

QUALITY ANALYSIS OF RICE GRAINS USING MORPHOLOGICAL TECHNIQUES

Submitted in partial fulfillment of the requirements for
the award of
Bachelor of Engineering Degree in Computer Science and Engineering

By

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**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **BADE SUCHITRA (38110064)**, **CHANDRIKA VIJAYA KRISHNA UNDAVALLI (38110099)** who carried out the project entitled **"QUALITY ANALYSIS OF RICE GRAINS USING MORPHOLOGICAL TECHNIQUES"** under my supervision from Nov 2021 to April 2022

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ABSTRACT

Rice is the most favorable and most consuming food for all the human being in all over the world. Market for rice depends on the quality of it. Currently the type and quality of rice are assessed by visual inspection method through naked eye. This process is however tedious, time consuming, needs human expertise and depends on physical fitness of the inspector. To overcome these drawbacks, in this paper, an automated system is introduced which identifies and classifies the rice grains based on digital image processing techniques. Image processing method is most suitable as it is a non-contact technique, where in the image of the rice grains are captured. The captured images are pre-processed, segmented and features are extracted through MATLAB. From the extracted features the quality of rice is assessed based on Neural Networks (NN) and Support Vector Machine (SVM) classifier algorithms. A comparative study is made between these two methods and the results infer that SVM based classification outskirts its counterpart.

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Chapter 1

INTRODUCTION

1.1 Introduction:

Grains are the prime crop for our country to increase the agricultural income. Also, yield is the most noticeable characteristic to farmers while the crop is in the ground, but when the milled rice reaches the market, quality becomes the key determinant of its sale-ability. These grains consist of several impurities like stones, weed seeds, chaff, and damaged seeds etc. The automation level of testing quality of grain is low and most work is done by manpower. The workload is so mass that it will lead to workers fatigue and need them to have sample testing experience. And it also makes the testing more costly and long to be made. With the development of import and export trade this contradiction is more and more outstanding. During grain handling operations, types of grain and their quality is required at several stages before the next operation can be determined and performed. In the present grain handling system, grain type and quality are rapidly assessed by visual inspection. This analysis process is, however, tedious and time consuming. There is no convenient method to identify these inferior quality grains in the market. Therefore, this has become a serious issue for the consumer. The farmers are affected by this manual activity. Therefore, it is required to explore the possibility of using technology for a suitable solution. The accuracy of quality checking by using manual method is varied from person to person and it also depends on working stress, persuasion and loyalty for traders and also the knowledge and experience of inspectors are required to accurately perform this evaluation process.

1.2 Literature survey:

1.2.1 Title 1: Rice Grain Identification and Quality Analysis using Image Processing based on Principal Component Analysis

Author: Muhammad Junaid Asif

Department of Mechatronics & Control Engineering, University of Engineering & Technology, Lahore; Tayyab Shahbaz; Syed Tahir Hussain Rizvi; Sajid Iqbal '06 May 2019'

Content: Different types of foods are available in grain form, but rice is one of the important and most used cereal grains of Pakistan and all over the world. Quality inspection of rice grain is also important for both local as well as export purpose. It is necessary to propose an automatic solution to perform the quality analysis as well as to distinguish between different classes of rice. Main purpose of this paper is to present an image processing-based solution to classify the different varieties of rice and its quality analysis.

1.2.2 Title 2: Rice Quality Analysis and Classification Using Image Processing Techniques

Author: Vijay Sonawane¹ ; Nikhil Gaikwad² ; Hrushikesh Mandekar³ ; Kishore Baradkar⁴ ; Chetan Gunjal⁵ 2021, IJCSMC

Content: More than half the world's people consume rice every day and fulfills over 21% calorific requirement of world population. It is considered the whole grain which is rich in fiber and it contains 80 percent with protein, phosphorus, and potassium. There are hundreds of different varieties of rice and each rice grain has a unique shape, texture, and flavor that make it just right for certain dishes. The quality of rice between various types has different standards. Therefore, you must select the best quality rice because rice with best quality is not only good for consumption but also good for health.

1.2.3 Title 3: Computer Vision and Machine Learning Analysis of Commercial Rice Grains

Author: Aimi Aznan,^{1,2} Claudia Gonzalez Viejo,¹ Alexis Pang,¹ and Sigfredo Fuentes 2021 Sep 23.

Content: Rice quality assessment is essential for meeting high-quality standards and consumer demands. However, challenges remain in developing cost-effective and rapid techniques to assess commercial rice grain quality traits. This paper presents the application of computer vision (CV) and machine learning (ML) to classify commercial rice samples based on dimensionless morphometric parameters and color parameters extracted using CV algorithms from digital images obtained from a smartphone camera. The artificial neural network (ANN) model was developed using nine morpho-colorimetric parameters to classify rice samples into 15 commercial rice types.

1.2.4 Title 4: Machine vision based quality analysis of rice grains

Author: T. G. Devi, Periasamy Neelamegam, S. Sudha 2017 IEEE

Content:

In machine vision based testing, we take both physical (grain shape and size) and chemical characteristics (amylose content, gel consistency) for evaluation and grading of rice grains. Quality assessment is done by finding 1) the region of boundary and 2) the end points of each grain by measuring the length, breadth and diagonal size of grain. In this proposed image processing algorithm, quality and grading of rice grains were analysed using the average values of the features extracted and it was implemented in Mat Lab.

Chapter 2

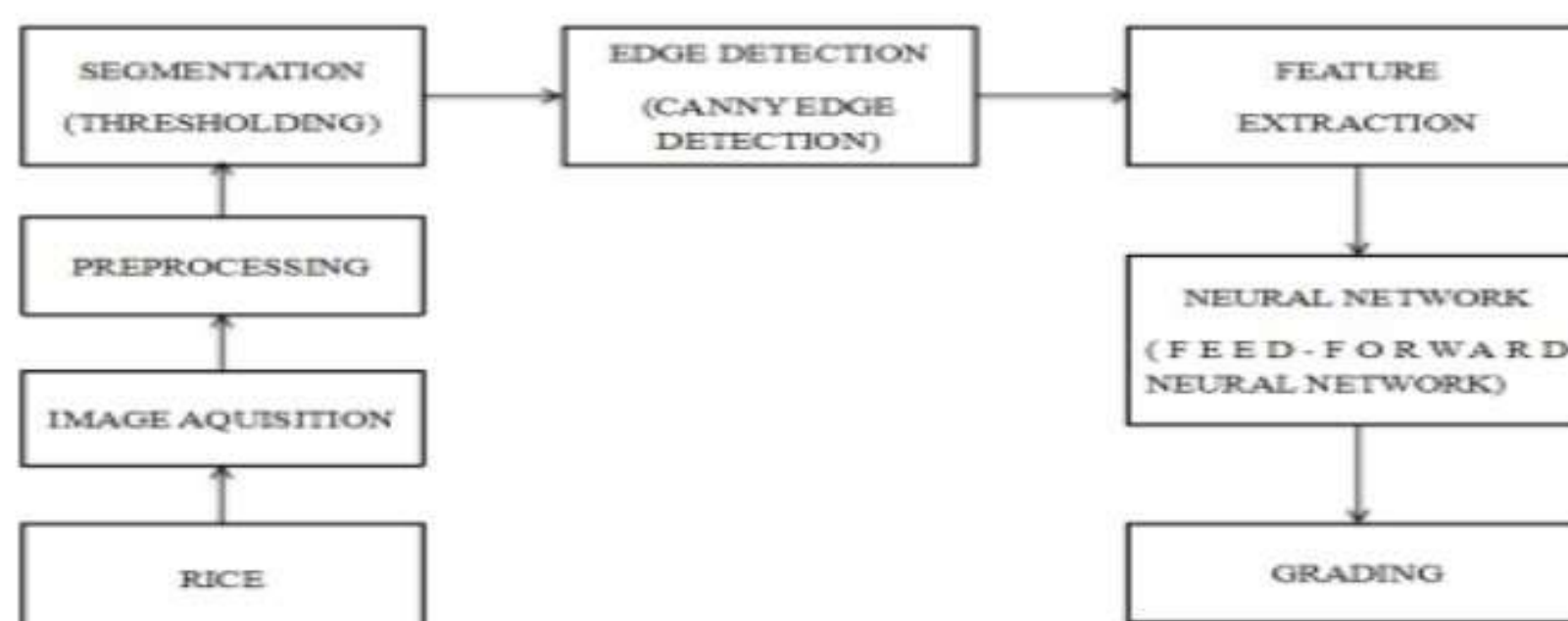
SYSTEM ANALYSIS

2.1 Existing system:

- In existing system normally they can identified by manual only. Those are easily identified village people and old persons.
- Now a days it is so difficult to identified the rice quality checking.

2.2 Proposed system:

- Consumers of today are very conscious about the quality of food grains. In order to ensure the quality of rice grains, an automated rice grain quality assessment system based on ANN and SVM classifiers has been addresses in this research work. Two types of rice grains viz. Ponni and Matta are taken up for study.
- The proposed system identified and classified the rice grains based on their morphological and geometrical features. The experimental analysis showed that the proposed ANN classifier has an overall accuracy of 83%, whereas SVM resulted in 91%.
- On the other hand, when the other parameters are considered, such that the computational time and parallel processing (classifying more than one samples at a time), the performance of SVM is far better than its counterpart.
- The reasons may be due to imbalance training ratio. It is concluded that the proposed system can effectively classify the type of rice grains.



2.3 Block diagram:

Fig:2.1

2.4 Modules:

- In first module we collect the images of data set and going to pre-processing it.

In pre-processing the images can be covert into frames and it will convert into gray scale.

- In second module adding filtering techniques

In this module we can get what we want in the image, by using filters and morphological techniques.

- In third module we can detect the rice grains.

In this module for detecting the rice grains, we are using edge detection and segmentation.

- In the final module we can Quality analysis of rice grains.

In this module rice can be analysed using neural networks.

Chapter 3

SYSTEM DESIGN

3.1.1 Image processing

Image processing is the technique to convert an image into digital format and perform operations on it to get an enhanced image or extract some useful information from it. Changes that take place in images are usually performed automatically and rely on carefully designed algorithms.

Image processing is a multidisciplinary field, with contributions from different branches of science including mathematics, physics, optical and electrical engineering. Moreover, it overlaps with other areas such as pattern recognition, machine learning, artificial intelligence and human vision research. Different steps involved in image processing include importing the image with an optical scanner or from a digital camera, analysing and manipulating the image (data compression, image enhancement and filtering), and generating the desired output image.

The need to extract information from images and interpret their content has been the driving factor in the development of image processing. Image processing finds use in numerous sectors, including medicine, industry, military, consumer electronics and so on. In medicine, it is used for diagnostic imaging modalities such as digital radiography, positron emission tomography (PET), computerised axial tomography (CAT), magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI). Industrial applications include manufacturing systems such as safety systems, quality control and automated guided vehicle control.

Complex image processing algorithms are used in applications ranging from detection of soldiers or vehicles, to missile guidance and object recognition and reconnaissance. Biometric techniques including fingerprinting, face, iris and hand recognition are being used extensively in law enforcement and security.

Digital cameras and camcorders, high-definition TVs, monitors, DVD players, personal video recorders and cell phones are popular consumer electronics items using image processing.

3.1.2 MATLAB

MATLAB, an abbreviation for 'matrix laboratory,' is a platform for solving mathematical and scientific problems. It is a proprietary programming language developed by [MathWorks](#), allowing matrix manipulations, functions and data plotting, algorithm implementation, user interface creation and interfacing with programs written in programming languages like [C](#), C++, Java and so on.

In MATLAB, the IPT is a collection of functions that extends the capability of the MATLAB numeric computing environment. It provides a comprehensive set of reference-standard algorithms and workflow applications for image processing, analysis, visualisation and algorithm development.

It can be used to perform image segmentation, image enhancement, noise reduction, geometric transformations, image registration and 3D image processing operations. Many of the IPT functions support C/C++ code generation for desktop prototyping and embedded vision system deployment.

3.2 What is a digital image?

A digital image may be defined as a two-dimensional function $f(x,y)$, where 'x' and 'y' are spatial coordinates and the amplitude of 'f' at any pair of coordinates is called the intensity of the image at that point. When 'x,' 'y' and amplitude values of 'f' are all finite discrete quantities, the image is referred to as a digital image.

Digitising the coordinate values is referred to as 'sampling,' while digitising the amplitude values is called 'quantisation.' The result of sampling and quantisation is a matrix of real numbers.

A digitised image is represented as:

$$f(x, y) = \begin{bmatrix} f(0, 0) & f(0, 1) & \dots & f(0, N-1) \\ f(1, 0) & f(1, 1) & \dots & f(1, N-1) \\ \vdots & \vdots & \vdots & \vdots \\ f(M-1, 0) & f(M-1, 1) & \dots & f(M-1, N-1) \end{bmatrix}$$

Each element in the array is referred to as a pixel or an image element.

Basic image processing commands in MATLAB

In MATLAB a digital image is represented as:

$$f(x, y) = \begin{bmatrix} f(1, 1) & f(1, 2) & \dots & f(1, N) \\ f(2, 1) & f(2, 2) & \dots & f(2, N) \\ \vdots & \vdots & \vdots & \vdots \\ f(M, 1) & f(M, 2) & \dots & f(M, N) \end{bmatrix}$$

In this representation, you can notice the shift in origin.

3.2.1 Reading images

Images are read in MATLAB environment using the function 'imread.' Syntax of imread is:

`imread('filename');`

where 'filename' is a string having the complete name of the image, including its extension.

3.2.2 Image display

Images are displayed on the MATLAB desktop using the function imshow, which has the basic syntax:

`imshow(f)`

where 'f' is an image array of data type 'uint8' or double. Data type 'uint8' restricts the values of integers between 0 and 255.

It should be remembered that for a matrix of type 'double,' the imshow function expects the values to be between 0 and 1, where 0 is displayed as black and 1 as white. Any value between 0 and 1 is displayed as grayscale. Any value greater than 1 is displayed as white, and a value less than zero is displayed as black. To get the values within this range, a division factor can be used. The larger the division factor, the darker will be the image.

VARIOUS IMAGE TOOLS AND THEIR CAPABILITIES	
Image tools	Capabilities
Pixel information	Displays information about the pixel under the mouse pointer
Pixel region	Superimposes pixel values on a zoomed-in pixel view
Measure distance	Measures the distance between two pixels
Image information	Displays information about images and image files
Adjust contrast	Adjusts the contrast of the displayed image
Crop image	Defines a crop region and crops the image
Display range	Shows the display range of the image data
Overview	Shows the currently visible image
Choose colormap	Shows the image under different colour settings

Fig:3.1 Various image tools and their capabilities

3.2.3 Writing images

Images are written to the current directory using the imwrite function, which has the following syntax:

imwrite(f, 'filename');

This command writes image data 'f' to the file specified by 'filename' in your current folder. The imwrite function supports most of the popular graphic file

formats including GIF, HDF, JPEG or JPG, PBM, BMP, PGM, PNG, PNM, PPM and TIFF and so on.

The following example writes a 100×100 array of grayscale values to a PNG file named random.png in the current folder:

```
>> F = rand(100);  
>> imwrite(F, 'random.png')
```

When you open the folder in which you are working, an image file named 'random.png' is created.

For JPEG images, the imwrite syntax applicable is:

```
imwrite(f, 'filename.jpg', 'quality', q)
```

where 'q' is an integer between 0 and 100.

It can be used to reduce the image size. The quality parameter is used as a trade-off between the resulting image's subjective quality and file size.

3.2.4 Image information

File details including file name, data, size, format, height and width can be obtained using the command:

```
imfinfo('filename')
```

Chapter 4

MODULES DESCRIPTION

Image processing covers a wide and diverse array of techniques and algorithms. Fundamental processes underlying these techniques include sharpening, noise removal, deblurring, edge extraction, binarisation, contrast enhancement, and object segmentation and labeling.

Sharpening enhances the edges and fine details of an image for viewing by human beings. It increases the contrast between bright and dark regions to bring out image features. Basically, sharpening involves application of a high-pass filter to an image.

4.1 Noise removal techniques

Reduce the amount of noise in an image before it is processed any further. It is necessary in image processing and image interpretation so as to acquire useful information. Images from both digital cameras as well as conventional film cameras pick up noise from a variety of sources. These noise sources include salt-and-pepper noise (sparse light and dark disturbances) and Gaussian noise (each pixel value in the image changes by a small amount). In either case, the noise at different pixels can either be correlated or uncorrelated. In many cases, noise values at different pixels are modeled as being independent and identically distributed and hence uncorrelated. In selecting noise reduction algorithm, one must consider the available computer power and time and whether sacrificing some image detail is acceptable if it allows more noise to be removed and so on.

Deblurring is the process of removing blurring artifacts (such as blur caused by defocus aberration or motion blur) from images. The blur is typically modelled as a convolution point-spread function with a hypothetical sharp input image, where both the sharp input image (which is to be recovered) and the point-spread function are unknown. Deblurring algorithms include methodology to remove the blur from an image. Deblurring is an iterative process and you might need to repeat the process multiple times until the final image is the best approximation of the original image.

Edge extraction or edge detection is used to separate objects from one another before identifying their contents. It includes a variety of mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply. Edge detection approaches can be categorised into search-based approach and zero-crossing-based approach. Search based methods detect edges by first computing a measure of edge strength (usually a first-order derivative function) such as gradient magnitude and then searching for a local directional maxima of the gradient magnitude using a computed estimate of the local orientation of the edge, usually the gradient direction. Zero-crossing methods look for zero-crossings in a second-order derivative function computed from the image to find the edge. First-order edge detectors include Canny edge detector, Prewitt and Sobel operators, and so on.

Other approaches include second-order differential approach of detecting zero-crossings, phase congruency (or phase coherence) methods or phase-stretch transform (PST). Second-order differential approach detects zero-crossings of the second-order directional derivative in the gradient direction. Phase congruency methods attempt to find locations in an image where all sinusoids in the frequency domain are in phase. PST transforms the image by emulating

propagation through a diffractive medium with engineered 3D dispersive property (refractive index).

Binarisation refers to reducing a greyscale image to only two levels of grey, i.e., black and white. Thresholding is a popular technique for converting any greyscale image into a binary image.

Contrast enhancement is done to improve an image for human viewing as well as for image processing tasks. It makes the image features stand out more clearly by making optimal use of colours available on the display or the output device. Contrast manipulation involves changing the range of contrast values in an image.

Segmentation and labeling of objects within a scene is a prerequisite for most object recognition and classification systems. Segmentation is the process of assigning each pixel in the source image to two or more classes. Image segmentation is the process of partitioning the digital image into multiple segments (sets of pixels, also known as super pixels). The goal is to simplify and/or change the contrast representation of an image into something that is more meaningful and easier to analyse. Once the relevant objects have been segmented and labelled, their relevant features can be extracted and used to classify, compare, cluster or recognise desired objects.

4.2 Types of images

The MATLAB tool box supports four types of images, namely, grey-level images, binary images, indexed images and RGB images. Brief description of these image types is given below.

4.2.1 Grey-level images

Also referred to as monochrome images, these use 8 bits per pixel, where a pixel value of 0 corresponds to 'black,' a pixel value of 255 corresponds to 'white' and intermediate values indicate varying shades of grey. These are also encoded as a 2D array of pixels, with each pixel having 8 bits.

4.2.2 Binary images

These images use 1 bit per pixel, where a 0 usually means 'black' and a 1 means 'white.' These are represented as a 2D array. Small size is the main advantage of binary images.

4.2.3 Indexed images

These images are a matrix of integers (X), where each integer refers to a particular row of RGB values in a secondary matrix (map) known as a colour map.

4.2.4 RGB image

In an RGB image, each colour pixel is represented as a triple containing the values of its R, G and B components. In MATLAB, an RGB colour image corresponds to a 3D array of dimensions $M \times N \times 3$. Here 'M' and 'N' are the image's height and width, respectively, and 3 is the number of colour components. For RGB images of class double, the range of values is [0.0, 1.0], and for classes uint8 and uint16, the ranges are [0, 255] and [0, 65535], respectively.

Most monochrome image processing algorithms are carried out using binary or greyscale images.

4.3 Image quality

Image quality is defined in terms of spatial resolution and quantisation.

Spatial resolution is the pixel density over the image. The greater the spatial resolution, the more are the pixels used to display the image. Spatial resolution is expressed qualitatively as dots per inch (dpi).

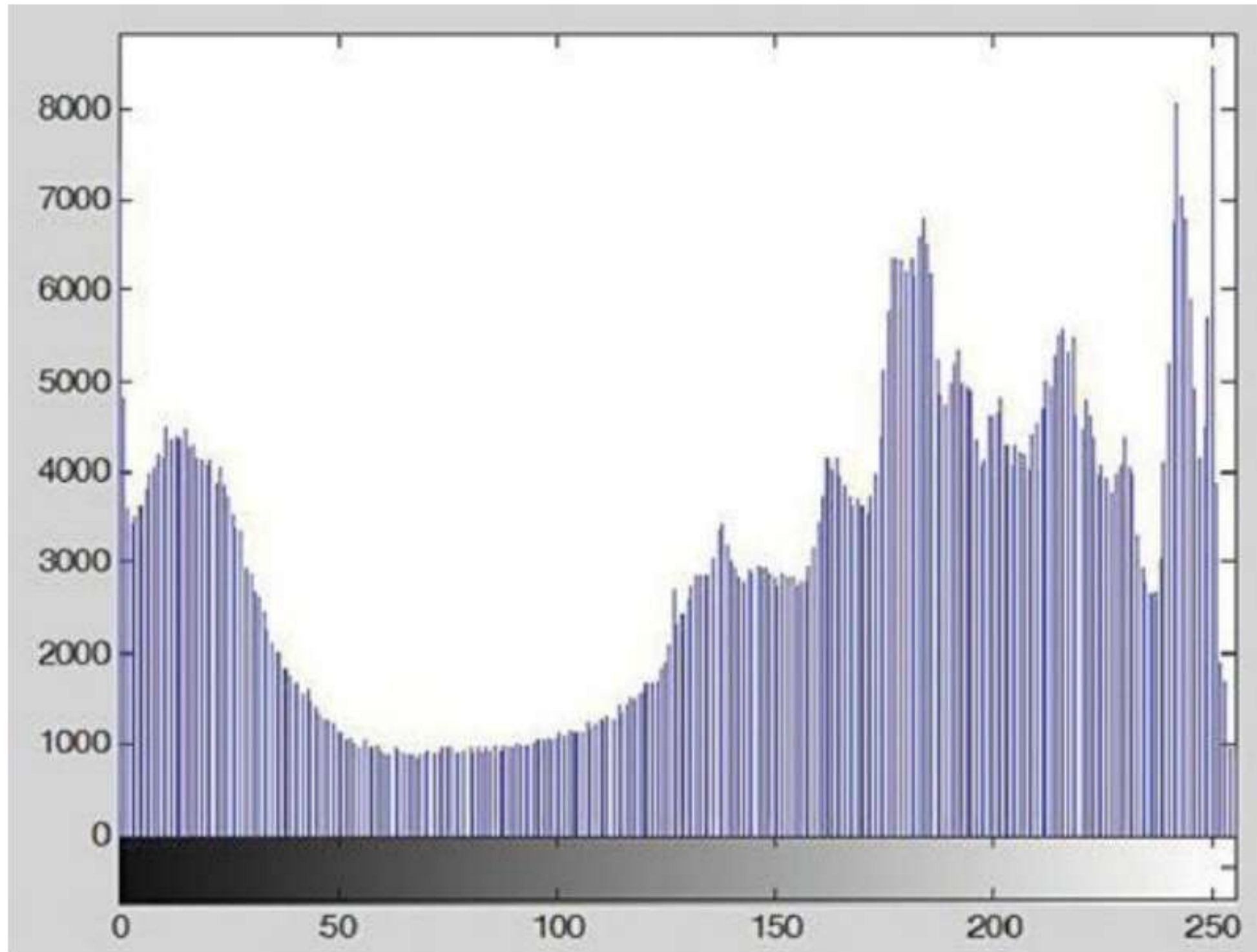
The image resolution can be changed using the `imresize` function. The command `imresize(x,1/2)` halves the image size. This is done by taking a matrix from the original matrix having elements whose row and column indices are even. `imresize(x,2)` means all the pixels are repeated to produce an image of the same size as original, but with half the resolution in each direction.

Other resolution changes can be done by using the desired scaling factors. Command `imresize(imresize(x,1/2),2)` changes the image resolution by half while keeping the image size same. Similarly, command `imresize(imresize(x,1/4),4)` changes the image resolution by one-fourth.

4.4 Histogram

Histogram of a greyscale image represents the frequency of its grey levels occurrence. It is a graph indicating the number of times each grey level occurs in the image. In a dark image, grey levels (and hence the histogram) are cluttered at the lower end. In a uniformly bright image, grey levels (and hence the histogram) are cluttered at the upper end. In a well contrasted image, grey levels (and hence the histogram) would be well spread out over much of the range.

Fig4.1 shows the histogram generated by the above command.



The three main operations performed on a histogram include histogram stretching, histogram shrinking and histogram sliding. All these operations are described in the following paragraphs.

4.4.1 Histogram stretching

This technique, also known as input cropping, consists of a linear transformation that stretches part of the original histogram so that its non-zero intensity range occupies the full dynamic grey scale.

If the histogram of the image is cluttered at the centre, it can be stretched using `imadjust` function. The following command stretches the histogram as shown

imadjust ***(F, [a,b], [c,d])***

The values of a, b, c and d must be between 0 and 1.

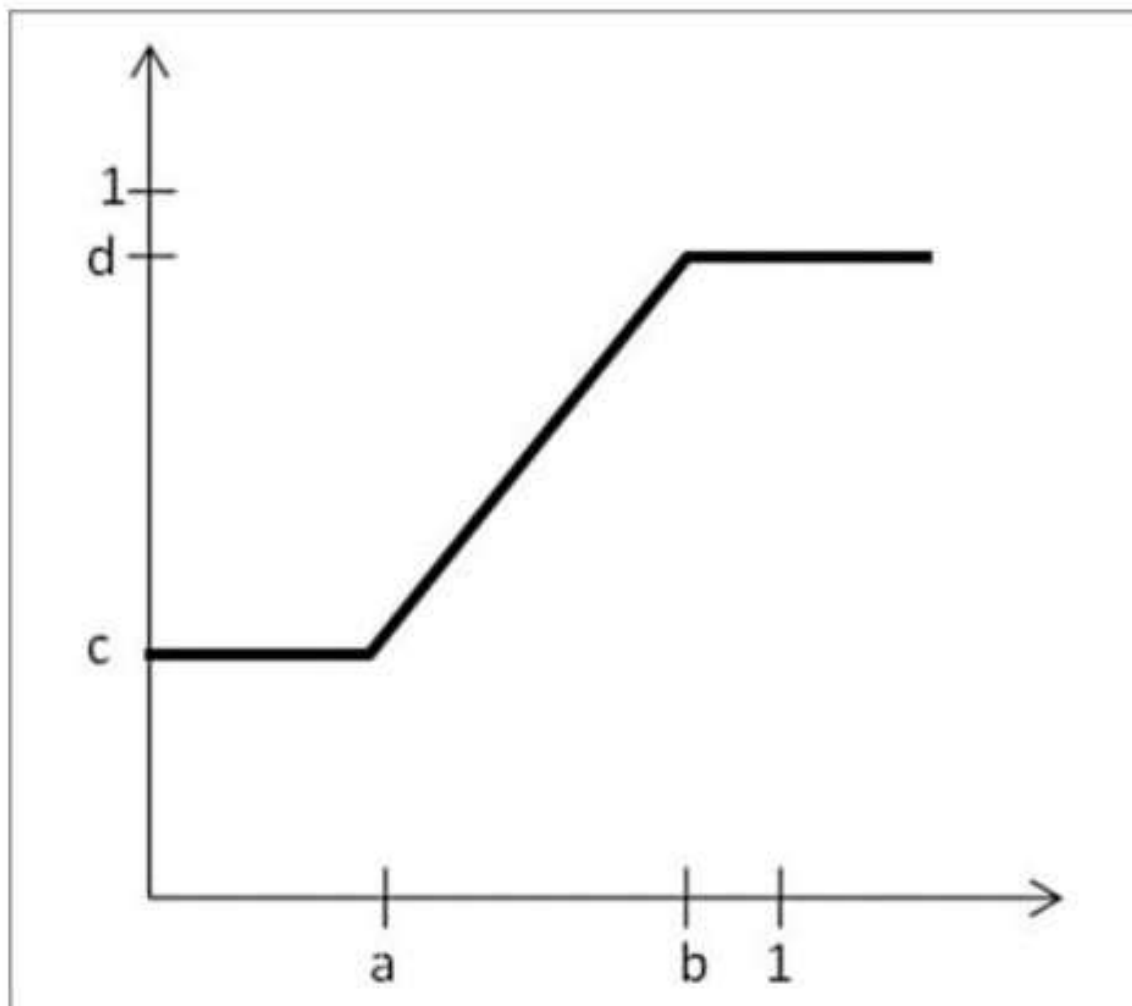


Fig. 4.2: Histogram stretched using imadjust function

Command `imadjust (F, [], [1,0])` inverts the grey value of the image, to produce a result similar to photographic negative.

Histogram stretching using above commands requires user input. An alternative approach is to use histogram equalisation command, which is entirely an automatic procedure. Histogram equalisation command in MATLAB is `histeq`. The use of `histeq` command is shown below:

4.4.2 Histogram shrinking

This technique, also known as output cropping, modifies the original histogram such that its dynamic greyscale range is compressed into a narrower greyscale. `imadjust` function can be used for histogram shrinking.

4.4.3 Histogram sliding

This technique consists of simply adding or subtracting a constant brightness value to all pixels in the image. The overall effect is an image with comparable contrast properties, but higher or lower average brightness, respectively. `imadd` and `imsubtract` functions can be used for histogram sliding.

When implementing histogram sliding, you must make sure that pixel values do not go outside the greyscale boundaries.

4.5 Thresholding

Thresholding is used to remove unnecessary details from an image and concentrate on essentials. It is also used to bring out hidden details, in case the object of interest and background have similar grey levels. Thresholding can be further classified as single thresholding and double thresholding. In MATLAB, single as well as double image thresholding can be done.

4.5.1 Single thresholding

A greyscale image is turned into a binary image (black and white) by first choosing a grey level 'T' in the original image, and then turning every pixel black or white depending on whether its grey value is greater than or less than 'T'. Thresholding

is a vital part of image segmentation, where users wish to isolate objects from the background. To convert an image F into black-and-white image G with threshold of 100, the command in MATLAB is $G=F>100$.

4.5.2 Double thresholding

In this case, there are two values $T1$ and $T2$, and the thresholding operation is performed as the pixel becomes white if the grey level is between $T1$ and $T2$. Also, the pixel becomes black if the grey level is outside these threshold values.

4.6 Image sharpening

Image sharpening is a powerful tool for emphasising texture and drawing viewer focus. It can improve image quality, even more than what is achieved through upgrading to a high-end camera lens.

Most image sharpening software tools work by applying something called an 'unsharp mask,' which actually acts to sharpen an image. The tool works by exaggerating the brightness difference along the edges within an image. Note that the sharpening process is not able to reconstruct the ideal image, but it creates the appearance of a more pronounced edge.

The command used for sharpening an image in MATLAB is:

$B = \text{imsharpen}(A)$

It returns an enhanced version of the greyscale or the true-colour (RGB) input image A , where image features such as edges have been sharpened using the unsharp masking method.

`B = imsharpen(A, Name, Value,...)` sharpens the image using name-value pairs to control aspects of unsharp masking.

Let us see the use of `imsharpen` function:

```
>> a=imread('Image_sharpen.jpg');  
>>imshow(a)
```

Fig4.3 shows the image to be sharpened (`Image_sharpen.jpg`).

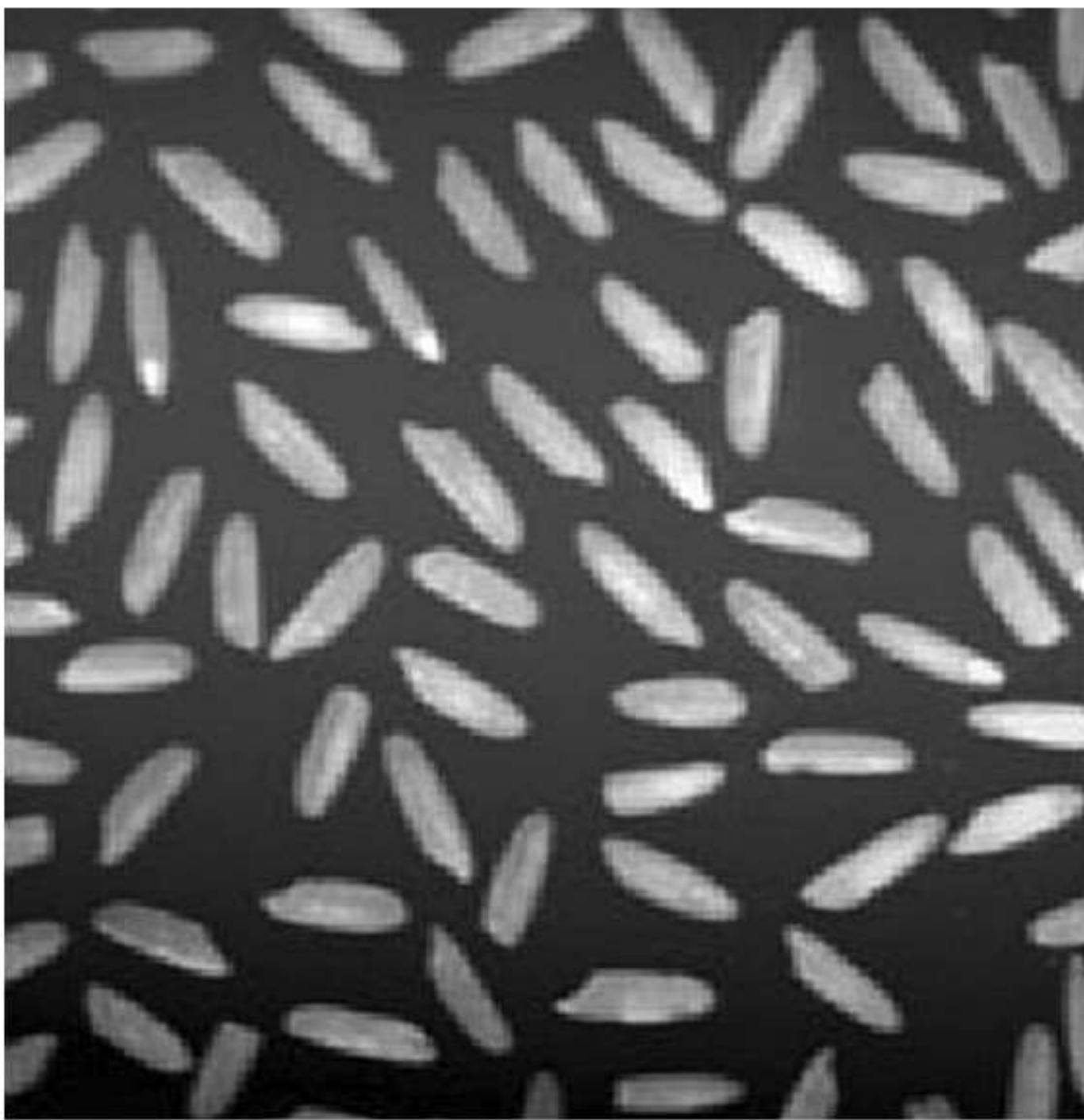


Fig:4.3 Image to be sharpened

(`Image_sharpen.jpg`)

Following commands sharpen the image using the simple `imsharpen` command:

```
>> b=imsharpen(a);  
>>figure,imshow(b)
```

Fig. 4.4 shows the resultant sharpened image.

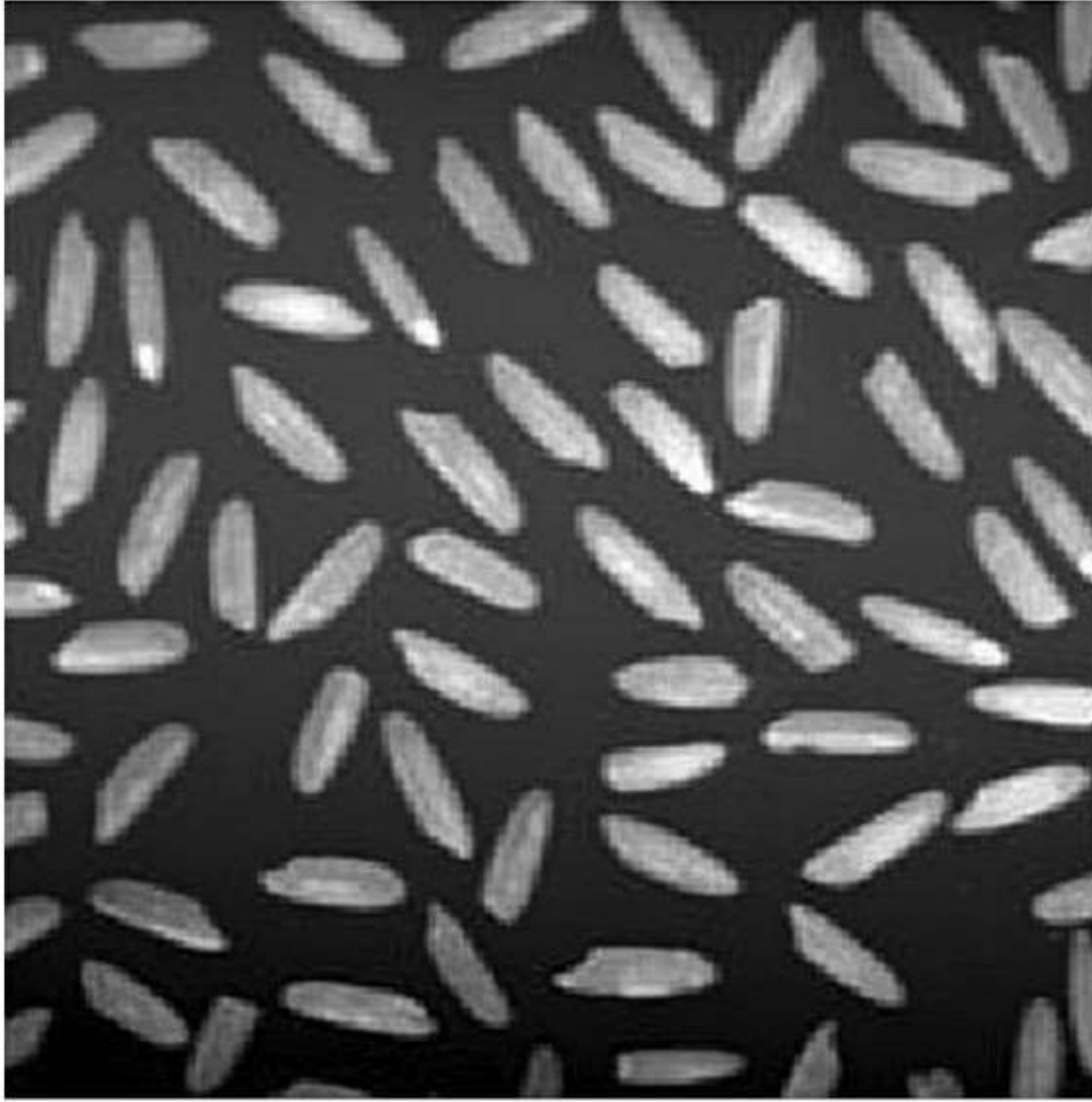


Fig:4.4 The resultant sharpened

image

You can specify 'radius' and 'amount' parameters in the `imsharpen` function as given in the example below:

```
>> b=imsharpen(a,'Radius',  
4,'Amount',2);  
>>figure,imshow(b)
```

shows the resultant image.



Fig4.5: Resultant image after specifying 'radius' and 'amount' parameters in the imsharpen function

As you can see, image is much sharper than the image in which, in turn, is much sharper than the image

Chapter 5

CONCLUSION

Conclusion:

The grading system is developed for easing the labor intensive work and creates consistency in the quality of product. There are several inferior quality grains arriving at the market day by day. This system is helpful for categorization grades of granules using Neural Network Pattern Recognition Tool. This system is based on features extraction from rice granules. Features which extracted from image of rice granules are Area, perimeter, major axis, minor axis.

5.1 Result & Screen shots:

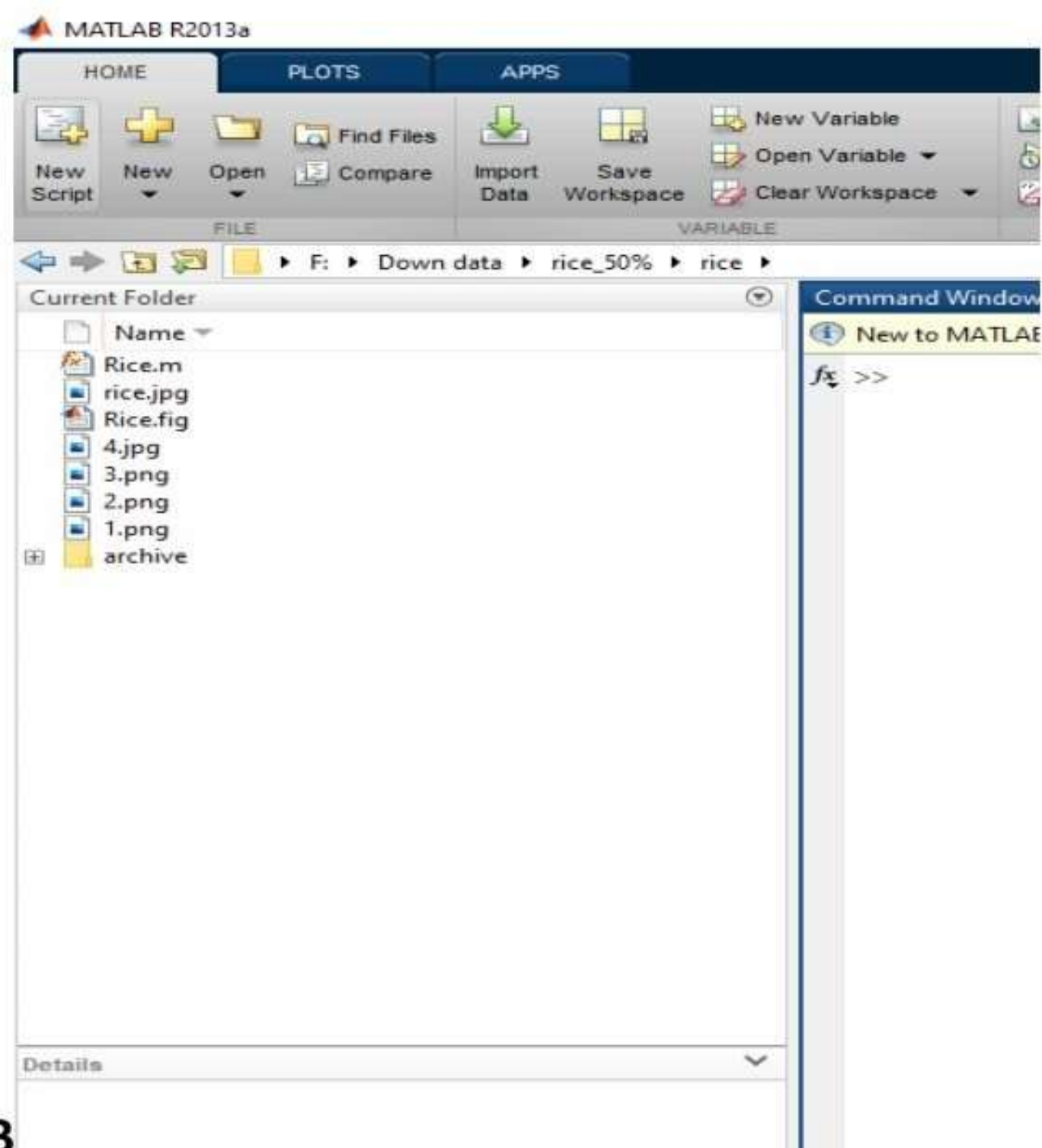


Fig 5.1 CODE OPENING IN MATLAB

Fig.5.2

COLLECTING DATASETS

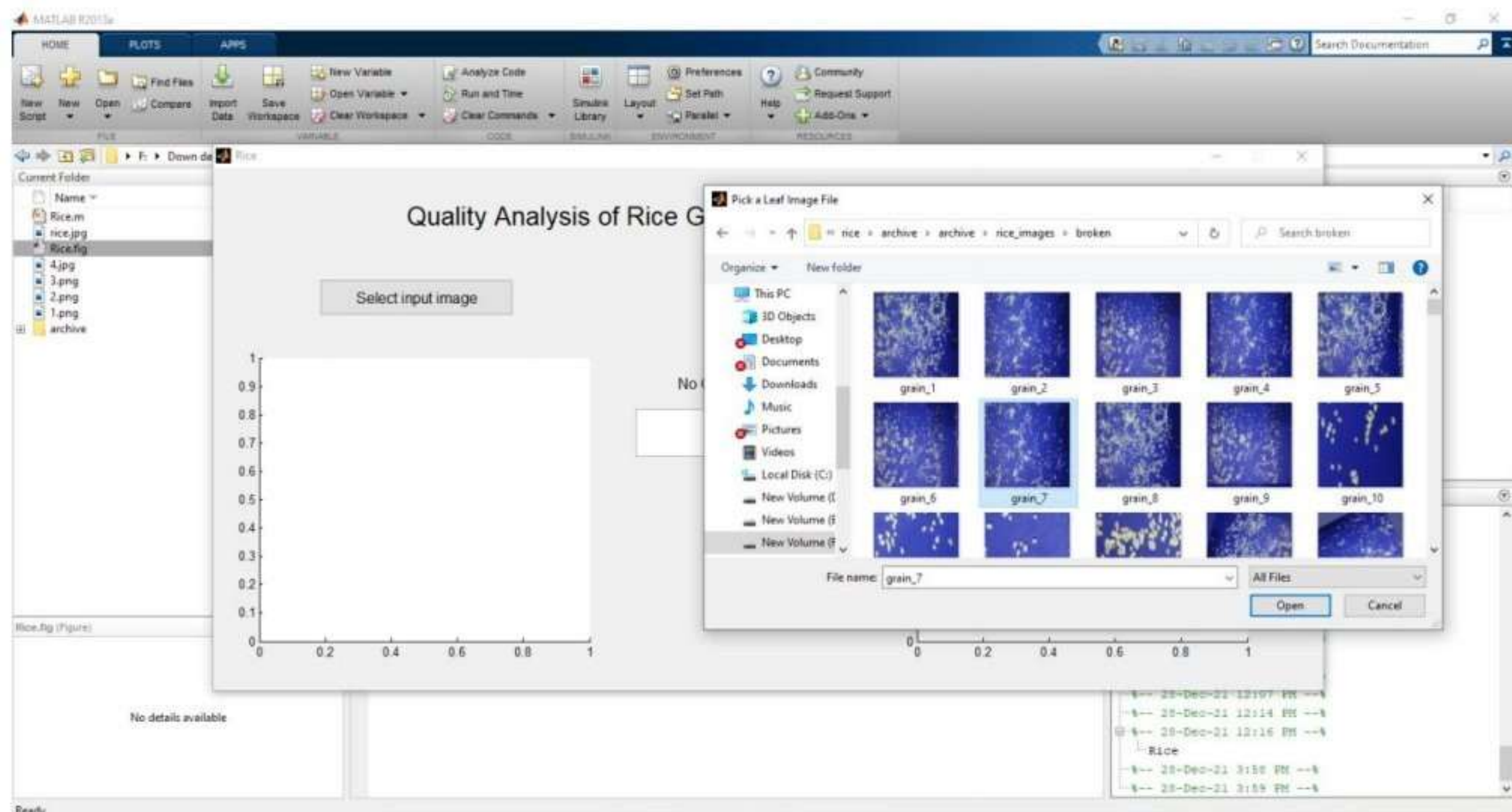


Fig5.3

RUNNING CODE:

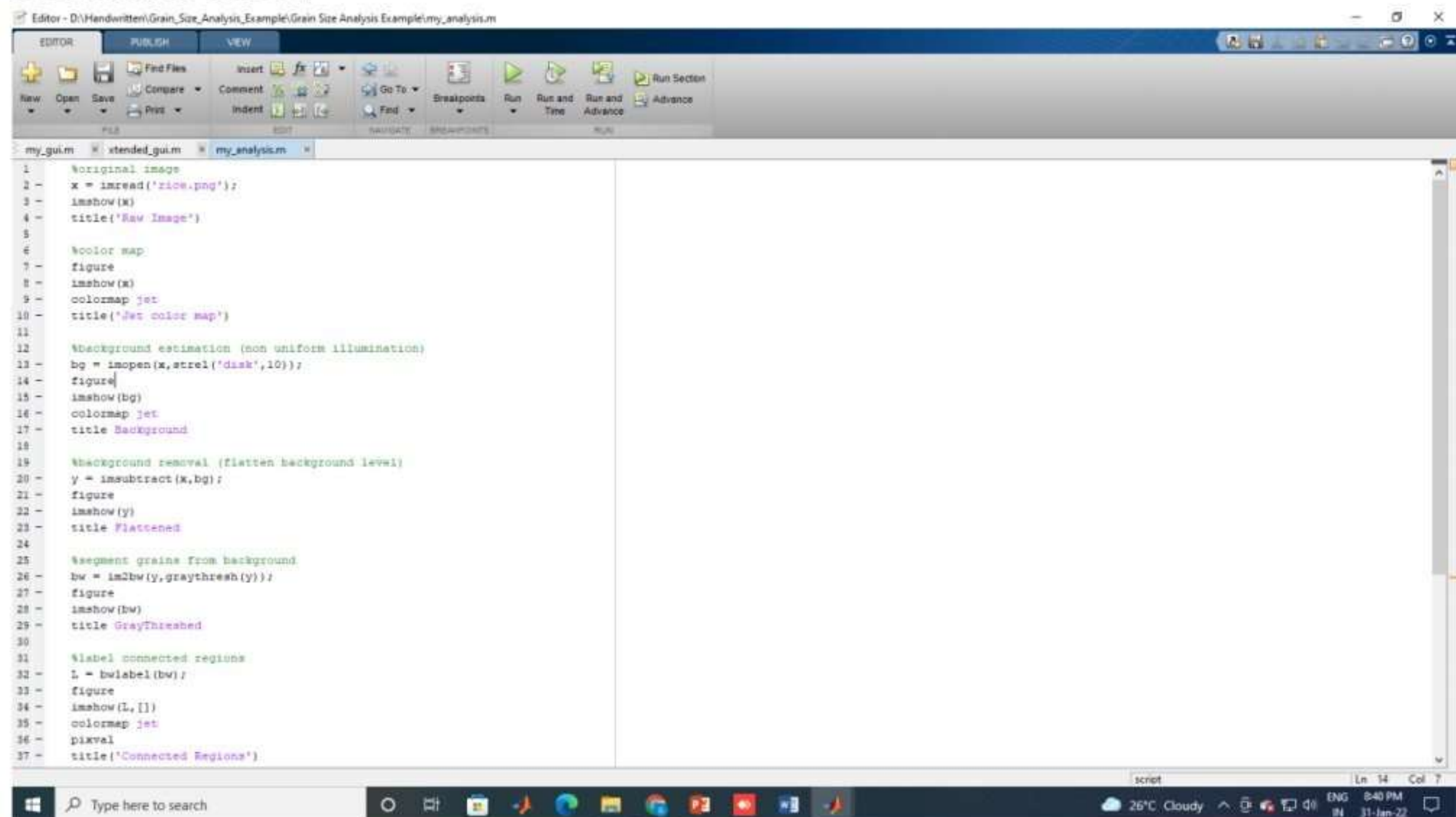


Fig 5.4 GETTING INPUT IMAGE

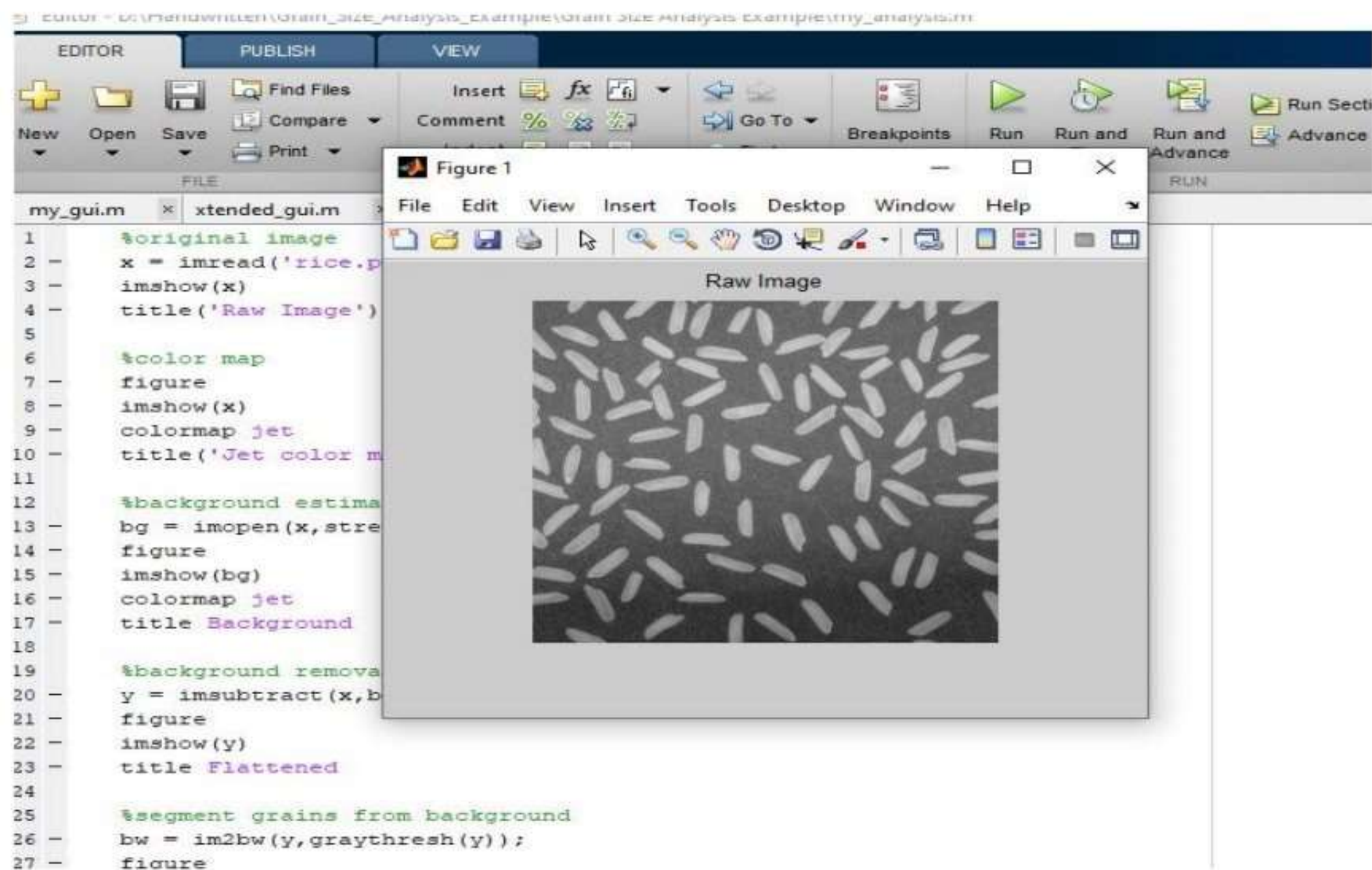


Fig 5.5 APPLYING PREPROCESSING

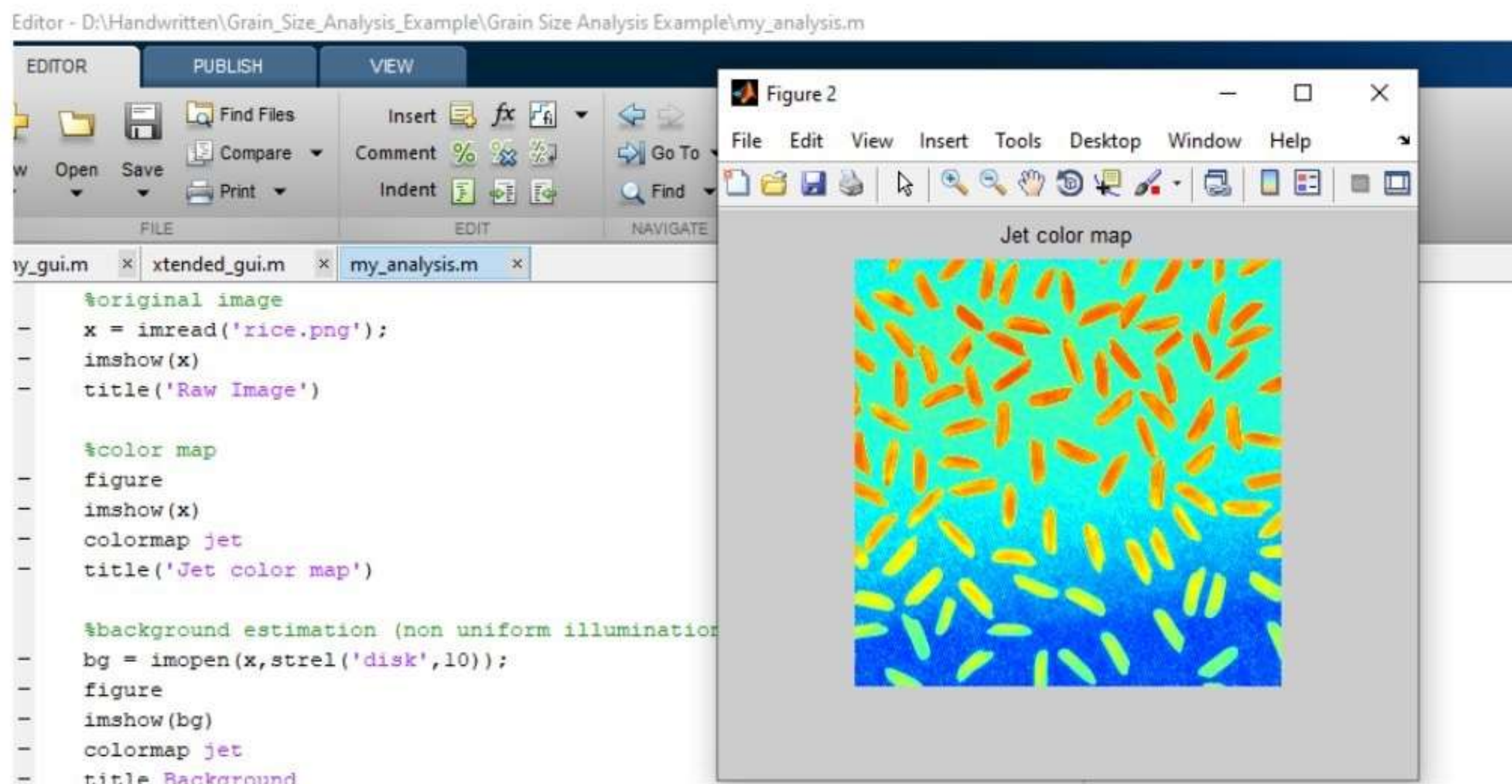


Fig 5.6APPLYING FILTERS

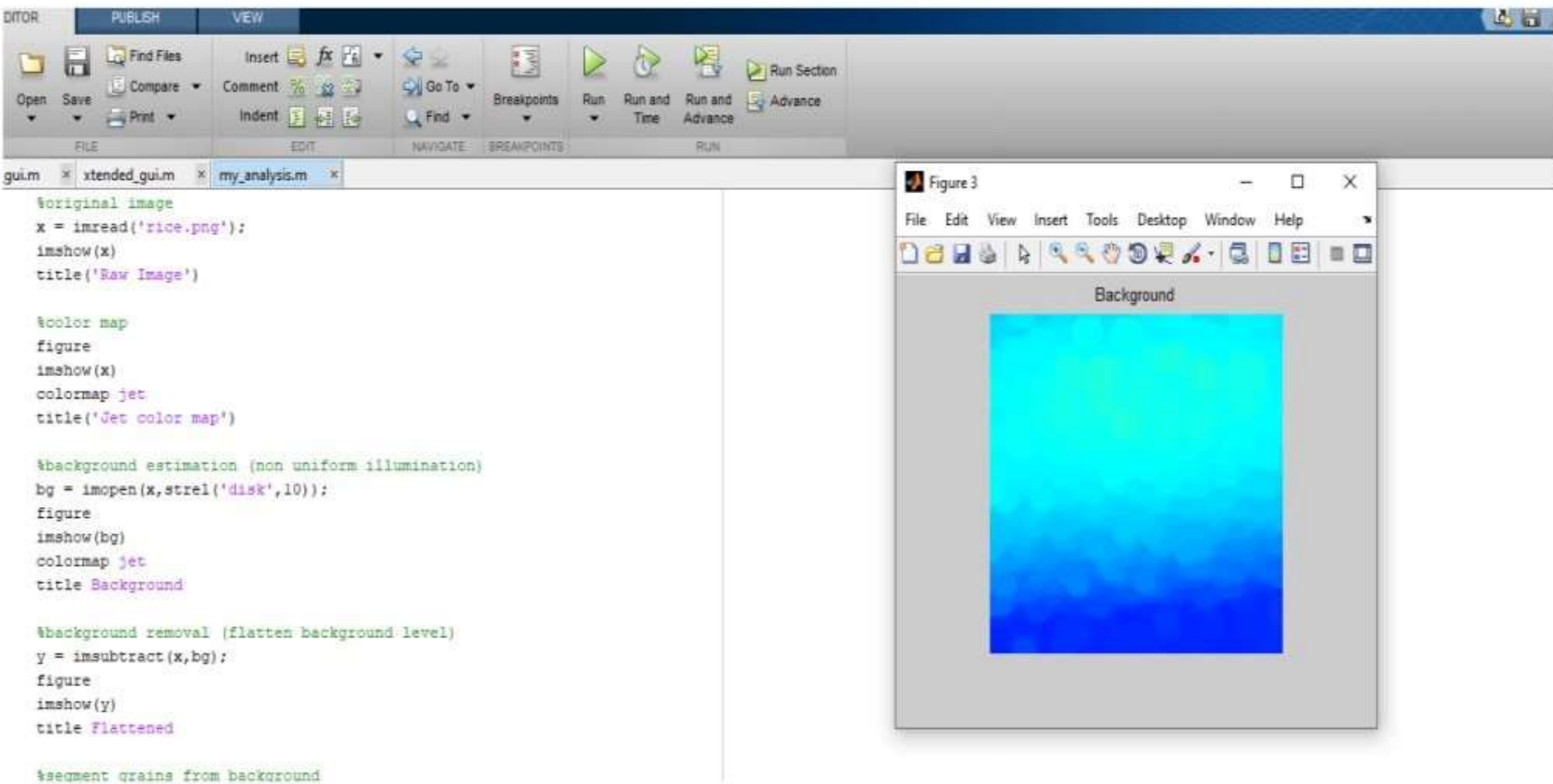


Fig 5.7FLATTENED

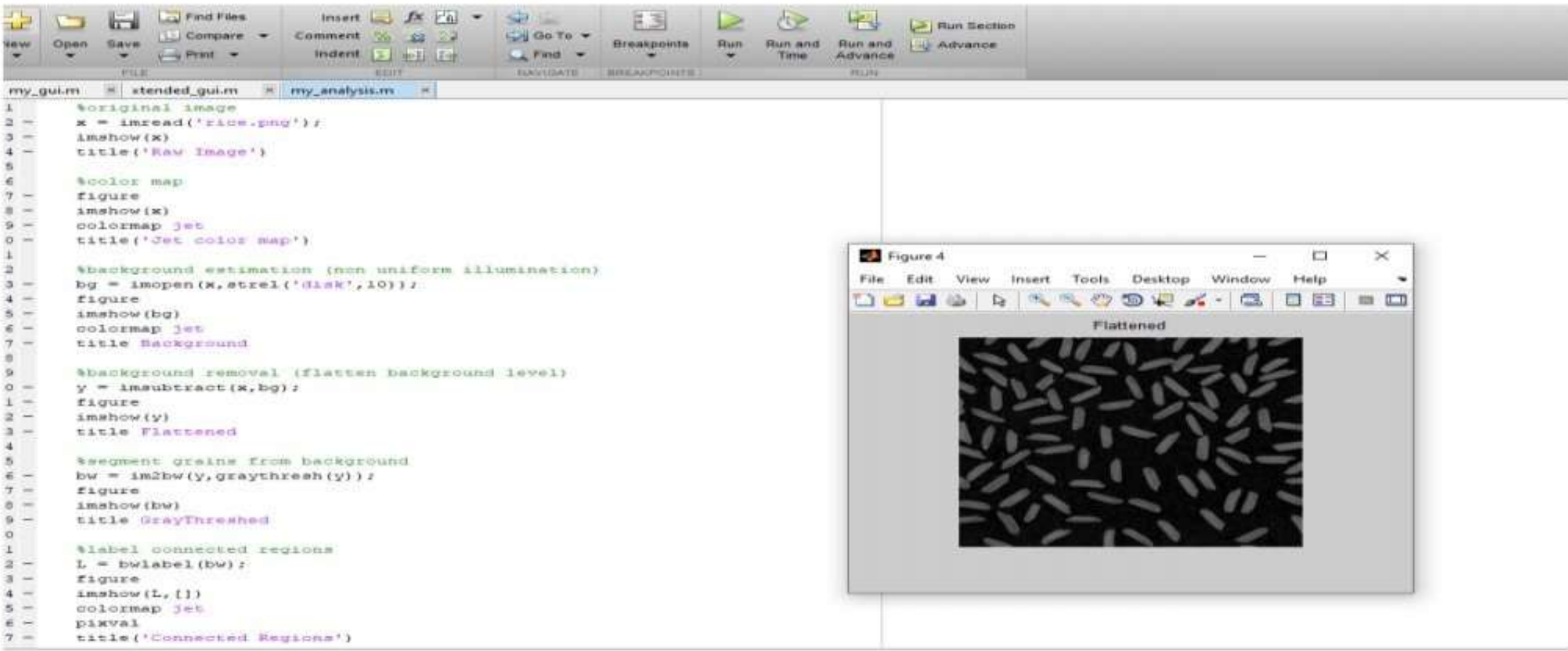


Fig 5.8 SEGMENTED TECHNIQUES

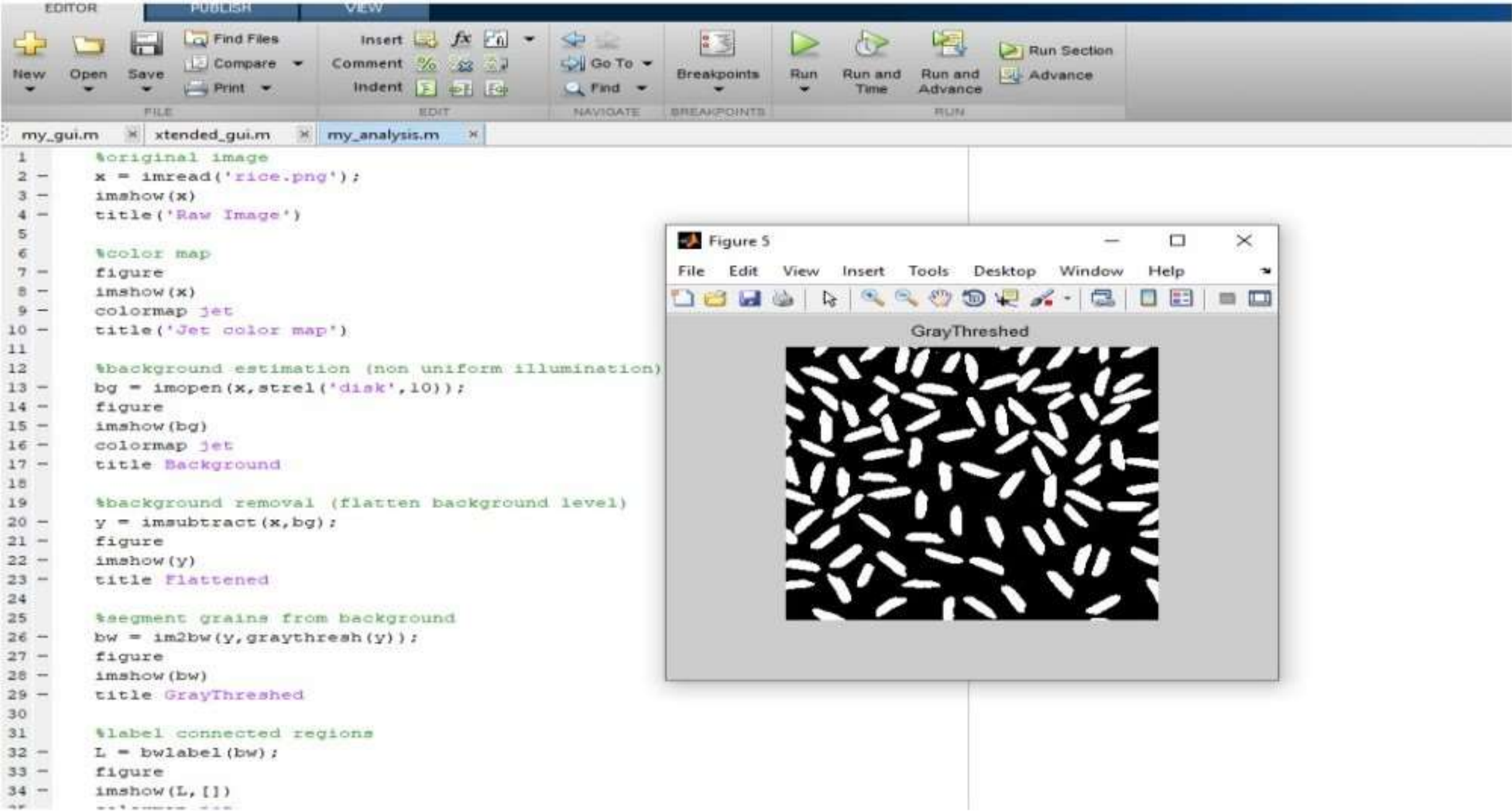


Fig 5.9 FEATURE EXTRACTION

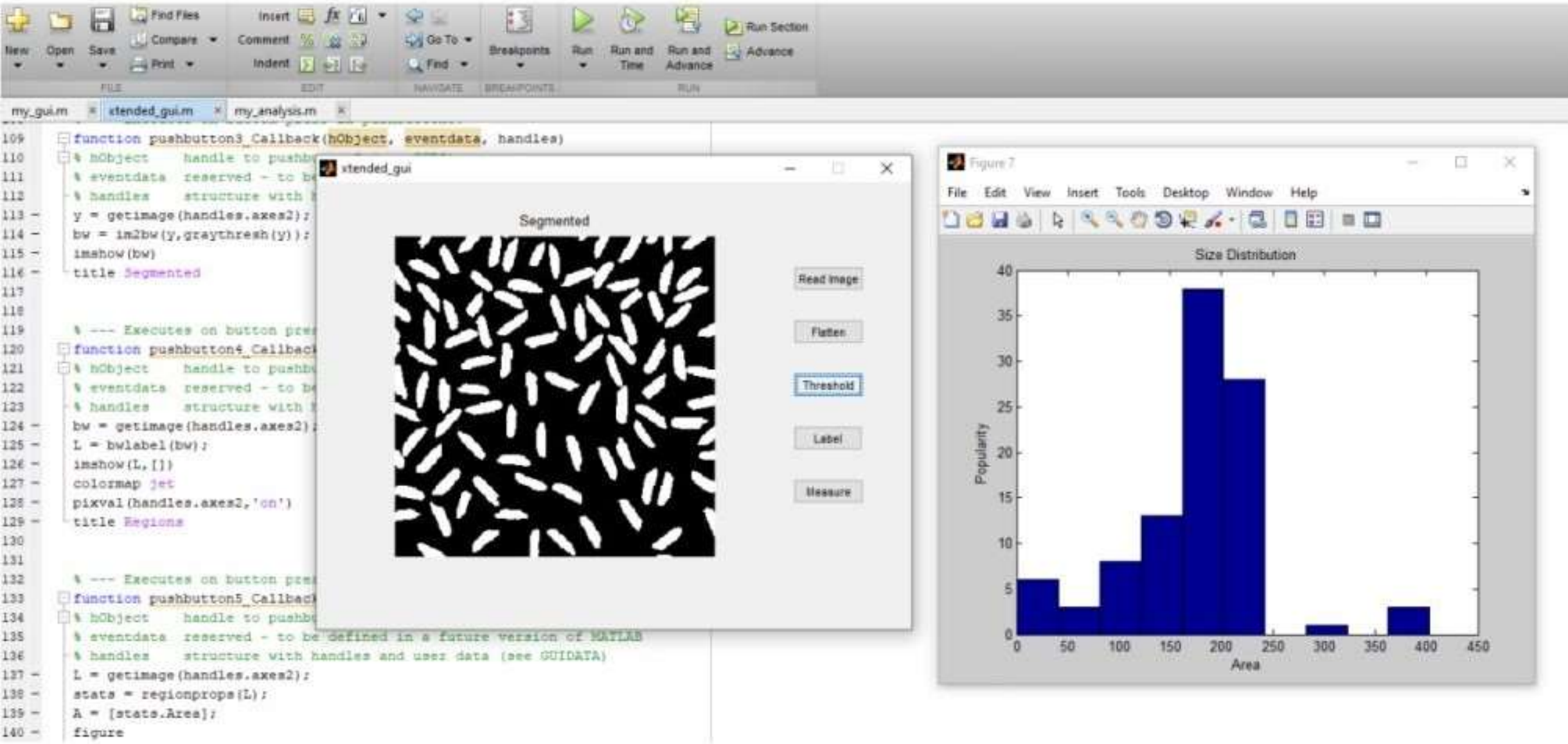


Fig 5.10 SELECTING INPUT IMAGE

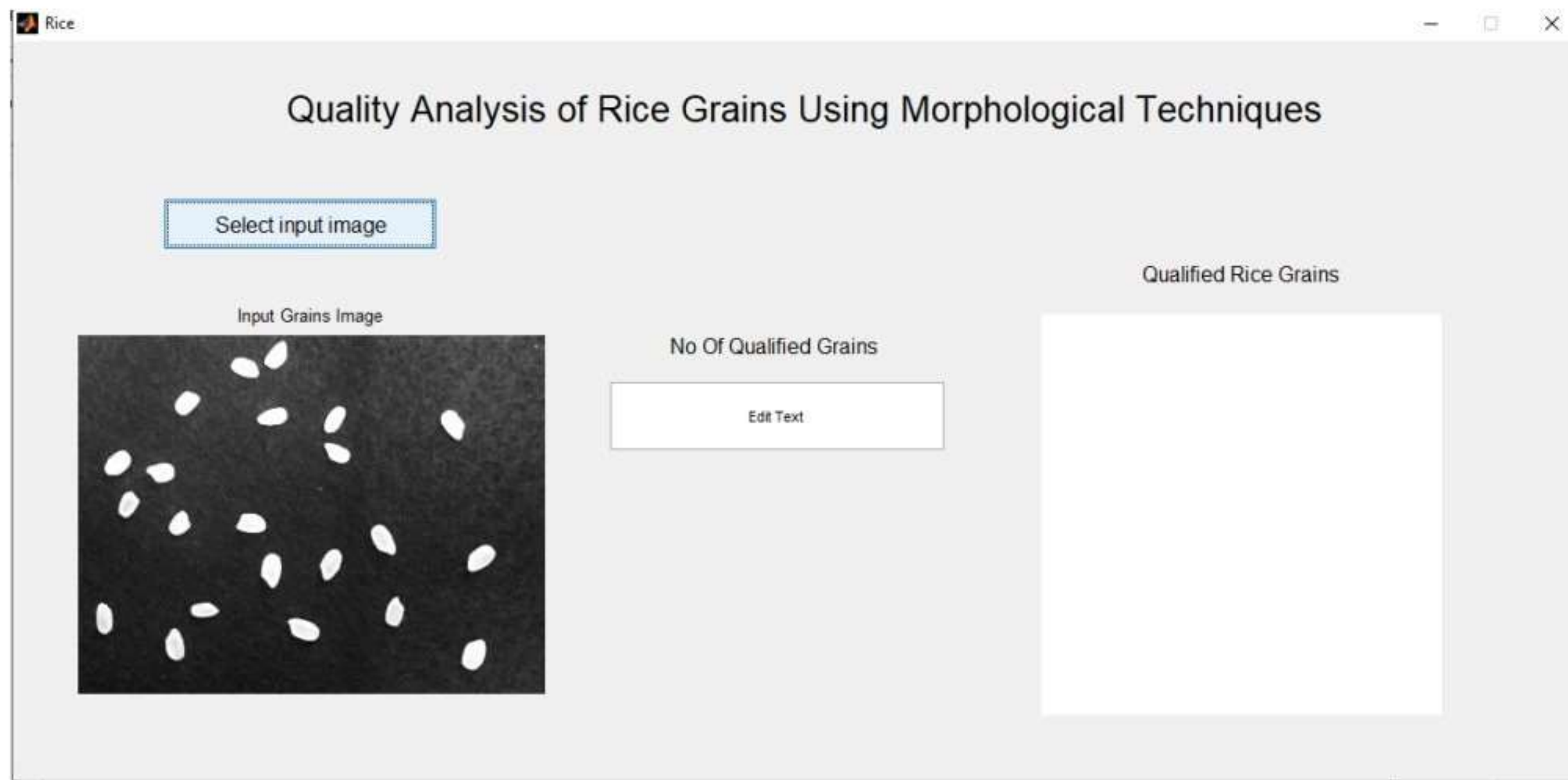
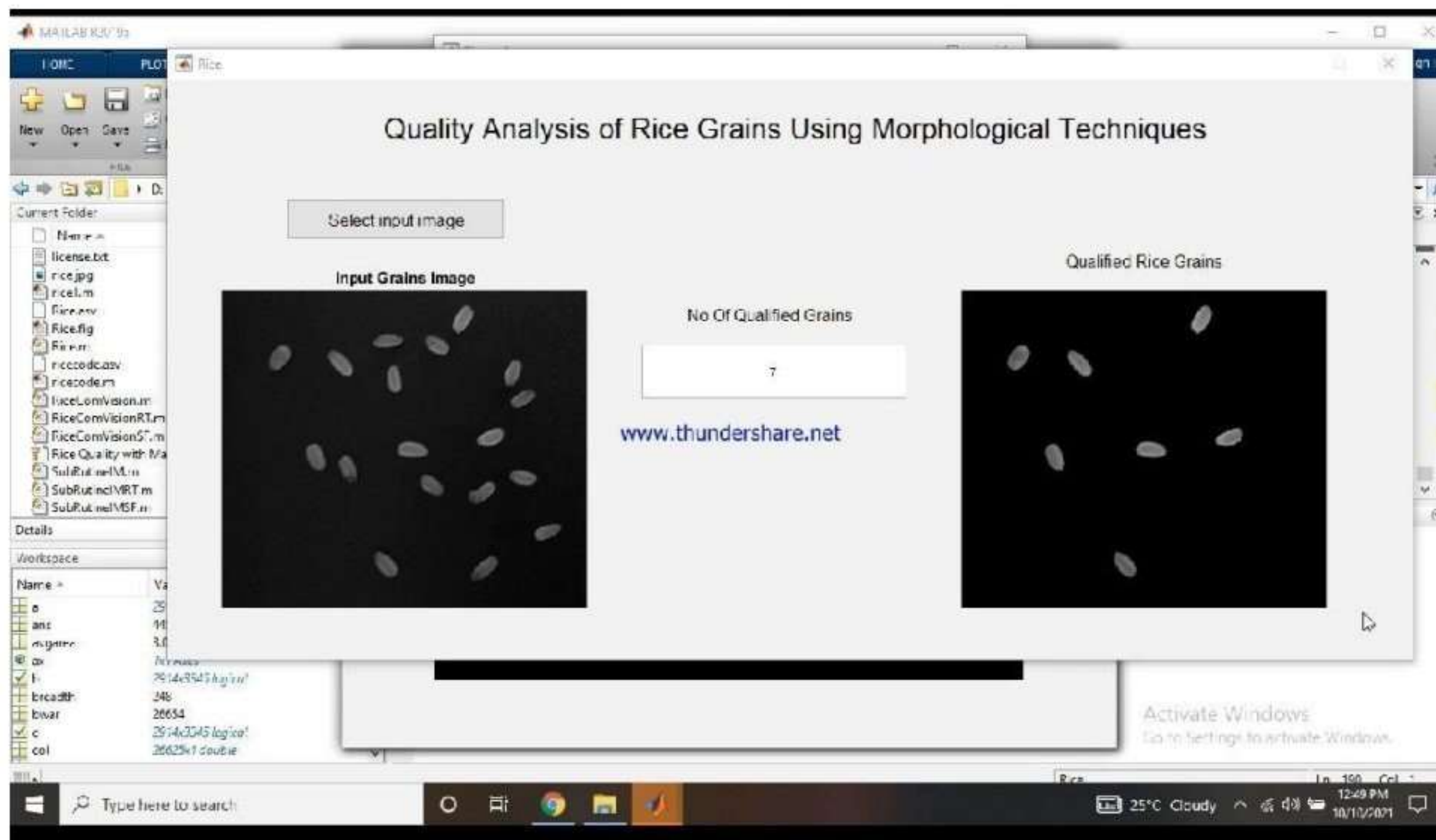


Fig 5.11 QUALIFIED IMAGE



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APPENDIX

A.SOURCE CODE

[11:26 AM, 2/28/2022] Chandrika: function varargout = Rice(varargin)

% RICE MATLAB code for Rice.fig

% RICE, by itself, creates a new RICE or raises the existing

% singleton*.

%

% H = RICE returns the handle to a new RICE or the handle to

% the existing singleton*.

%

% RICE('CALLBACK',hObject,eventData,handles,...) calls the local

% function named CALLBACK in RICE.M with the given input arguments.

%

% RICE('Property','Value',...) creates a new RICE or raises the

% existing singleton*. Starting from the left, property value pairs are

% applied to the GUI before Rice_OpeningFcn gets called. An

% unrecognized property name or invalid value makes property application

% stop. All inputs are passed to Rice_OpeningFcn via varargin.

%

```

% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
% instance to run (singleton)".

%

% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help Rice

% Last Modified by GUIDE v2.5 10-Oct-2021 12:15:23

% Begin initialization code - DO NOT EDIT

gui_Singleton = 1;

gui_State = struct('gui_Name',    mfilename, ...
    'gui_Singleton', gui_Singleton, ...
    'gui_OpeningFcn', @Rice_OpeningFcn, ...
    'gui_OutputFcn', @Rice_OutputFcn, ...
    'gui_LayoutFcn', [] , ...
    'gui_Callback', []);

if nargin && ischar(varargin{1})

    gui_State.gui_Callback = str2func(varargin{1});

```

```
end
```

```
if nargout
```

```
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
```

```
else
```

```
    gui_mainfcn(gui_State, varargin{:});
```

```
end
```

```
% End initialization code - DO NOT EDIT
```

```
% --- Executes just before Rice is made visible.
```

```
function Rice_OpeningFcn(hObject, eventdata, handles, varargin)
```

```
% This function has no output args, see OutputFcn.
```

```
% hObject    handle to figure
```

```
% eventdata  reserved - to be defined in a future version of MATLAB
```

```
% handles    structure with handles and user data (see GUIDATA)
```

```
% varargin   command line arguments to Rice (see VARARGIN)
```

```
% Choose default command line output for Rice
```

```

handles.output = hObject;

% Update handles structure

guidata(hObject, handles);

% UIWAIT makes Rice wait for user response (see UIRESUME)

% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = Rice_OutputFcn(hObject, eventdata, handles)

% varargout cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

ss = ones(300,300);

axes(handles.axes1);

imshow(ss);

axes(handles.axes2);

```

```

imshow(ss);

% Get default command line output from handles structure

varargout{1} = handles.output;


% --- Executes on button press in pushbutton1.

function pushbutton1_Callback(hObject, eventdata, handles)

% hObject    handle to pushbutton1 (see GCBO)

% eventdata  reserved - to be defined in a future version of MATLAB

% handles    structure with handles and user data (see GUIDATA)

[filename, pathname] = uigetfile({'.';'.bmp';'.jpg';'.gif';'.png'}, 'Pick a Leaf Image
File');

Image = imread([pathname,filename]);

a=Image;

I1 = rgb2gray(a);

f=a;

I1=imsharpen(I1);

I=medfilt2(I1);

axes(handles.axes1);

```

```

imshow(I);

title('Input Grains Image');

b=imbinarize(I);

c=imfill(b,'holes');

figure;

imshow(c)

title('Segmented Rice Image');

se = strel('line',15,120);

c = imdilate(b,se);

figure

imshow(c), title('Morphological Image')

c=bwareaopen(c,200);

figure

imshow(c)

S=regionprops(c,'boundingbox');

numgrains = numel(S);

label=bwlabel(c);

figure

for j=1:numgrains

```

```

[row,col]=find(label==j);

len=max(row)-min(row)+2;

breadth=max(col)-min(col)+2;

tp = round(S(j).BoundingBox);

xrange = tp(1)+(-1:tp(3)+1);

yrange = tp(2)+(-1:tp(4)+1);

target = a(yrange,xrange) .* uint8(c(yrange,xrange)); % NOTE

mytitle=strcat('Rice number: ',num2str(j)); % not used yet

ax=subplot(1,numgrains,j);

bwar=bwarea(target);

quality(j,1)=len;

quality(j,2)=breadth;

quality(j,3)=bwar;

```

```

[11:30 AM, 2/28/2022] Chandrika: function varargout = xtended_gui(varargin)

% XTENDED_GUI M-file for xtended_gui.fig

%   XTENDED_GUI, by itself, creates a new XTENDED_GUI or raises the existing

%   singleton*.

%

```

```

%   H = XTENDED_GUI returns the handle to a new XTENDED_GUI or the handle
to
%   the existing singleton*.
%
%   XTENDED_GUI('CALLBACK',hObject,eventData,handles,...) calls the local
%   function named CALLBACK in XTENDED_GUI.M with the given input
arguments.
%
%   XTENDED_GUI('Property','Value',...) creates a new XTENDED_GUI or raises
the
%   existing singleton*. Starting from the left, property value pairs are
%   applied to the GUI before xtended_gui_OpeningFunction gets called. An
%   unrecognized property name or invalid value makes property appli...
[11:39 AM, 2/28/2022] Chandrika: function varargout = Rice(varargin)

% RICE MATLAB code for Rice.fig

%   RICE, by itself, creates a new RICE or raises the existing
%   singleton*.
%
%   H = RICE returns the handle to a new RICE or the handle to
%   the existing singleton*.

```

```

%
%  RICE('CALLBACK',hObject,eventData,handles,...) calls the local
%  function named CALLBACK in RICE.M with the given input arguments.
%
%  RICE('Property','Value',...) creates a new RICE or raises the
%  existing singleton*. Starting from the left, property value pairs are
%  applied to the GUI before Rice_OpeningFcn gets called. An
%  unrecognized property name or invalid value makes property application
%  stop. All inputs are passed to Rice_OpeningFcn via varargin.
%
%  *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
%  instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES
%
% Edit the above text to modify the response to help Rice
%
% Last Modified by GUIDE v2.5 10-Oct-2021 12:15:23

```

```

% Begin initialization code - DO NOT EDIT

gui_Singleton = 1;

gui_State = struct('gui_Name',    mfilename, ...

    'gui_Singleton', gui_Singleton, ...

    'gui_OpeningFcn', @Rice_OpeningFcn, ...

    'gui_OutputFcn', @Rice_OutputFcn, ...

    'gui_LayoutFcn', [] , ...

    'gui_Callback', []);

if nargin && ischar(varargin{1})

    gui_State.gui_Callback = str2func(varargin{1});

end

if nargin

    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});

else

    gui_mainfcn(gui_State, varargin{:});

end

% End initialization code - DO NOT EDIT

```

```

% --- Executes just before Rice is made visible.

function Rice_OpeningFcn(hObject, eventdata, handles, varargin)

% This function has no output args, see OutputFcn.

% hObject    handle to figure

% eventdata  reserved - to be defined in a future version of MATLAB

% handles    structure with handles and user data (see GUIDATA)

% varargin   command line arguments to Rice (see VARARGIN)


% Choose default command line output for Rice

handles.output = hObject;


% Update handles structure

guidata(hObject, handles);


% UIWAIT makes Rice wait for user response (see UIRESUME)

% uiwait(handles.figure1);

```

```

% --- Outputs from this function are returned to the command line.

function varargout = Rice_OutputFcn(hObject, eventdata, handles)

% varargout cell array for returning output args (see VARARGOUT);
% hObject handle to figure
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

ss = ones(300,300);

axes(handles.axes1);

imshow(ss);

axes(handles.axes2);

imshow(ss);

% Get default command line output from handles structure
varargout{1} = handles.output;


% --- Executes on button press in pushbutton1.

function pushbutton1_Callback(hObject, eventdata, handles)

% hObject handle to pushbutton1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB

```

```

% handles    structure with handles and user data (see GUIDATA)

[filename, pathname] = uigetfile({'.','bmp','.jpg','.gif','.png'}, 'Pick a Leaf Image
File');

Image = imread([pathname,filename]);

a=Image;

l1 = rgb2gray(a);

f=a;

l1=imsharpen(l1);

l=medfilt2(l1);

axes(handles.axes1);

imshow(l);

title('Input Grains Image');

b=imbinarize(l);

c=imfill(b,'holes');

figure;

imshow(c)

title('Segmented Rice Image');

se = strel('line',15,120);

c = imdilate(b,se);

```

```

figure

imshow(c), title('Morphological Image')

c=bwareaopen(c,200);

figure

imshow(c)

S=regionprops(c,'boundingbox');

numgrains = numel(S);

label=bwlabel(c);

figure

for j=1:numgrains

    [row,col]=find(label==j);

    len=max(row)-min(row)+2;

    breadth=max(col)-min(col)+2;

    tp = round(S(j).BoundingBox);

    xrange = tp(1)+(-1:tp(3)+1);

    yrange = tp(2)+(-1:tp(4)+1);

    target = a(yrange,xrange) .* uint8(c(yrange,xrange)); % NOTE

    mytitle=strcat('Rice number: ',num2str(j)); % not used yet

    ax=subplot(1,numgrains,j);

```

```

bwar=bwarea(target);

quality(j,1)=len;

quality(j,2)=breadth;

quality(j,3)=bwar;


imshow(target);

end

avgarea=sum(quality(:,3))/numgrains;

no_Q_grains=0;


for j=1:numgrains

    [row,col]=find(label==j);

    len=max(row)-min(row)+2;

    breadth=max(col)-min(col)+2;

    tp = round(S(j).BoundingBox);

    xrange = tp(1)+(-1:tp(3)+1);

    yrange = tp(2)+(-1:tp(4)+1);

```

```

target = a(yrange,xrange) .* uint8(c(yrange,xrange)); % NOTE

mytitle=strcat('Rice number: ',num2str(j)); % not used yet

ax=subplot(1,numgrains,j);

bwar=bwarea(target);

if bwar>avgarea

    no_Q_grains=no_Q_grains+1;

end

end

Ql=bwareaopen(c,round(avgarea));

figure

imshow(Ql)

[m,n]=size(Ql);

for i=1:m

    for j=1:n

        if(Ql(i,j)>0)

            f(i,j,:)=f(i,j);

        else

```

```

        f(i,j,:)=0;

    end

end

end

axes(handles.axes2);

imshow(f)

no_Q_grains;

set(handles.edit1,'string',no_Q_grains);


function edit1_Callback(hObject, eventdata, handles)

% hObject    handle to edit1 (see GCBO)

% eventdata  reserved - to be defined in a future version of MATLAB

% handles    structure with handles and user data (see GUIDATA)


% Hints: get(hObject,'String') returns contents of edit1 as text
%        str2double(get(hObject,'String')) returns contents of edit1 as a double

```

```

% --- Executes during object creation, after setting all properties.

function edit1_CreateFcn(hObject, eventdata, handles)

% hObject    handle to edit1 (see GCBO)

% eventdata  reserved - to be defined in a future version of MATLAB

% handles    empty - handles not created until after all CreateFcns called


% Hint: edit controls usually have a white background on Windows.

%    See ISPC and COMPUTER.

if      ispc      &&      isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))

    set(hObject,'BackgroundColor','white');

end

```



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Quality Analysis Of Rice Grains Using Morphological Techniques

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Sathyabama Institute of Science and Technology, Chennai

Abstract- Human beings from all over the world prefer and consume rice more than any other food. Rice is at its peak of demand when its quality is good. Currently, the kind and quality of rice is determined through a naked-eye visual assessment approach. This method, however, is arduous, time-consuming, requires human skill, and is dependent on the inspector's physical health. To address these issues, this work introduces an automated system that uses digital image processing techniques to identify and classify rice grains. The image processing approach is the most appropriate since it is a non-contact technique that captures the picture of the rice grains. MATLAB is used to pre-process, segment, and extract features from the captured images. Using Neural Networks (NN) and Support Vector Machines (SVM) algorithmic classifications, the quality of rice is assessed based on the extracted features. The results indicate that SVM-based classification performs better than its counterpart based on our comparison study.

Keywords— Rice Quality, Morphological approaches, Support Vector Machine, Neural Networks.

I. INTRODUCTION

Grains are the prime crop for our country to increase the agricultural income. Impurities like as stones, weed seeds, chaff, and damaged seeds are found in these grains. The amount of automation used to assess grain quality is modest, and the majority of the job is done by hand. The workload is so heavy that workers will become exhausted, and they will require sample testing experience. It also makes testing more expensive and time-consuming. Visual inspection is used to quickly check grain type and quality in the current grain handling system. This analytical procedure, on the other hand, is arduous and time-consuming. This laborious work has an impact on the farmers. As a result, it is necessary to investigate the possibilities of utilizing technology to find an appropriate solution. The accuracy of quality inspection by manual approach varies from person to person, and it also depends on working stress, persuasion, and loyalty among merchants, as well as the expertise and experience of inspectors. The proposed system goal is to find an effective way to determine rice quality. The proposed system goal is to cut down on labor, prices, and time. The system must now accomplish the following tasks: Image processing methods are used to examine and identify the quality of rice grains based on their size and form. Rice is a popular cereal grain in Asian nations, with a high consumption rate. It is widely available around the globe. Rice for humans is used to make a variety of value-added goods [1]. The quality of milled rice is a major element in the rice market. With the import and export commerce, quality measurement becomes even more critical. Paddy, chaff, broken grains, weed seeds, stones, and other dispensable things can be found in rice samples [2]. The impurity concentration of rice has an impact on its quality. Rice mill operators must provide grades to rice samples based on Sri Lankan quality criteria.

Rice is India's most widely grown crop. It indicates that 70% of India's population consumes rice on a daily basis, i.e. twice a day. Food is the simplest way for a person to become infected with any disease. When we learn about any form of ailment, we get concerned about our health and begin to take measures. For example, we use face masks to avoid pollution in our daily lives, and we use bacteria-free hand-wash and sanitizers to avoid becoming polluted by water. When it comes to food, however, we buy it directly from the market, wash it with water, and prepare it immediately, implying that we are completely reliant on the food grains we get from the market. After purchasing the rice packet, we occasionally find various small particles such as small stones, half-sized grains, husk, and so on. We also occasionally find undesired items when eating. We are unconcerned about the product's quality. India is the world's third-largest rice producer, with a diverse range of rice kinds and quality [3]. Rice quality may be graded based on the shape, colour, and moisture level of the rice grain, according to SNI 6128:2015[4][5]. Rice, on the other hand, is ingested to meet the body's nutritional requirements[6]. As a result, it's critical to understand which rice varieties have the most nutrients [7][8].

II. RELATEDWORKS

In existing system normally, they can be identified by manual only. Those are easily identified village people and old persons. Now a days it is so difficult to identified the rice quality checking [9][10]. Many researches worked to find out proper methodology for segmenting touching and/ or overlapping rice kernels. M. J. Asif et al., (2018). [11], Rice is the most important and most widely consumed grain in Pakistan and the world, despite different meals being prepared from grains. Inspections of rice grains are important domestically and internationally. The

quality analysis should be automatically used to identify different types of rice. During the course of the research, the researchers will develop a method for classifying and analyzing rice varieties through image processing. Vijay Sonawane et al., (2021) [12], It is a whole grain that is high in fiber and has an 80 percent protein, phosphorus, and potassium content. Rice comes in hundreds of distinct types, each with its own form, texture, and flavor that makes it ideal for particular meals. Varying varieties of rice have different quality criteria. As a result, you must choose the highest-grade rice since high-quality rice is not only delicious but also healthy.

Aznan, Aimi et al. (2021) [13], Keeping rice quality high and consumer expectations high is vital for the success of the industry. Yet, establishing cost-effective and quick methods for analyzing rice grain quality characteristics remains a challenge. Based on dimensionless morphometric characteristics and color parameters retrieved from digital photos captured with a smartphone camera with CV algorithms, this work illustrates how computer vision (CV) and machine learning (ML) can be used to categorize commercial rice samples. A model using nine morpho-colorimetric factors was created to classify rice samples into 15 commercial types.

T. G. Devi et al., (2017) [14], As part of machine vision-based testing, we evaluate and grade rice grains both physically (grain size and shape) and chemically (amylose concentration and gel consistency). A suggested image processing technique, which was implemented in Mat Lab, was used to evaluate the quality and grade of rice grains using the average values of the collected features. J. Panigrahi et al., (2020). [15], They have expressed worry about rice quality in their work. They considered that a rice size should be more precise, that is, it should grow to its full size in order to offer all of its proteins to everyone. They predicted the quality of rice using a photograph of rice. They used feature extraction techniques and used a variety of machine learning approaches to train our model. W. Prihasty et al., (2020) [16]. They presented early study towards predicting rice quality based on amylose phenolic and flavonoid levels assessed using the FTIR Spectroscopy method. The designed prediction system was validated using a chemical analysis approach. The amounts of amylose, phenolic, and flavonoids in rice were determined using partial least square (PLS) methods, and the kinds and quality of rice's were clustered using Principal Component Analysis (PCA) methods. The suggested system's coefficients of determination for amylose content, phenolic content, and flavonoids were 0.95, 0.86, and 0.95, respectively, with respective RMSE values of 1.4, 0.72, and 0.44. Rice samples may be divided into three quality classes

using this technique: high quality, premium quality, and medium quality rice. The existing work limitation is less accuracy.

III. PROPOSED SYSTEM ARCHITECTURE

Food grain quality is very important to consumers today[17]. This proposed system is to increase the accuracy. This proposed system, which is shown in figure 1, presents an automated system for assessing rice grain quality based on ANNs and SVMs. Rice grains can be categorized into two types: small or large. The proposed system allows for morphological and geometrical features to be used to identify and classify rice grains. SVM outperformed its counterpart in terms of computational time and parallel processing (classifying more than one sample at a time), when those factors are taken into account. A training ratio imbalance may account for these results. Fig. 2 depicts the type of rice grain classification which the proposed system can effectively classify.

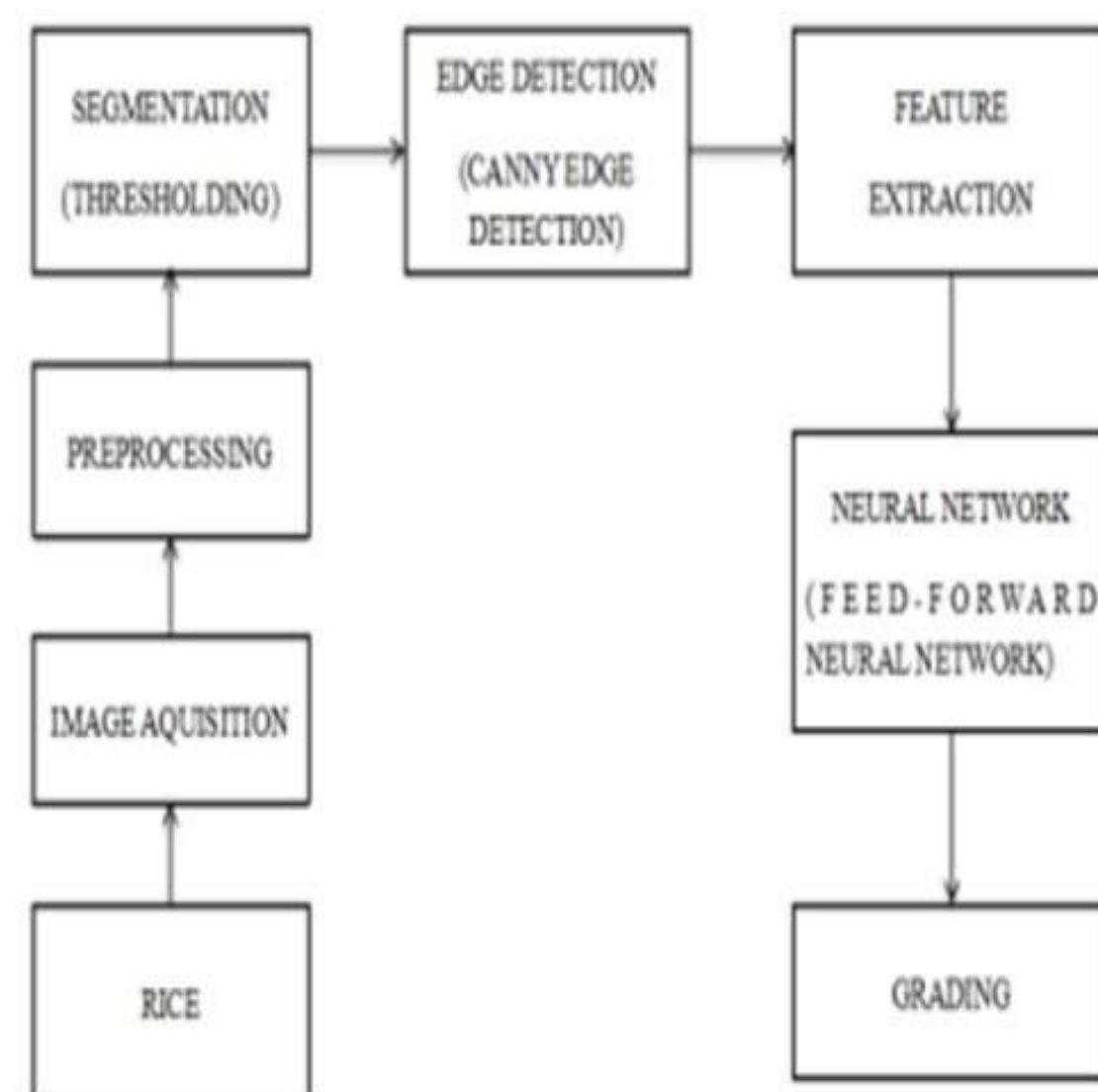
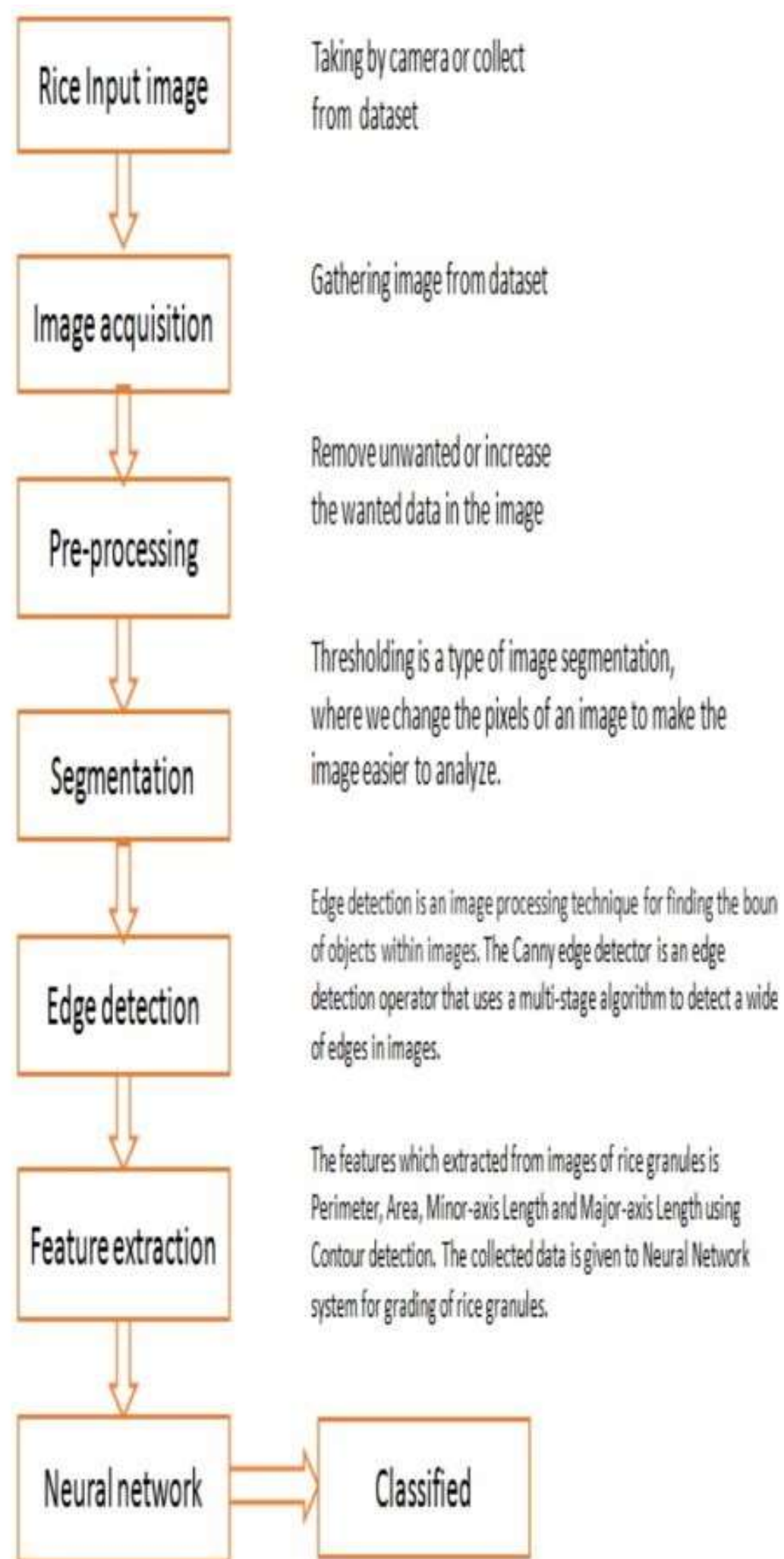


Fig.1. Architecture of the proposed system



From the extracted features the quality of rice is assessed based on Neural Networks (NN) and Support Vector Machine (SVM) classifier algorithms.

Fig.2. Methodology of the proposed system

1) Modules

In first module we collect the images of data set and going to pre-processing it. In pre-processing the images can be convert into frames and it will convert into gray scale. In second module adding filtering techniques. In this module we can get what we want in the image, by using filters and morphological techniques. In third module we can detect the rice grains. In this module for detecting the rice grains, we are using edge detection and segmentation. In the final module we can Quality analysis of rice grains. In this module rice can be analysed using neural networks.

2) Methodology

In this system we can classify the quality of rice grains by using SVM algorithm and Matlab. At first collecting the datasets from kaggle in the form of

images. That input images may given to the pre-processing, this module will process the image and it will removes unwanted noise and converts it into grayscale. The gray scale image is small size so it can easily process to next level. The grayscale output can be given to the segmentation module it can be dived the image into no.of pixels and each pixel having some content it will detected using the pixel level by using Thresholding technique. Edge detection can be detects the edges or boundaries of the rice grains in an image by using the canny edge detection. And feature extraction can be extract the rice size and shape of the rice grains. After extracting the image those values can be given to the neural network, it classified weather it is quality or not. In this neural network we are using SVM algorithm, here the input of feature extracted values can be processed to 1st layer and this output can be given to the hidden layers those hidden layers are compare the both values and the it will classified.

Dataset Selection

One of the significant factor of a rice grain purity is measured by the percentage of foreign grains mixture. Most of the Rice traders used to verify the purity of rice grain by Manual annotations done by labors with the years of experience. But this process is Costly and produce erroneous result in most cases. Which also takes very long time.

So this work is going find the purity of a Rice sample within a few seconds and with a very good accuracy from a scanned image of the sample. The ultimate result will detect each grains and classify it to its corresponding grain type which is shown in fig. 3 and Fig.4.

IV RESULTS AND DISCUSSION

This module segments rice seeds from an image input and classifies them into four categories: rice, paddy, stone, and foreign objects. It is critical to preprocess rice in a way that will improve segmentation performance. As part of preprocessing, noise is removed, subtracted, binarized and morphological operations are performed. Evaluation of the solution is highly dependent on execution time. Image quality and size are directly related to execution time. In TABLE I, we present results of the preprocessing time. To measure effectiveness, we use two unique performance indicators. One is precision, and the other is recall rate. Positive predictive value refers to precision, while sensitivity refers to recall. As a result, precision refers to how accurately instances within a sample are identified. From all relevant examples that were analyzed, the recall represents the number of accurately identified cases. A measure of

Classification Class	Precision Rate%	Recall Rate%	F Measure %
Rice	96.7	99.4	99.7

Table 1 Processing Time

relevance and knowledge of the subject matter are both necessary for both. The F-measure, also known as a harmonic mean, combines precision with recall. A test on rice categories, foreign objects, rice and stones was conducted to assess the accuracy of the segmentation module. The segmentation method was assessed for its prediction and recall rates. There is a perfect segmentation of rice objects in this image. FP values represent unnecessary objects that have been incorrectly detected. This is true of rice sample objects that have not been detected. There is an average precision rate of 96.7% and a recall rate of 99.40% during the segmentation process.

Distance	Precision Rate%	Recall Rate%	F Measure %
9cm	88.9	85.8	89
12cm	94.6	93.18	91
15cm	95	96	93
18cm	96	97	95
21cm	96.7	99.4	99.7

Table.2 Processing time for Various Size

Sample Output

The experimental results are shown in the below figure 3. The figure 3 explains about collect and gathering image from dataset. The images are given as input and find the number of qualified grains.

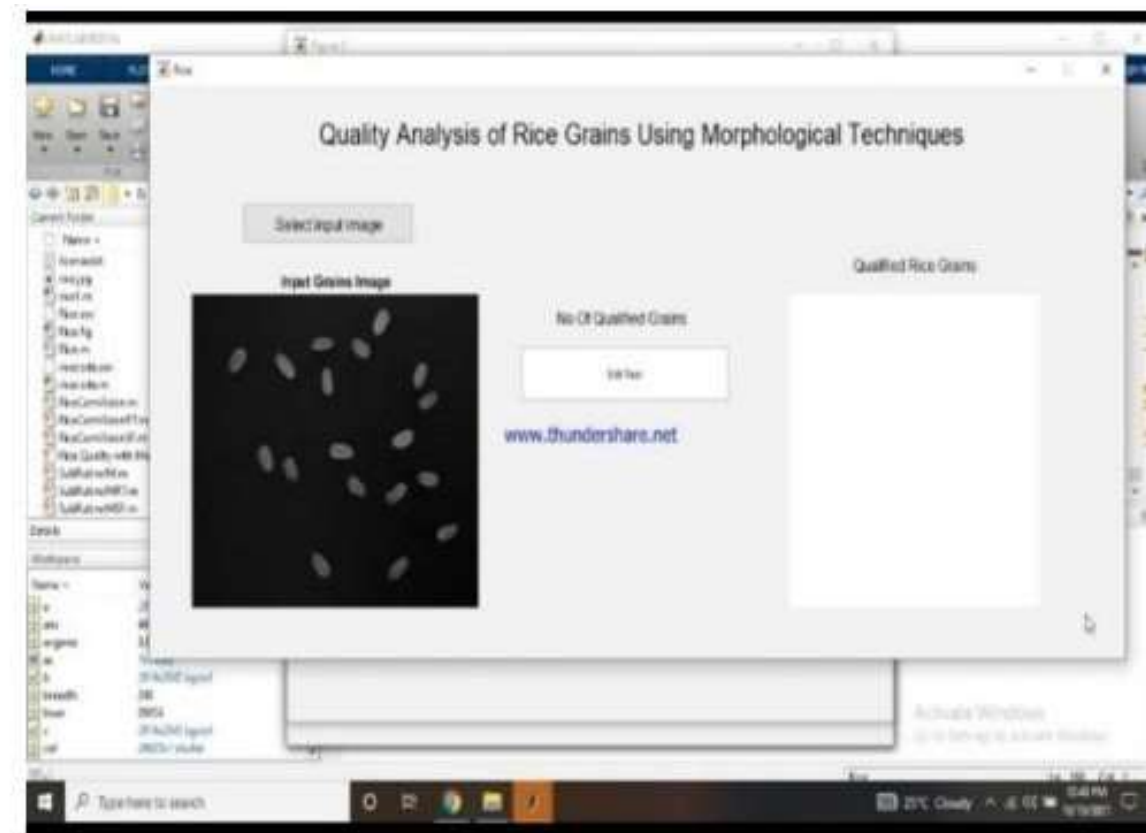


Fig.3 Collect and gathering image from dataset

Figure 4. shows how we are removing unwanted data from the dataset by using segmentation and Thresholding Process.

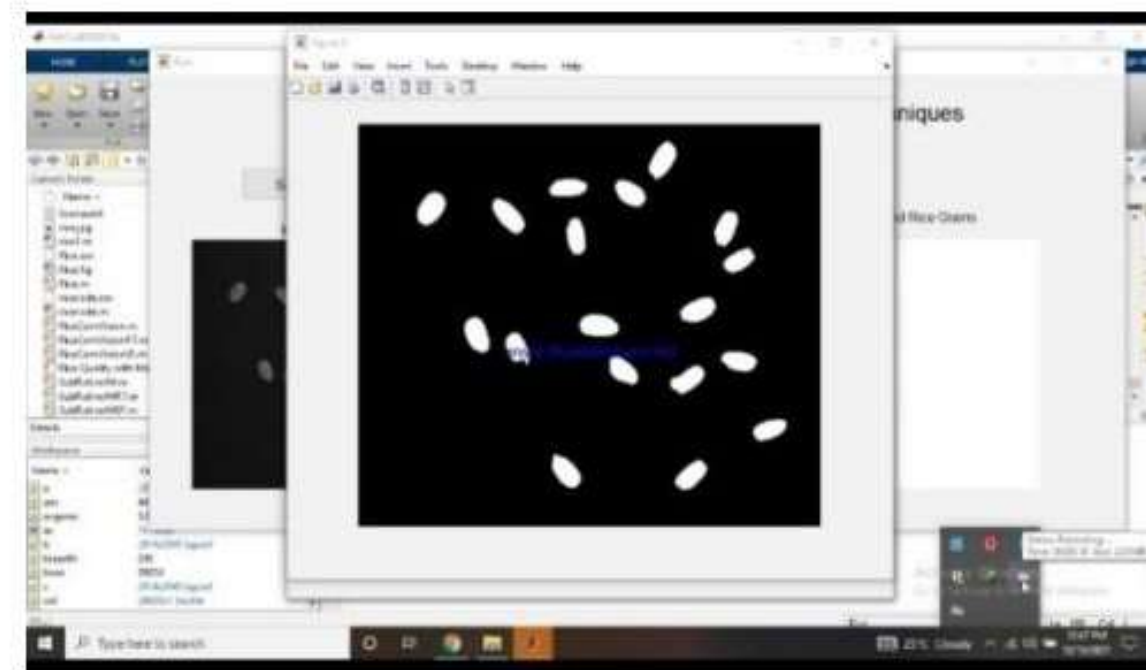


Fig.4 Sample Output

At last, we will get the qualified Image in Figure 5.



Fig.5 Sample Output2

The Analysis about the proposed system is shown in Fig.6.

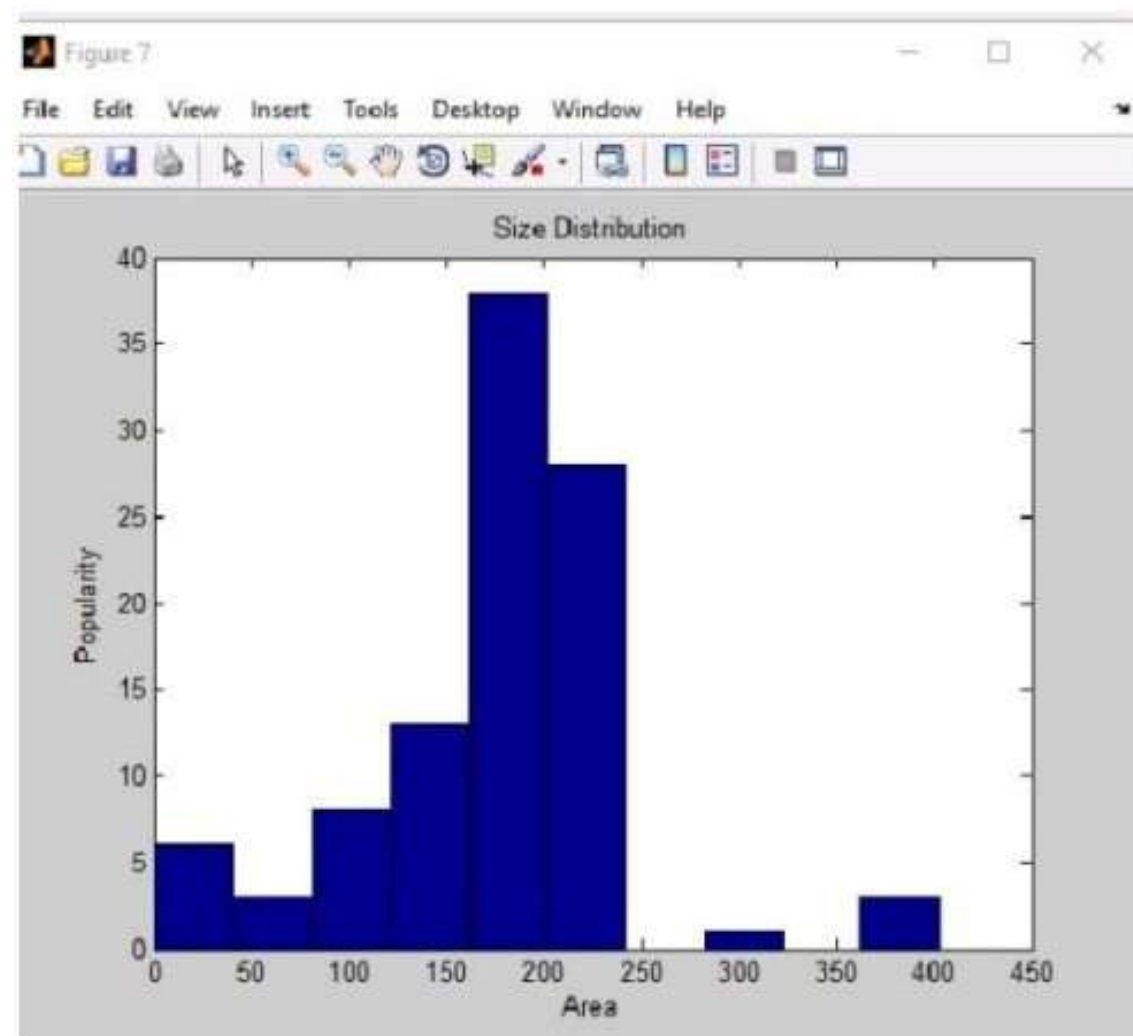


Fig.6 Quality Analysis

V.CONCLUSION

The machine vision algorithm is implemented in this study to segment overlapping and touching rice seeds using a combination of techniques. SVM or Neural Networks, based on linear kernels and demonstrating efficacy in classification, are used to implement the classification method. Better results than manual and traditional methods. The technology is efficient and accurate, and it is inexpensive. As a result of using light weighted algorithms and feature vectors, this approach takes a shorter time than manual process and provides better algorithmic efficiency. A further validation step can be designed for improving stone identification accuracy.

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Quality Analysis Of Rice Grains Using Morphological Techniques

Chandrika Vijaya Krishna¹, Bade Suchitra², L. Sujihelen³, M.S. Roobini⁴, Suja Cherukullapurath⁵, A. Jesudoss⁶

^{1,2,3,4,5,6}Department of Computer Science and engineering,
Sathyabama Institute of Science and Technology, Chennai

Abstract— Human beings from all over the world prefer and consume rice more than any other food. Rice is at its peak of demand when its quality is good. Currently, the kind and quality of rice is determined through a naked-eye visual assessment approach. This method, however, is arduous, time-consuming, requires human skill, and is dependent on the inspector's physical health. To address these issues, this work introduces an automated system that uses digital image processing techniques to identify and classify rice grains. The image processing approach is the most appropriate since it is a non-contact technique that captures the picture of the rice grains. MATLAB is used to pre-process, segment, and extract features from the captured images. Using Neural Networks (NN) and Support Vector Machines (SVM) algorithmic classifications, the quality of rice is assessed based on the extracted features. The results indicate that SVM-based classification performs better than its counterpart based on our comparison study.

Keywords— Rice Quality, Morphological approaches, Support Vector Machine, Neural Networks.

I. INTRODUCTION

Grains are the prime crop for our country to increase the agricultural income. Impurities like as stones, weed seeds, chaff, and damaged seeds are found in these grains. The amount of automation used to assess grain quality is modest, and the majority of the job is done by hand. The workload is so heavy that workers will become exhausted, and they will require sample testing experience. It also makes testing more expensive and time-consuming. Visual inspection is used to quickly check grain type and quality in the current grain handling system. This analytical procedure, on the other hand, is arduous and time-consuming. This laborious work has an impact on the farmers. As a result, it is necessary to investigate the possibilities of utilizing technology to find an appropriate solution. The accuracy of quality inspection by manual approach varies from person to person, and it also depends on working stress, persuasion, and loyalty among merchants, as well as the expertise and experience of inspectors. The proposed system goal is to find an effective way to determine rice quality. The proposed system goal is to cut down on labor, prices, and time. The system must now accomplish the following tasks: Image processing methods are used to examine and identify the quality of rice grains based on their size and form. Rice is a popular cereal grain in Asian nations, with a high consumption rate. It is widely available around the globe. Rice for humans is used to make a variety of value-added goods [1]. The quality of milled rice is a major element in the rice market. With the import and export commerce, quality measurement becomes even more critical. Paddy, chaff, broken grains, weed seeds, stones, and other dispensable things can be found in rice samples [2]. The impurity concentration of rice has an impact on its quality. Rice mill operators must provide grades to rice samples based on Sri Lankan quality criteria.

Rice is India's most widely grown crop. It indicates that 70% of India's population consumes rice on a daily basis, i.e. twice a day. Food is the simplest way for a person to become infected with any disease. When we learn about any form of ailment, we get concerned about our health and begin to take measures. For example, we use face masks to avoid pollution in our daily lives, and we use bacteria-free hand-wash and sanitizers to avoid becoming polluted by water. When it comes to food, however, we buy it directly from the market, wash it with water, and prepare it immediately, implying that we are completely reliant on the food grains we get from the market. After purchasing the rice packet, we occasionally find various small particles such as small stones, half-sized grains, husk, and so on. We also occasionally find undesired items when eating. We are unconcerned about the product's quality. India is the world's third-largest rice producer, with a diverse range of rice kinds and quality [3]. Rice quality may be graded based on the shape, colour, and moisture level of the rice grain, according to SNI 6128:2015[4][5]. Rice, on the other hand, is ingested to meet the body's nutritional requirements[6]. As a result, it's critical to understand which rice varieties have the most nutrients [7][8].

II. RELATEDWORKS

In existing system normally, they can be identified by manual only. Those are easily identified village people and old persons. Now a days it is so difficult to identified the rice quality checking [9][10]. Many researches worked to find out proper methodology for segmenting touching and/ or overlapping rice kernels. M. J. Asif et al., (2018). [11], Rice is the most important and most widely consumed grain in Pakistan and the world, despite different meals being prepared from grains. Inspections of rice grains are important domestically and internationally. The

quality analysis should be automatically used to identify different types of rice. During the course of the research, the researchers will develop a method for classifying and analyzing rice varieties through image processing. Vijay Sonawane et al., (2021) [12], It is a whole grain that is high in fiber and has an 80 percent protein, phosphorus, and potassium content. Rice comes in hundreds of distinct types, each with its own form, texture, and flavor that makes it ideal for particular meals. Varying varieties of rice have different quality criteria. As a result, you must choose the highest-grade rice since high-quality rice is not only delicious but also healthy.

Aznan, Aimi et al. (2021) [13], Keeping rice quality high and consumer expectations high is vital for the success of the industry. Yet, establishing cost-effective and quick methods for analyzing rice grain quality characteristics remains a challenge. Based on dimensionless morphometric characteristics and color parameters retrieved from digital photos captured with a smartphone camera with CV algorithms, this work illustrates how computer vision (CV) and machine learning (ML) can be used to categorize commercial rice samples. A model using nine morpho-colorimetric factors was created to classify rice samples into 15 commercial types.

T. G. Devi et al., (2017) [14], As part of machine vision-based testing, we evaluate and grade rice grains both physically (grain size and shape) and chemically (amylose concentration and gel consistency). A suggested image processing technique, which was implemented in Mat Lab, was used to evaluate the quality and grade of rice grains using the average values of the collected features. J. Panigrahi et al., (2020). [15], They have expressed worry about rice quality in their work. They considered that a rice size should be more precise, that is, it should grow to its full size in order to offer all of its proteins to everyone. They predicted the quality of rice using a photograph of rice. They used feature extraction techniques and used a variety of machine learning approaches to train our model. W. Prihasty et al., (2020) [16]. They presented early study towards predicting rice quality based on amylose phenolic and flavonoid levels assessed using the FTIR Spectroscopy method. The designed prediction system was validated using a chemical analysis approach. The amounts of amylose, phenolic, and flavonoids in rice were determined using partial least square (PLS) methods, and the kinds and quality of rice's were clustered using Principal Component Analysis (PCA) methods. The suggested system's coefficients of determination for amylose content, phenolic content, and flavonoids were 0.95, 0.86, and 0.95, respectively, with respective RMSE values of 1.4, 0.72, and 0.44. Rice samples may be divided into three quality classes

using this technique: high quality, premium quality, and medium quality rice. The existing work limitation is less accuracy.

III. PROPOSED SYSTEM ARCHITECTURE

Food grain quality is very important to consumers today[17]. This proposed system is to increase the accuracy. This proposed system, which is shown in figure 1, presents an automated system for assessing rice grain quality based on ANNs and SVMs. Rice grains can be categorized into two types: small or large. The proposed system allows for morphological and geometrical features to be used to identify and classify rice grains. SVM outperformed its counterpart in terms of computational time and parallel processing (classifying more than one sample at a time), when those factors are taken into account. A training ratio imbalance may account for these results. Fig. 2 depicts the type of rice grain classification which the proposed system can effectively classify.

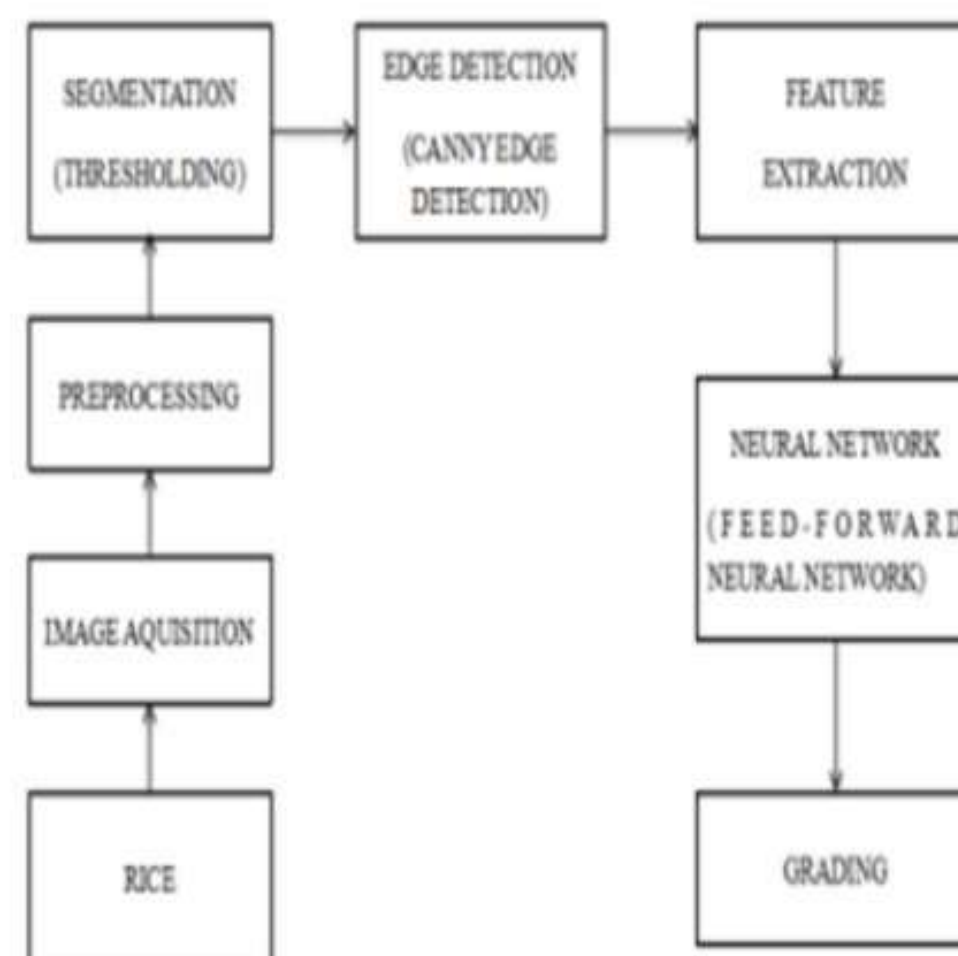
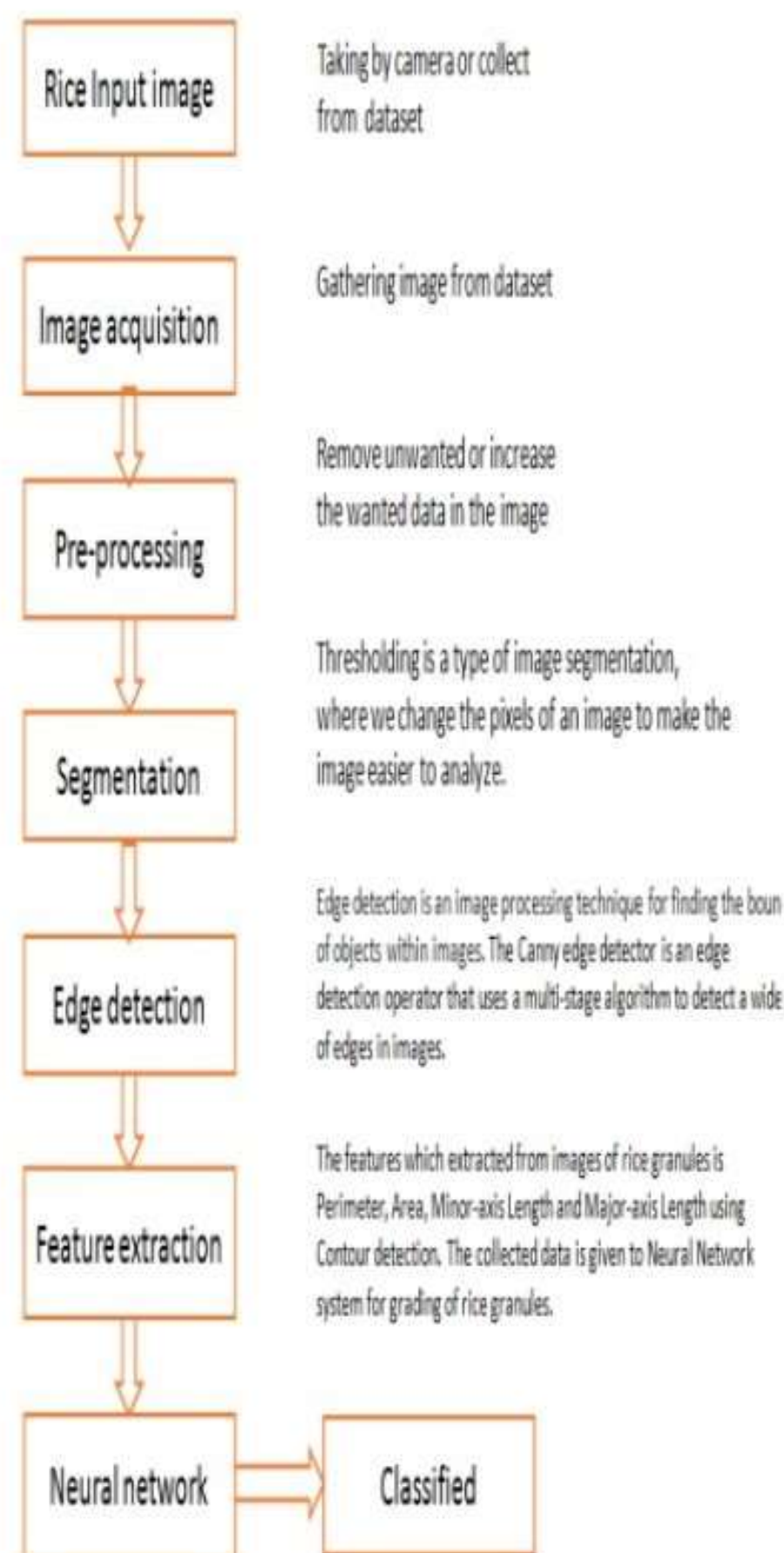


Fig.1. Architecture of the proposed system



From the extracted features the quality of rice is assessed based on Neural Networks (NN) and Support Vector Machine (SVM) classifier algorithms.

Fig.2. Methodology of the proposed system

1) Modules

In first module we collect the images of data set and going to pre-processing it. In pre-processing the images can be convert into frames and it will convert into gray scale. In second module adding filtering techniques. In this module we can get what we want in the image, by using filters and morphological techniques. In third module we can detect the rice grains. In this module for detecting the rice grains, we are using edge detection and segmentation. In the final module we can Quality analysis of rice grains. In this module rice can be analysed using neural networks.

2) Methodology

In this system we can classify the quality of rice grains by using SVM algorithm and Matlab. At first collecting the datasets from kaggle in the form of

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Dataset Selection

One of the significant factor of a rice grain purity is measured by the percentage of foreign grains mixture. Most of the Rice traders used to verify the purity of rice grain by Manual annotations done by labors with the years of experience. But this process is Costly and produce erroneous result in most cases. Which also takes very long time.

So this work is going find the purity of a Rice sample within a few seconds and with a very good accuracy from a scanned image of the sample. The ultimate result will detect each grains and classify it to its corresponding grain type which is shown in fig. 3 and Fig.4.

IV RESULTS AND DISCUSSION

This module segments rice seeds from an image input and classifies them into four categories: rice, paddy, stone, and foreign objects. It is critical to preprocess rice in a way that will improve segmentation performance. As part of preprocessing, noise is removed, subtracted, binarized and morphological operations are performed. Evaluation of the solution is highly dependent on execution time. Image quality and size are directly related to execution time. In TABLE I, we present results of the preprocessing time. To measure effectiveness, we use two unique performance indicators. One is precision, and the other is recall rate. Positive predictive value refers to precision, while sensitivity refers to recall. As a result, precision refers to how accurately instances within a sample are identified. From all relevant examples that were analyzed, the recall represents the number of accurately identified cases. A measure of

Classification Class	Precision Rate%	Recall Rate%	F Measure %
Rice	96.7	99.4	99.7

Table 1 Processing Time

relevance and knowledge of the subject matter are both necessary for both. The F-measure, also known as a harmonic mean, combines precision with recall. A test on rice categories, foreign objects, rice and stones was conducted to assess the accuracy of the segmentation module. The segmentation method was assessed for its prediction and recall rates. There is a perfect segmentation of rice objects in this image. FP values represent unnecessary objects that have been incorrectly detected. This is true of rice sample objects that have not been detected. There is an average precision rate of 96.7% and a recall rate of 99.40% during the segmentation process.

Distance	Precision Rate%	Recall Rate%	F Measure %
9cm	88.9	85.8	89
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Table.2 Processing time for Various Size

Sample Output

The experimental results are shown in the below figure 3. The figure 3 explains about collect and gathering image from dataset. The images are given as input and find the number of qualified grains.

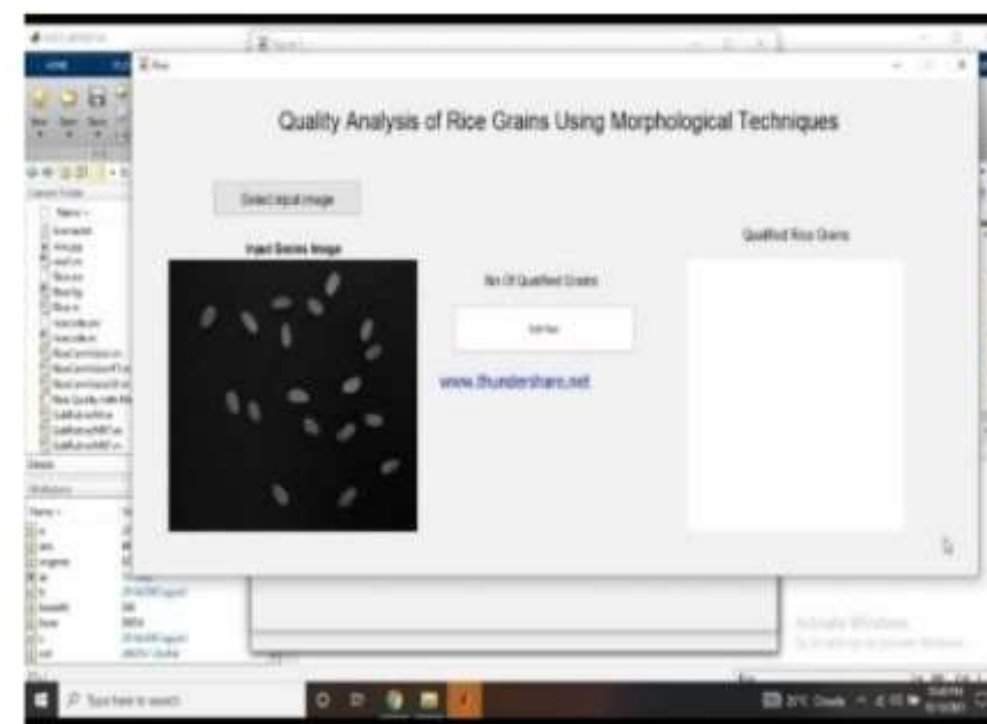


Fig.3 Collect and gathering image from dataset

Figure 4. shows how we are removing unwanted data from the dataset by using segmentation and Thresholding Process.

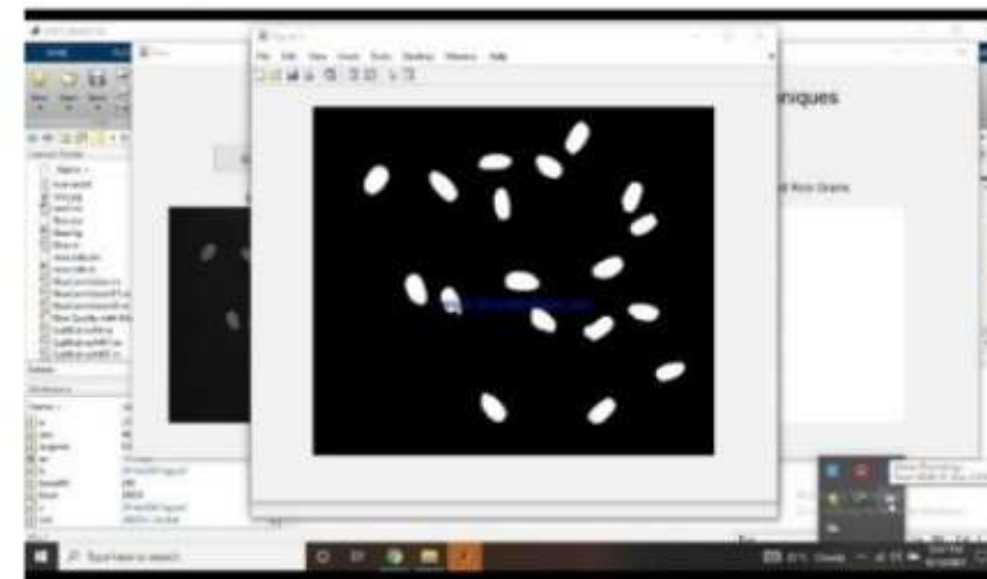


Fig.4 Sample Output

At last, we will get the qualified Image in Figure 5.



Fig.5 Sample Output2

The Analysis about the proposed system is shown in Fig.6.

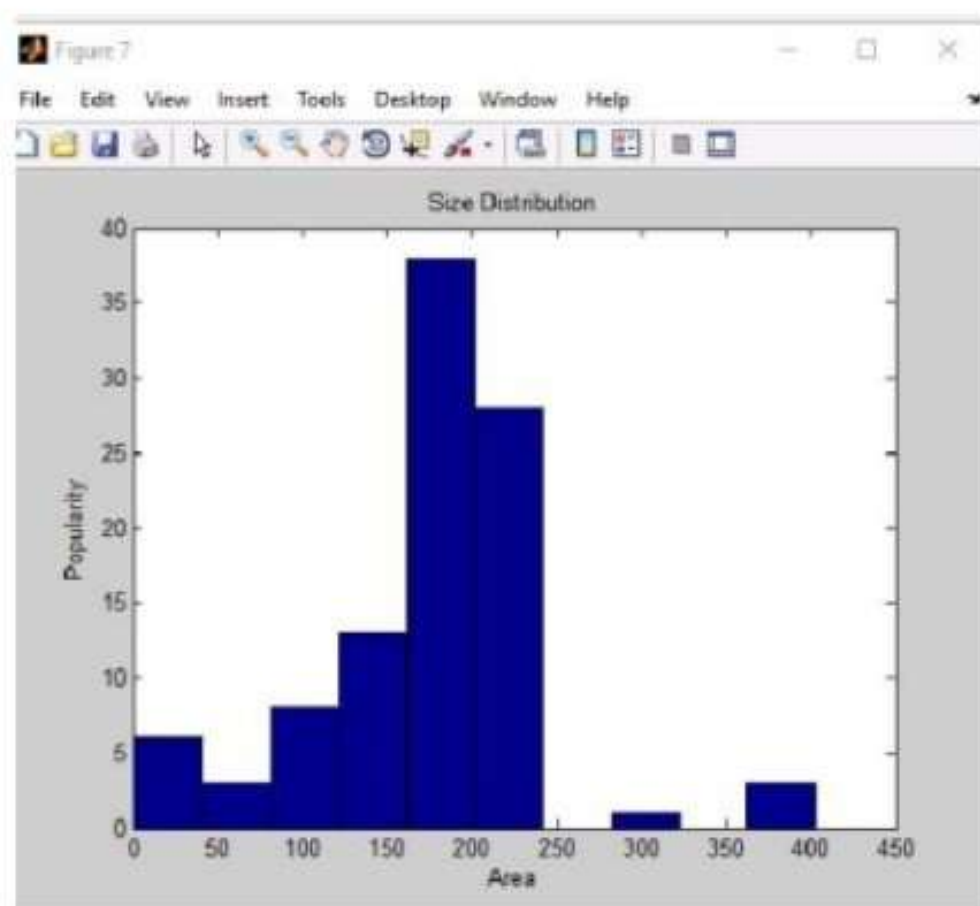


Fig.6 Quality Analysis

V.CONCLUSION

The machine vision algorithm is implemented in this study to segment overlapping and touching rice seeds using a combination of techniques. SVM or Neural Networks, based on linear kernels and demonstrating efficacy in classification, are used to implement the classification method. Better results than manual and traditional methods. The technology is efficient and accurate, and it is inexpensive. As a result of using light weighted algorithms and feature vectors, this approach takes a shorter time than manual process and provides better algorithmic efficiency. A further validation step can be designed for improving stone identification accuracy.

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