IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, May 2024

Rice Quality Analysis Using Image Processing

Pratiksha M. Rajpurohit, Sanika V. Chaudhari, Sneha S. Sarkar,
Rimpa R. Singh, Prof. Vanita Buradkar
Department of Computer Science
Rajiv Gandhi College of Engineering Research and Technology, Chandrapur, India
DBATU University, Chandrapur

Abstract: *In many Asian countries, rice is a popular food that lots of people eat. It is easy to find worldwide. When people use rice for food, they often make different products from it. In farming and food science, checking the quality of rice is really important to make sure people like it and to farm it well. This study wants to change how we usually check rice quality. Instead of doing it by hand, we want to use computers to look at pictures of rice and figure out if it's good or not. We'll use fancy math and technology to do this quickly and accurately. This new way will make it easier to make sure rice is good quality, which is important as farming keeps changing. By employing advanced algorithms and image pre-processing techniques, this research aims to automate the evaluation process. The focus is on identifying key quality parameters such as grain size and shape swiftly and accurately. This innovative approach not only enhances precision but also streamlines the assessment process, offering a promising avenue for optimizing rice quality control in agriculture and food science.*

Keywords: Image processing, Segmenting, Morphology, classification, Algorithm

I. INTRODUCTION

Rice is a widely consumed staple food for a significant portion of the global population. It's a dominant source of carbohydrates and also gives energy. Quality is a major factor in the milled rice business. With the growth of the import and export industries, quality assessment becomes increasingly crucial.

There are various types of rice, such as long- grain, medium-grain, and short-grain, each with its own culinary uses.

Rice quality analysis is vital for ensuring safety , consumer satisfaction and economic viability of rice product. The project involves application of image processing technique to analyse quality of rice through analysing parameters such as grain size and shape

The methodology include image pre- processing, morphological operation, edge detection, object measurement, object classification.

The principal objective of proposed approach is to introduce alternative Avenue for quality control and analysis characterized by reduced expenditure in terms of effort , cost and time .

II. LITERATURE REVIEW

The paper discusses the utilization of image processing algorithms to analyse rice grain quality based on size, which has become a prevalent and effective methodology. This approach enables the assessment and classification of rice grain quality by employing advanced image processing techniques. By concentrating on the dimensions of rice grains, these algorithms enhance our understanding of their quality attributes. This technique has the potential to revolutionize conventional methods of evaluating grain quality, offering a more accurate and efficient means of classification.

In this article, the authors utilized a convolutional neural network (CNN) algorithm for image processing to grade rice based on length, width, area, and colour identification. The results indicated varying levels of effectiveness in quality assessment, with some parameters showing better results than others, particularly in terms of area- based quality assessment.

In this work machine learning and image processing techniques for identification and rice quality analysis of work. In the process they used RNN model as machine: earning model for classification. To detect the edge and identify its type

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, May 2024

RCNN object detect ion method where used. Accuracy of the model is 92.36% and analysis was done on the rice grace classification.

The paper demonstrates a low-cost rice quality assessment system based on image processing and machine learning (ML) algorithms. A Raspberry-Pi based image acquisition module was developed to extract the structural and geometric features from 3081 images of eight different varieties of rice grains. Based on features such as perimeter, area, solidity, roundness, compactness, and shape factor, an automatic identification system is developed to segment the grains based on their types and classify them by using seven machine learning algorithms. These ML models are trained using the images and are compared using different ML models. ROC curves are plotted for each model for quantitative analysis to assess the model's performance. It is concluded that the random forest classifier presents an accuracy of 77 percent and is the best performing model for the classification of rice varieties. Furthermore, the same algorithm is efficiently employed to determine the price of adulterated rice samples based upon the market price of individual rice.

In order to identify different types of grains and determine the purity of grains using image processing techniques based on various parameters including grain size and shape, They proposed a grain classification system based on machine learning and 10 image processing algorithms. The Python programming language and Python software are used for all operations. Images are collected from a dataset that includes images of food grains. On the captured images, feature extractions, segmentation, and image processing techniques are applied. That can be extracted in a noncontact method from the grains. This paper will also discuss and offers suggestions for how to categorize different types of food grains. It also determines the purity of the grain using image processing techniques based on characteristics like major axis length, minor axis length, area, and others.

III. PROPOSED MODEL

Utilizing an image processing technique,[10] the assessment of rice seed quantities is undertaken, followed by their classification based on parameters like length, breadth, and the length-breadth ratio. Particularly, the length represents the average longitudinal dimension of rice grains and breadth represents the average width. The length-breadth ratio is computed as L/B = [(Average length of rice grain) / (average breadth of rice)]*10.

The process depicts a series of steps:

Image Pre-Processing:

Image thresholding is a technique that simplifies a grayscale image into a binary image by classifying each pixel value as either black or white based on its intensity

[1] level compared to the threshold value. This procedure reduces the image to only two levels of intensity, making it easier to identify and segregate objects of interest.

It use to decide which part of the image are rice grain and which part are the black background. Visualizing processing algorithms, the concept of pixel classification based on intensity threshold is commonly used.

This principle establishes a threshold value; pixels above it are classified as white, while those below as black. It underpins image enhancement methods, crucial for extracting key features for analysis.

Shrinkage Morphological Operation:

The rice grains are placed randomly on a black background, and there is no specific orientation for the grains, [1] In instances where the grains come into contact with one another, morphological operations are used to distinguish them.

There are two types of grain contact: point and line contact. Morphological operations, which involve the combination of dilatation and erosion, can be used to address this issue. Erosion is a process that separates adjacent parts of a rice grain without causing any damage to its structure. Following the erosion process, dilation is performed to restore the original shape of any degraded features without reconnecting the separated elements.

Edge Detection:

Edge detection, the third step, plays a pivotal role in identifying the boundaries of rice grains. [1]

For detecting edges Canny algorithm is used.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, May 2024

The algorithm has 5 steps:

1. Gaussian Smoothing: To Blur the image it is convolved with a Gaussian kernel to reduce noise. This suppress the noise in the image.
2. Calculating Gradient: Gradient of smoothed image is calculated. The step highlight areas of significant intensity that corresponds to edges.
3. Non maximum suppression: All non- maximum values are suppressed leaving the local maxima in gradient direction. This step help to thin out the edges and keep only the most prominent ones.
4. Double thresholding: Two threshold are applied to gradient value: upper threshold & lower threshold. Pixels having gradient above higher threshold are noted as edges and the one that is below the lower threshold is discarded.
5. Edge tracking by hysteresis: The aim of the step is to connect weak edges to strong edges.

Object Measurement

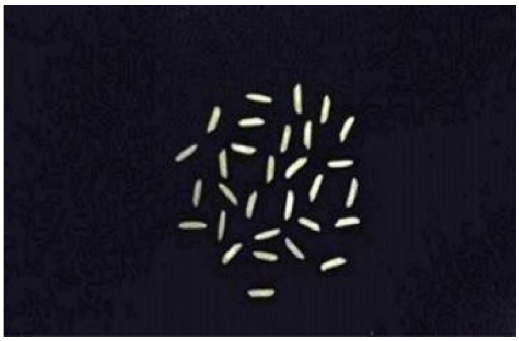
The fourth stage involves measuring rice grains by first counting them. After quantifying the grains, edge detection algorithms are applied to determine endpoint values for each grain. These dimensions are then used to calculate the length-breadth ratio.

Object Classification:

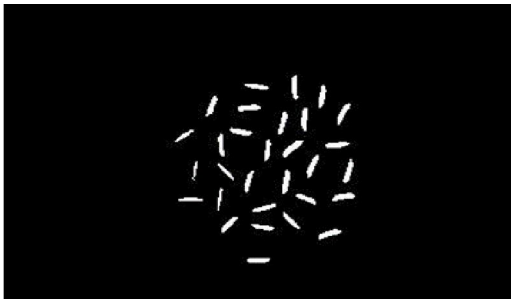
In the final step of the algorithm, object classification is executed.[1] This necessitates a compilation of standard, measured, and calculated outcomes.

IV. RESULT

[1] Image Pre-Processing: Image thresholding is a technique that simplifies grayscale image into binary image.



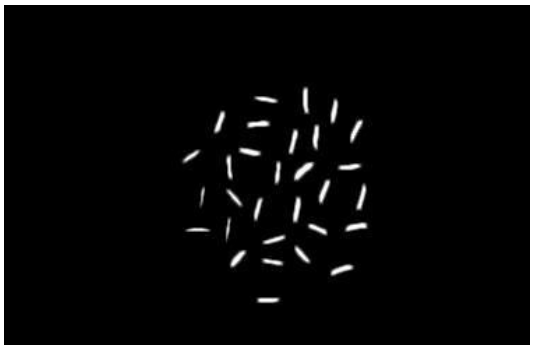
Input Image



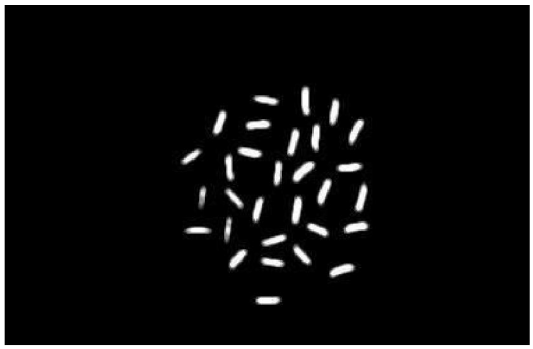
Binary Image

[2] Morphological Operation: Morphological Operations are image processing technique used for shape analysis and feature extraction

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, May 2024

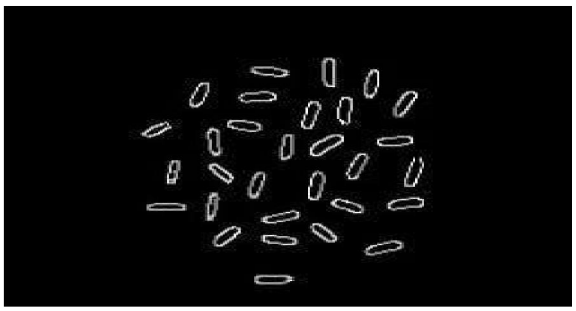


Erosion Image



Dilation Image

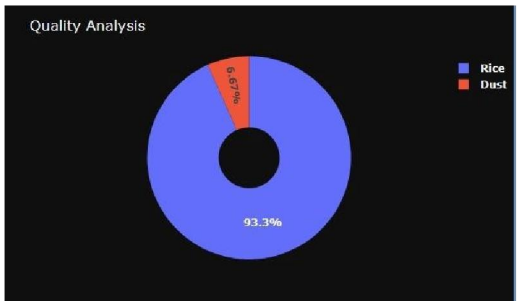
[3] Edge Detection: This step plays a pivotal role in identifying the boundaries of rice grains for which canny algorithm is used.



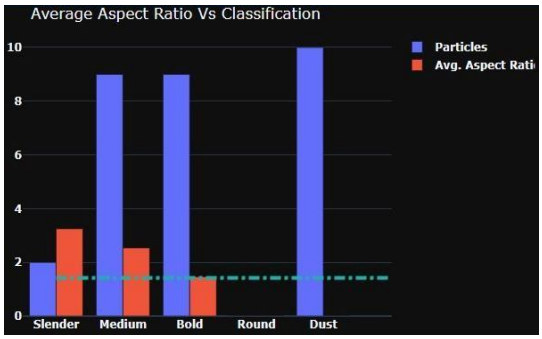
Edge Detection Image

[4] Object Measurement: The Fourth stage encompasses object measurement, ascertaining the measurement and count of rice grains.

[5] Object Classification: The final step where rice grains are classified in different categories



IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, May 2024



V. CONCLUSION

All over the world rice is most consuming food and the requirement and demand of rice in market is always high. In market rice demand is always cantered at quality of rice depending upon its factors like length, thickness Traditional methods to check this all aspects of rice can be very time consuming process and have to done manually. Quality and purity checking of grains are commonly derived from human vision observation. Analysing the grain sample manually is a long and time consuming as well as sophisticated process, and having more chances of errors with the subjectivity of human perception. An attempt is made to grade the rice grains when subjected to pre-processing. Based on the rice grains, filtered image is performed from the original image to eradicate the noise. Later on we classify the different types of rice grains based on Edge detection and based on length-breadth ratio. We conclude the quality of rice grains using length, breadth, length - breadth ratio.

REFERENCES

[1] Harshith Singathala, Jyotsna Malla, Preetham Lekkala, "Quality Analysis and Classification of Rice Grains using Image Processing Techniques", International Research Journal of Engineering and Technology (IRJET), Volume: 10 Issue: 08 Aug 2023

[2] Mr. Virendra Nimbalkar, Mr. Siddhesh Pandit, Ms. Tanvi Parate, Mr. Sudam Wagh Prof. Govind Suryawanshi, "RICE QUALITY ANALYSIS USING IMAGE PROCESSING AND MACHINE LEARNING ", International Journal of Creative Research Thoughts (IJCRT), Volume 10, Issue 5 May 2022

[3] R. C. Dharmik, Sushilkumar Chavhan, Shashank Gotarkar, Arjun Pasoriya, "RICE QUALITY ANALYSIS USING IMAGE PROCESSING AND MACHINE LEARNING",(2022)

[4] Sahil Kalra ,Yong Yu,"AN AUTOMATEDIMAGE PROCESSING MODULE FOR QUALITY EVALUATION OF MILLED RICE",(2023)

[5] Narmada B Assistant Professor, Praveen kumar S, Sangeeth kumar P, Sekar K A, Tamilselvan G, "QUALITY TESTING OF RICE GRAINS USING IMAGE PROCESSING",(2023)

[6] M. B. Lam, T. -H. Nguyen and W. -Y. Chung, "Deep Learning- Based Food Quality Estimation Using Radio Frequency-Powered Sensor Mote," in IEEE Access, vol. 8, pp. 88360-88371, 2020, doi: 10.1109/ACCESS.2020.2993053

[7] S. Gayathri, T. U. Ujwala, C. V. Vinusha, N. R. Pauline and D. B. Tharunika, "Detection of Papaya Ripeness Using Deep Learning Approach," 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2021, pp. 1755-1758, doi: 10.1109/ICIRCA51532.2021.9544902.

[8] Biglari, Roya & Mohanna, Farahnaz & Ahsani, Mohammad. (2022). Introducing an Automatic Bread Quality Assessment Algorithm using Image Processing Techniques. European Journal of Electrical Engineering and Computer Science. 6.31-38.10.24018/ejece.2022.6.6.470.

[9] D. R. Wijaya, N. F. Syarwan, M.A. Nugraha, D. Ananda, T. Fahrudin and R. Handayani, "Seafood Quality Detection Using Electronic Nose and Machine Learning Algorithms with Hyperparameter Optimization," in IEEE Access, vol. 11,pp. 6248462495,2023,doi: 10.1109/ACCESS.2023.3286980.

[10] Vijay Sonawane et al, International Journal of Computer Science and Mobile Computing, Vol.10 Issue.6, June-2021.