Advance Algorithmic Approach to Quality Analysis of Indian Basmati Rice Using Digital Image Processing

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ABSTRACT

In this research, the best Indian Basmati Rice will be selected through the development of one of the algorithms published in this field using digital image processing, where rice of excellent quality, acceptable and bad is detected at the same time.

Keywords: Average Precook Length, Broken/fragmented grains, Chalkiness value, Damaged/discolored grains, Indian Basmati Rice, Image Processing Tool, L/B Ratio, L/B2 Ratio, Elongation ratio.

I. INTRODUCTION

Image processing is the study of any algorithm that takes an image as input and returns an image as output. Rice is the most important food crop of developing world, so can be developed by using digital image processing. More than 900 million of the world’s people depend on rice as producers or consumers. Automated machine based inspection using software system is more speedy, accurate, convenient, harmless and non-destructive in comparison with traditional methods. An algorithm can be developed which can serve as a skeleton to develop software system. Indian basmati rice can be analyzed and classified based on the parameters like length uncooked rice, width uncooked rice, length to width ratio uncooked rice, length cooked rice, width cooked rice, length to width ratio cooked rice, elongation ratio, chalkiness value, broken/fragment grains and damaged/discolored grains. Development an algorithm to measure all such parameters which analyse the quality of rice grain by comparing with given standards.

There are many researches applied machine vision to estimate rice appearance quality inspection. Bhavesh B. Prajapati, Sachin Patel. (2013) suggest algorithm to quality analysis of Indian Basmati Rice using digital processing. Bhavesh B. Prajapati1, Sachin Patel2 (2013) have suggest mobile device for measuring quality parameters of Indian Basmati Rice using image processing techniques. Yan, Chen and Guan et al. (2009) have discussed inspection of quality of rice grain appearance using machine vision. Wan et al. (2002) proposed an automatic inspection machine based on image-processing for sorting of rice grains into sound, cracked, chalky, immature, dead, broken, damaged and off-type categories. Guzman et al. (2008) used Artificial Neural Networks. Guzman and Peralta et al. (2008) suggested Machine Vision Based Classification of Philippine Rice Grains, which represents the classification accuracies of the sizes, shapes, and varietal types of fifty two ice popularly grown in the Philippines using multilayer neural networks. Their system is more effective when compared to human inspection method.

II. METHODS AND MATERIAL

By measuring the dimensions to obtain the average length and width ratio of the basmati grains before and after cooked rice to obtain the good result. Following equations are used:

\[
\frac{L}{B} \text{ ratio} = \frac{\text{Average length of uncooked rice}, \text{mm}}{\text{Average breath of uncooked rice}, \text{mm}}
\]

\[
\frac{L}{B^2} \text{ ratio} = \frac{\text{Average length of cooked rice}, \text{mm}}{\text{Average breath of cooked rice}, \text{mm}}
\]
Elongation ratio (ER) means the ratio of the length of cooked rice to that of uncooked rice which measures the expansion length upon cooking. This can be obtained as:

\[
\text{Elongation ratio} = \frac{\text{length of cooked rice, mm}}{\text{length of uncooked rice, mm}}
\]

Percentages of following parameters are obtained by counting the number of parameterized rice grains per 100 rice grains by common equation.

- **Damaged, discolored grains** include rice kernels, broken, fragments of whole that are internally damaged or discolored, materially affecting the quality.

\[
\text{Max. discolored grain %} = \frac{\text{Number of discolored grains}}{100 \text{ grains}} \times 100
\]

- **Chalky grains** mean the grains at least half of which are milky white in color and brittle in nature.

\[
\text{Max. Chalky Grain %} = \frac{\text{Number of chalky grains}}{100 \text{ grains}} \times 100
\]

- **Broken and fragments** includes pieces of rice kernels which are less than three fourth of a whole kernel.

\[
\text{Max. Broken and fragment %} = \frac{\text{Number of broken and fragment grains}}{100 \text{ grains}} \times 100
\]

### III. RESULT AND DISCUSSION

Following algorithm, the equations were modified and added to which three types of India Basmati Rice were detected.

1: Scan the rice sample
2: Check image size and resolution
3: If [size and resolution as per requirement] Continue
   Else
   Discard the image and rescan
4: If [overlapped rice is more than permissible limit] Rearrange again and rescan
   Else
   Continue
5: Perform binarization on image
6: Measure average length uncooked rice
7: Measure average width uncooked rice
8: Measure average length and width ratio (L/B)
9: If [Length and width ratio within standard parameters] Continue
10: Measure average length cooked rice
11: Measure average width cooked rice
12: Measure average length and width ratio (L/B2)
13: If \[L/B2-L/B \geq 0]\] \[L/B = L/B2\]
   Else
Rice object is considered damaged/broken grain
14: Calculate percentage damaged/broken grain
15: Measure chalkiness value
16: If [Chalkiness value within standard parameters]
Continue
 Else
 Rice object is considered discolored grain
17: Calculate percentage discolored grain
18: Calculate Elongation ratio(ER)
19: Store and make a set of parameters
20: If [parameters values are within standard parameters range]
21: If[ER >1]
 Rice sample quality is excellent
Else
 Rice sample quality is acceptable
 Else
 Rice sample quality is not acceptable (poor)
22: Generate detailed report

CONCLUSION

With the development of algorithm approach to quality analysis of Indian Basmati Rice has become possible to identify three types of basmati rice which is “excellent, accepting and poor” where it was obtained at a time faster and in quantities of high quality and with result of a high greater profit return.

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