Parametric Evaluation and Classification of Bhaliya and Shihori Wheat Varieties

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Abstract— This paper presents parametric evaluation and classification method for Bhaliya and Shihori wheat varieties. In this paper we quantify the quality of bhaliya and Shihori wheat by counting its geometric features and after that train the neural network for Classification.

I. INTRODUCTION

Wheat is one of the main cereals consumed in the India. The highest consumption of the wheat is in Gujarat. Wheat is leading source of the vegetable protein the human food, having higher protein content than other major cereals, maize or rice. Quality Control is one of the major parameters in Food Industry because after harvesting, based on quality a food product has been sorted and graded. The increases awareness and sophistication of consumers have created the expectation for improving quality in consumer Food products. Food quality is complex being determined by combination of sensitive, nutritive, hygienic-toxicological and technological properties. More than one quality attributes therefore in most of the manual food quality grading systems. Quality Evaluation traditionally performed by human vision of some trained people. In Indian scenario grain is inspected by naked eyes and sold commercially. This method is time consuming, tedious and inherently inconsistent therefore quality inspection by human is neither efficient nor perfect [1].

II. PROBLEM DEFINITION

Fig 2.1 Sample of Bhaliya wheat seeds

Fig 2.2 Sample of Shihori wheat seeds

Bhaliya and Shihori wheat seeds contain small, normal and large seeds as shown in fig 2.1 and Fig 2.2. These seeds are having very much importance for quantifying quality. At the time of processing these seeds are differentiated as small, normal and large. Because small seed has lower quality compare to normal seed and normal has lower quality than large seed. This paper proposes a new method for counting the number of shrbati wheat seeds as small, normal and large using machine vision technique [1].

III. PROPOSED ALGORITHM

Sr. No.	Steps
1	Select Region of Interest(ROI) of wheat seeds
2	Convert the RGB Image to Gray Image
3	Apply edge detection algorithm
4	Calculate Geometric parameters of the wheat seeds
5	Based on parameters value classify the wheat seeds
6	Show small, medium and long elements of wheat seeds as output

Table. 1: samples of shrbati Tookdi wheat

IV. PARAMETER CALCULATION

A. Major axis length

It was the distance between the end points of the longest line that could be drawn through the seed. The major axis endpoints were found by computing the pixel distance between every combination of border pixels in the seed boundary.

B. Minor axis length

It was the distance between the end points of the longest line that could be drawn through the seed while maintaining perpendicularity with the major axis.

C. Area

The algorithm calculated the number of pixels inside, and including the seed boundary (mm2/pixel).

D. Eccentricity

The eccentricity E is the ratio of the distance between foci of the ellipse and its major axis length.

Diagram for histograms of above calculated features computed from one sample of shrbati Tookdi wheat as shown in Fig 4.1 to Fig4.8 From the histogram of Major Axis Length we can clearly specify the range of Major Axis Length for small, normal and large seed. We marked small seed as circle 1, normal seed as circle 2 and large seed as circle 3. Likewise from the other histograms we can distinguish three classes of wheat seeds. The Minor Axis

Length, Major Axis Length, Eccentricity and Area of Bhaliya wheat seeds for three different classes are calculated from the histograms of all 8 samples of shrbati Tookdi wheat which is shown in table 1.

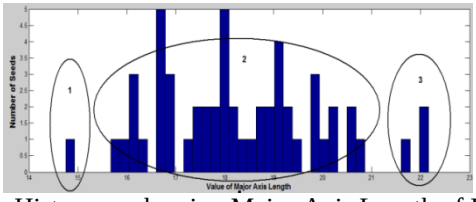

Fig. 4.1: Histogram showing Major Axis Length of Bhaliya wheat seeds

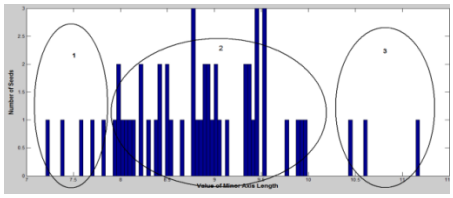

Fig. 4.2: Histogram showing Minor Axis Length of Bhaliya wheat seeds

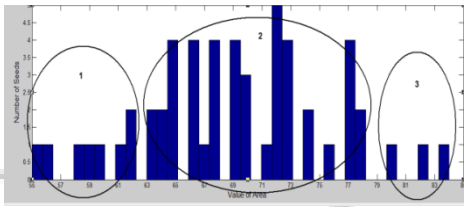

Fig. 4.3: Histogram showing area of Bhaliya wheat seeds

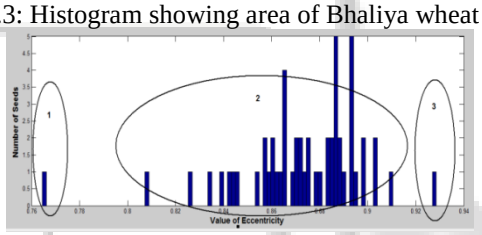

Fig. 4.4: Histogram showing Eccentricity of Bhaliya wheat seeds

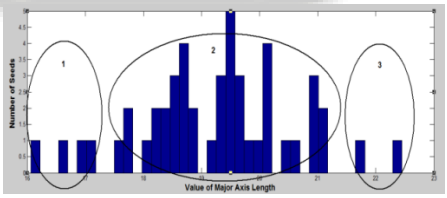

Fig. 4.5: Histogram showing Major Axis Length of Shihori wheat seeds

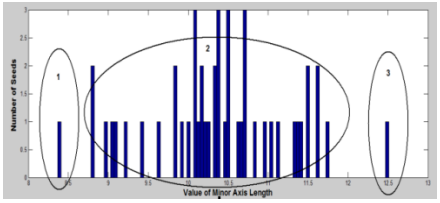

Fig. 4.6: Histogram showing Minor Axis Length of Shihori wheat seeds

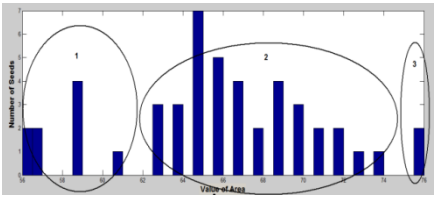

Fig. 4.7: Histogram showing Value of Area of Shihori wheat seeds

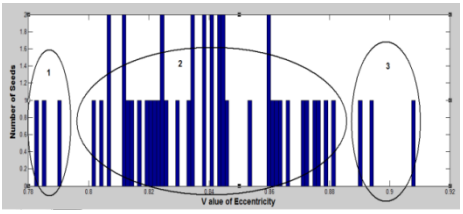

Fig. 4.8: Histogram showing Value of Eccentricity of Shihori wheat seeds

V. PARAMETRIC ANALYSIS

Classification of wheat seeds can be done based on parameters like Major Axis length, Minor Axis Length, Area and Eccentricity.

Table5.1 and 5.2 shows intended parameters based on histogram for normal seeds, large seeds and small seeds. It shows value of major axis length, minor axis length, area and eccentricity of various wheat seeds available in one sample. Same way values of all four parameters for 15 wheat samples are found.

Sr. No.	Mj	Mn	Ar	Ecc
1	16.87209	8.038088	66	0.879221
2	18.87089	8.762326	72	0.885662
3	15.90652	7.374205	56	0.886046
4	16.67844	8.979994	63	0.842677
5	16.67208	7.707961	55	0.886709
6	19.86346	8.887875	73	0.89431
7	19.01292	8.553672	69	0.893085
8	15.69289	7.961285	60	0.861759
9	17.95375	9.026595	73	0.864421
10	16.85102	8.297605	58	0.870363

Table. 5.1: Analysis of several Bhaliya wheat seeds available in one sample

Sr. No.	Mj	Mn	Ar	Ecc
1	18.52853	10.94236	67	0.806988
2	20.18432	12.51106	69	0.784728
3	20.8563	11.49058	76	0.834545
4	18.48503	10.09173	56	0.837824
5	18.43023	10.64534	63	0.816319
6	19.34418	10.67846	67	0.833828
7	18.6163	8.976127	61	0.87608
8	17.17007	10.01791	59	0.812148
9	17.49866	10.15755	57	0.814277
10	18.65827	8.797361	59	0.881866

Table. 5.2: Analysis of several Shihori wheat seeds available in one sample

Parameters	Small Seed	Normal Seed	Large Seed
Major Axis Length	14-16	16-21	21-23
Minor Axis Length	5-8	8-10	10-12
Area	55-63	63-77	77-85
Eccentricity	0.76-0.8	0.8-0.92	0.92-0.94

Table. 5.3: Parameter Extraction of Bhaliya wheat seeds with specified range

Parameters	Small Seed	Normal Seed	Large Seed
Major Axis Length	14-17	17-21	21-23
Minor Axis Length	7-9	9-12	12-14
Area	50-60	60-74	74-76
Eccentricity	0.76-0.82	0.82-0.9	0.9-0.92

Table. 5.4: Parameter Extraction of Shihori wheat seeds with specified range

VI. CLASSIFICATION OF WHEAT SEEDS

A two layer feed forward network with five nodes is used for Classification. The training function using gradient descent with momentum weight as learning function, and maximum like hood as performance function, is used to train NN. The training of the neural network was performed using 8 samples of Bhaliya and Shihori wheat and then an unknown sample is tested. [2]

For training the neural network, wheat seeds in image are divided into three types i.e. large seed, normal seed, and small seed by considering the values of Major Axis Length, Minor Axis Length, Area and Eccentricity. The model for trained neural network for wheat seed as shown in fig 6.1.

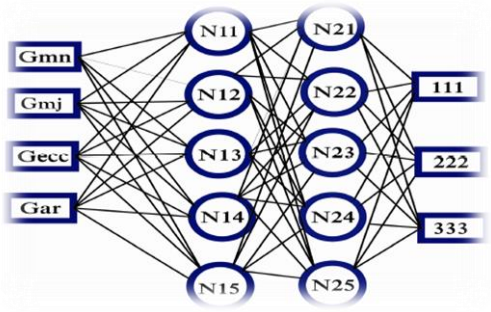

Fig 6.1: Schematic diagram of two layer feed forward neural network

Table 6.1 and 6.2 shows grading of several bhaliya and Shihori seeds of one sample respectively. Here Gmj. Gmn, Gar ane Gecc are grades of major axis length, minor axis length, area and eccentricity respectively. We define parameter of small seed as 1, normal seed as 2 and large seed as 3.

Sr. No.	Gmj	Gmn	Gar	Gecc	Grade
1	2	2	2	2	222
2	2	2	2	2	222
3	1	1	1	2	111
4	2	2	2	2	222
5	2	2	1	2	222
6	2	2	2	2	222
7	2	2	1	2	222
8	2	2	3	2	222
9	2	2	2	2	222
10	2	2	2	2	222

Table6.1 Grading of several Bhaliya wheat available in one sample.

Sr.No.	Gmj	Gmn	Gar	Gecc	Grade
1	2	3	2	1	222
2	2	2	3	2	222
3	2	2	1	2	222
4	2	2	2	2	222
5	2	2	2	2	222
6	2	1	1	2	111
7	2	2	1	2	222
8	2	2	1	2	222
9	2	1	1	3	111
10	2	2	2	2	222

Table6.2 Grading of several Shihori wheat available in one sample.

VII. CONCLUSION

This paper presents a quality analysis of Bhaliya and shihori wheat seeds by image analysis and Neural Network technique. We are calculating major axis length, minor axis length, area and eccentricity for counting small, normal and large seed for a given sample.

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