Introduction To Innovative Projects

Rice Quality Analysis through Image Processing

Final Report

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Abstract

In this project, we take processing, enhancement and analysis of digital images as a way to determine the quality of different rice samples. The image is processed in the Spatial domain. Image reduction, image enhancement, image increment, object recognition in the spatial domain is applied on grain by grain of different samples of rice to determine its size, colour and quality as whole to grade the grain of rice.

Keywords - Grading, Rice grain, Quality, Image processing

1. Introduction

1.1 THEORETICAL BACKGROUND

The Agricultural industry, on the whole, is very vast and ancient. Quality assessment of grains is a very big challenge since time immemorial. The project presents a solution for quality evaluation and grading of rice grains using image processing techniques. Commercially the grading of rice is done according to the size of the grain (full, half or broken). The food grains quality are rapidly assessed through

visual inspection by human inspectors. The decision making capabilities of human-inspectors are subjected to external influences such as fatigue, vengeance, bias etc. With the help of image processing techniques we can overcome that and which are also a nondestructive and cost-effective techniques. Here we also discuss the procedure used to obtain the percentage quality of rice grains. Rice quality is nothing but the combination of physical and chemical characteristics. Grain size and shape, chalkiness, whiteness, milling degree, bulk density and moisture content are some physical characteristics , gelatinization temperature and gel consistency are chemical characteristics of rice.

1.2 MOTIVATION

The paper presents a solution of grading and evaluation of rice grains on the basis of grain size and shape using image processing techniques. Specifically edge detection algorithm is used to find out the region of boundaries of each grain. In this technique we find the endpoints of each grain and after using caliper we can measure the length and breadth of rice. This method requires minimum time and it is low in cost.

1.3 AIM OF PROPOSED WORK

In this study, the image processing algorithms are developed to segment and identify rice grains. Use of image processing algorithm is an efficient method to analyze grains quality by its size.

1.4 OBJECTIVE OF PROPOSED WORK

To analysis and classify the quality of rice grains.

2 OVERVIEW OF THE PROPOSED SYSTEM

2.1 INTRODUCTION

The image processing technique is used for counting the number of rice seeds and classifies them on the basis of length, breadth and length - breadth ratio. Length is the average length of rice grain while breadth is the average breadth of rice grain and length-breadth ratio is calculated as:

L/B=[(Average length of rice grain)/(average breadth of rice)]*100

In first pre-processing step image registration takes place and noise is removed from the image by using filter. Shrinkage algorithm used for segmenting the touching kernels which is second step. In third step we perform edge detection to find out the region of boundaries. In fourth step rice seed measurement is done and in the same step length, breadth and length-breadth is also measured. In the fifth step of the

algorithm rice is classified according to its size and shape.

2.2
FRAMEWORK

2.3 SYSTEM MODEL
ANALYSIS

A. Image pre-processing

Filter is applied to remove noise which occurs during the acquisition of image. Filter also sharpens the image. Threshold algorithm is used to segment the rice grains from the black background.

B. Shrinkage morphological operation

Erosion is applied to separate the touching features of rice grains without losing the integrity of single feature. Dilation process follows erosion process. The goal of dilation is grow the eroded features to their original shape without rejoining the separated features.

C. Edge detection

Edge detection helps to find out the region of boundaries of rice grains. We use canny algorithm to detect the edges.

D. Object measurement

Measurement indicates the count of rice grains. After getting the count of rice grains, edge detection algorithms applied on the image and outcome of the applied algorithm is we get endpoint values of each grain. We use caliper to join the endpoints and measure the value of length and breadth of each grain. After getting the value of length and breadth we can calculate length-breadth ratio.

E. Object classification

Classification requires all standard, measured and calculated results. The standard

database for rice size and shape measurement is referred from laboratory manual on rice grain quality, Directorate of Rice Research, Rajendranagar, Hyderabad. The classification of rice grains as per the standard database is shown in following tables.

Table below indicates classification of rice grains on the basis of length and lengthbreadth ratio:

3. RESULTS AND DISCUSSION

3.1 SUMMARY OF THE RESULT

Accuracy of counting total number of grains in the images should be 100% and it should be suitable to grade large quality of grains efficiently, which otherwise will consume lot of time in manual analysis, this feature will be able to save lot of time & human effort.

3.1.1 TEST IMAGES

3.1.2 CODE(python)

```
import cv2

import numpy as np

from matplotlib

import pyplot as plt

def get_classificaton(ratio):

ratio =round(ratio,1)

toret=""

if(ratio>=3):

toret="Slender"

elif(ratio>=2.1 and ratio<3):

toret="Medium"

elif(ratio>=1.1 and ratio<2.1):

toret="Bold"

elif(ratio<=1):

toret="Round"

toret="("+toret+")"

return toret

#rnjn
```

```
print("Starting")
```

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```
img = cv2.imread('rice.png',0)#load in greyscale mode

#convert into binary

ret,binary = cv2.threshold(img,160,255,cv2.THRESH_BINARY)# 160 - threshold,

255 - value to assign, THRESH_BINARY_INV - Inverse
binary

#averaging filter

kernel = np.ones((5,5),np.float32)/9

dst = cv2.filter2D(binary,-1,kernel)# -1 : depth of the destination image
```

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```
kernel2 =

cv2.getStructuringElement(cv2.MORPH_ELLIPSE,(3,3))

#erosion

erosion = cv2.erode(dst,kernel2,iterations = 1)

#dilation

dilation = cv2.dilate(erosion,kernel2,iterations = 1)

#edge detection

edges = cv2.Canny(dilation,100,200)

### Size detection
```

```
_,contours,hierarchy = cv2.findContours(erosion,
cv2.RETR_EXTERNAL,

cv2.CHAIN_APPROX_SIMPL
E)

print ("No. of rice grains=",len(contours))

total_ar=0

for cnt in contours:
```



```
x,y,w,h = cv2.boundingRect(cnt)

aspect_ratio = float(w)/h

if(aspect_ratio<1):

aspect_ratio=1/aspect_ratio

print (round(aspect_ratio,2),get_classificaton(aspect_ratio))

total_ar+=aspect_ratio

avg_ar=total_ar/len(contours)

print ("Average Aspect Ratio=",round(avg_ar,2),get_classificaton(avg_ar))

#plot the images

imgs_row=2

imgs_col=3
```

```
plt.subplot(imgs_row,imgs_col,1),plt.imshow(img,'gray')

plt.title("Original image")

plt.subplot(imgs_row,imgs_col,2),plt.imshow(binary,'gray')

plt.title("Binary image")

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plt.subplot(imgs_row,imgs_col,3),plt.imshow(dst,'gray')

plt.title("Filtered image")

plt.subplot(imgs_row,imgs_col,4),plt.imshow(erosion,'gray')

plt.title("Eroded image")

plt.subplot(imgs_row,imgs_col,5),plt.imshow(dilation,'gray')


 1
 0

plt.title("Dialated image")

plt.subplot(imgs_row,imgs_col,6),plt.imshow(edges,'gray')

plt.title("Edge detect")

plt.show()
```

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1

6.
CONCLUSION

The image analysis algorithms are applied on image in which rice grains are randomly placed and spread in one layer. If the error occurs like touching kernels shrinkage operation works efficiently for separating the connecting part from point touching kernels. Edge detection is performed to find out the region of boundaries and endpoints of each grain; and then after that using caliper length and breadth can be measured. After getting the values for length and breadth, length-breadth ratio is to be Calculated. In this study, the image processing algorithms are developed to segment and identify rice grains. use of image processing algorithm is an efficient method to analyze grains quality by its size. The main benefit of proposed method is it requires minimum time; cost is less and gives better results compared with manual results or traditional methods. We have successfully executed all the steps proposed. Last two steps include calculating the size of the grains and then classifying them according to the Table provided.

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