms of the wavelengths of light. The HSV color space is quite similar to the way in which humans perceive color. It encapsulates information about a color in terms that are more familiar to humans; what color is it? How intense is it? How light or dark is it? Colors used in HSV can be clearly defined by human perception, which is not always the case with RGB.

6.5 WEBCAM

A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops. Their most popular use is the establishment of video links, permitting computers to act as videophones or videoconference stations. Other popular uses

include security surveillance, computer vision, video broadcasting, and for recording social videos. Webcams are known for their low manufacturing cost and flexibility, making them the lowest cost form of video telephony. They have also become a source of security and privacy issues, as some built-in webcams can be remotely activated via spyware.

6.6 Microcontroller Unit

The µC is the final decision making body on the system. The logic is developed and then the program is burned inside the microcontroller and the other peripherals are accessed via microcontroller only.

6.7 RS232

RS 232 IC is a driver IC to convert the µC TTL logic (0-5) to the RS 232 logic (+-9v).Many device today work on RS 232 logic such as PC, GSM modem , GPS etc. so in order to communicate with such devices we have to bring the logic levels to the 232 logic (+/-9v).

7. Conclusion

Quality of a grain is an important requirement for today's market, to protect consumers from substandard products. There are so many inferior quality grains arriving to the market day by day. Today in rice trade; rice of low quality is sold without being noticed. However, there is no convenient method to identify these inferior quality grains in the market. Therefore, this has become a serious issue for both the consumer and the governments. This project will help in identification and classification of varieties of rice using Image processing

References

[1] L.A.I.Pabamalie,H.L.Premaratne,"A Grain Quality Classification System," University of Colombo School of Computing, Sri Lanka, 2010 IEEE.
[2] Yong Wu and Yi Pan, "Cereal Grain Size measurement Based on Image Processing Technology", International Conference on Intelligent Control and Information Processing August 13-15, 2010 - Dalian, China
[3] D. M. Hobson, R. M. Carter, Y. Yan,"Characterisation and Identification of Rice Grains through Digital Image Analysis," Department of Electronics, University of Kent, Canterbury, Kent CT2 7NT, UK
[4] R.Kiruthika1, S.Muruganand2, Azha Periasamy3, "Matching Of Different Rice Grains Using Digital Image Processing," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 2, Issue 7, July 2013
[5] Megha R.Siddagangappa1, Asso.Prof. A. H. Kulkarni 2,"Classification and Quality Analysis of Food Grains", IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 16, Issue 4, Ver. III (Jul – Aug. 2014)
[6] Hua Gao1, Yaqin Wang2,1 , Pingju Ge1,"Rice Shape Parameter Detection Based On Image Processing".