

Rice Grain Quantity, Quality, and Classification

Introduction:

Image processing can be used to analyze many different properties of an image, including the distribution and change in colors in the image, the number, size, position, orientation, and shape of objects in the image, and even - when combined with machine learning techniques for object recognition - the type of objects in the image.

Objective:

Using image processing techniques and edge detection algorithms to count the number of grains and to classify the rice grains based on broken and full grains.

Proposed Architecture:

- ★ Converting images from RGB to Grayscale
- ★ Morphological Methods
 - Erosion
 - Dilation
- ★ Edge Detection

Morphological Methods:

Morphological operations apply a structuring element to an input image, creating an output image of the same size.

- Erosion:

Erosion shrinks the image pixels, or erosion removes pixels on object boundaries.

- Dilation:

Dilation expands the image pixels, or it adds pixels to object boundaries.

Edge Detection:

Edge Detection is a method of segmenting an image into regions of discontinuity.

- **Canny Edge detection:**

Canny Edge Detection is used to detect the edges in an image. It accepts a grayscale image as input and it uses a multi-stage algorithm

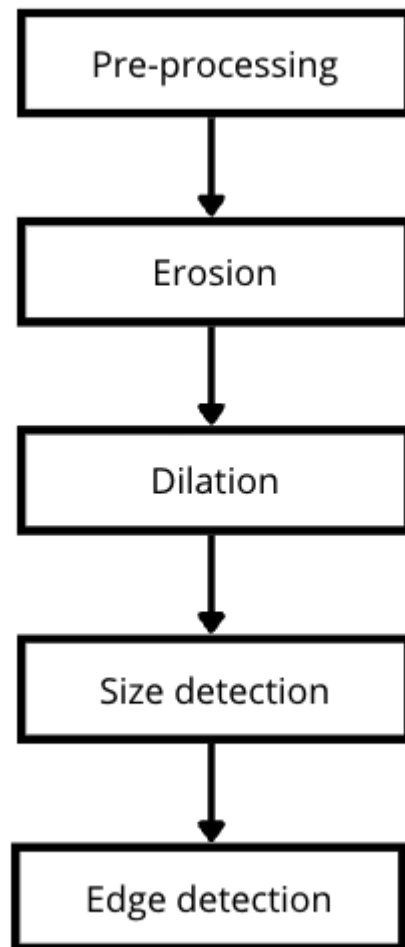


Fig 1: Proposed System

Implementation:

Language: Python

Libraries: OpenCV, NumPy, Matplotlib.

- The initial stage of image processing is pre-processing the given images.
- Converting the RGB image to Grayscale. Conversion to grayscale was done because it simplifies the algorithm and reduces computational requirements.
- A kernel of matrix size 5 is convolved with the image.

- With the help of erosion, small white noises are removed and detached two connected rice grains.
- Erosion is followed by dilation.
- It increases the white region in the image or the size of the foreground object(rice grain) increases. Erosion removes white noises, but it also shrinks our object. Hence, the images were dilated.
- Contours are used for joining all the continuous points (along the boundary), having the same intensity. The contours are a useful tool for shape analysis and object detection and recognition.
- The Canny Edge Detection algorithm was used to detect the edges that gave the total quantity of the grains from the image.
- The ratio of each grain was calculated to analyze the quality in terms of slender, medium, bold, and round.
- For every full grain image given, the ratio of each grain was calculated and an average aspect ratio of all the grains was calculated. This process was repeated for all the images given.
- The average ratio of all full grains and broken grains from their respective images was taken to define the condition that helped classify the rice grains.
- With the help of the matplotlib library, the images were plotted for better understanding and to give a visualization of the pre-processing techniques that were applied.

Future enhancement:

A different and more precise approach can be made, by initially pre-processing the images and training them using a neural network followed by segmentation and classification.

Reference:

YouTube - <https://youtu.be/R8PKv9509s8>