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Eggs Defect Detection using Image Processing

Miss Praise Malewadkar
Department of Computer Engineering
Don Bosco College of Engineering,
Fatorda-Goa

Miss Sweety Naik
Department of Computer Engineering
Don Bosco College of Engineering,
Fatorda-Goa

Mr. Fedrick Carvalho
Department of Computer Engineering
Don Bosco College of Engineering,
Fatorda-Goa

Mr. Norman Dias
Asst. Professor
Department of Computer Engineering
Don Bosco College of Engineering,
Fatorda-Goa

***Abstract*—This project deals with the fertility of the eggs based on image processing and RGB color model. Till date Image classification is done on objects based on the external appearance.We aim to do the classification on the internal image. In this research, our aim is to develop a system for the eggs using RGB color model and distinguish between fertile, non-fertile and rotten eggs.Our system employs a computer and camera to analyze and interpret images equivalent to the human eye.The colors namely Red, Green and Blue of the eggs would be investigated using this system. The computer program developed uses the average color intensity to differentiate between the different color and fertility of the egg.**

INTRODUCTION

Current approach for Image classification done on objects is based on the external appearance [3]. We aim to do the classification on the internal image. The purpose is to classify eggs as fertilized and non-fertilized as well as separation of defective eggs from qualified ones for safe consumption by using candling and image processing techniques. Till date image classification done on objects based on the external appearance. We aim to do the classification on the internal image.

A. Aim

To classify eggs as fertilized and non-fertilized as well as separation of defective eggs from qualified ones for safe consumption by using candling and image processing techniques.

B. Objective

Automatic separation of defective eggs from qualified eggs reduces visual control difficulties which are done using human power as well as ensures improvement on the quality control process.In large poultry farms the separation of spoiled and good eggs becomes a problem. So we are converting this manual work into automatic work and improve human errors.

C. Purpose

The purpose of this project is to use candling process, image processing techniques and algorithms to create a system that will identify the fertility of the eggs to determine whether it is consumable or not. Automatic separation of defective eggs from qualified eggs reduces visual control difficulties which are done using human power as well as ensures improvement on the quality control process.

II. EXISTING SYSTEM

Image processing techniques have been used to classify commercial eggs into their respective grades and to check the cleanliness or dirtiness of the eggs. Image processing techniques such as grayscales conversion, image filtering and black and white pixels conversion have been used to improve the quality of the external image

A. Problem with existing system

Image processing technique such as the conversion to black and white image and the calculation of egg's diameter could produce poor results due to pixel degradation. This shall decrease the performance of the system.

B. Scope of the project

The eggs are divided into 3 categories: Rotten, fertilized and good. To define the degree of maturity, we use RGB color model.By knowing the degree of maturity of eggs it can be determine whether the egg is consumable or not. An objective and accurate maturity assessment is important which would be efficiently achieved by the proposed system.

III.HARDWARE MODEL

Android phone of 16 megapixels is used to capture the image of the egg which passed through the track body over the conveyor belt. The moment and capturing of image is controlled with the Arduino UNO along with the motor driver to control the speed of the motor connected to the track pulley. When the egg reaches to the position sensor, the conveyor belt stops moving due to the delay provided by the Arduino and the LED glows and the image is captured into the phone memory.

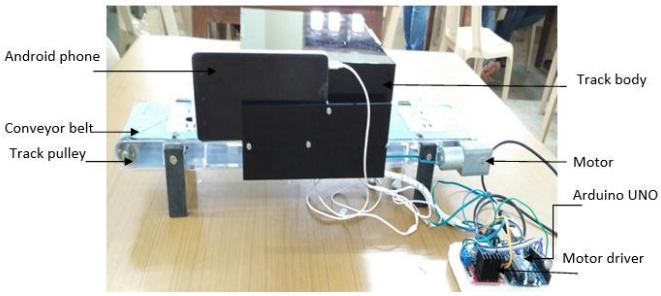

Fig: 3.1 hardware model

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IV. HIERARCHY

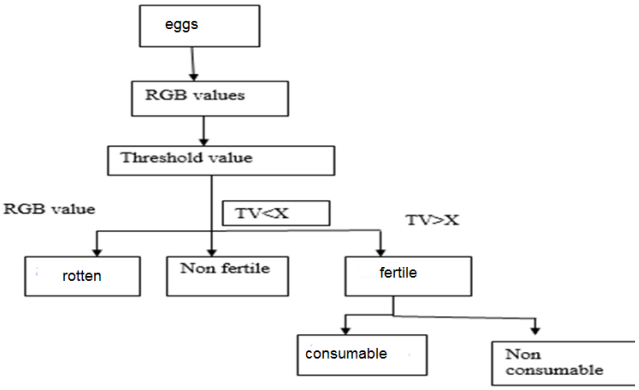

Fig. 4.1 hierarchy of system

The eggs are classified using the RGB values calculated after capturing the image. After getting the RGB values the threshold values are calculated of the dataset of fertilized eggs of 16 days and non-fertilized eggs which were kept in the fridge and at room temperature for 20 and 15 days respectively. With respect to the threshold values the eggs were classified into rotten, fertilized and non-fertilized eggs.

V. OBSERVATION

The dataset was collected for 16 days of 50 eggs. The images were taken every day of each eggs from Ella farm, Old Goa. The dataset of 50 eggs was collected for 15 days by keeping the eggs at room temperature. The dataset of 50 eggs was collected for 20 days stored into fridge temperature.

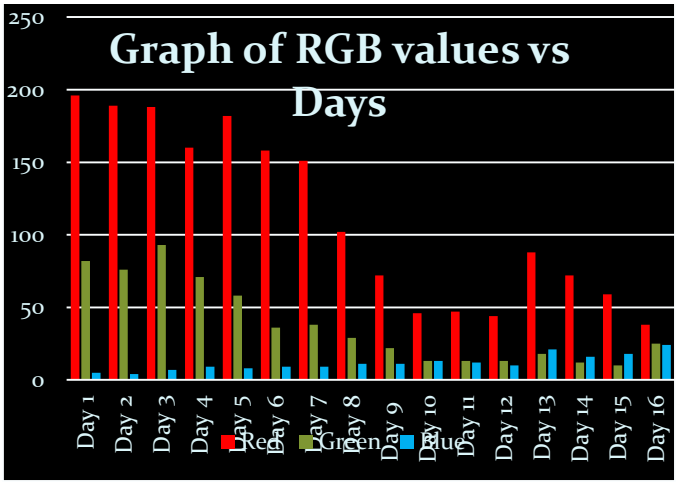

Fig. 5.1 Graph of RGB values vs days

From the above graph we can see that, as the egg becomes more and more mature, the red value of the RGB color model decreases and the blue component of the RGB color model increases. The egg starts to appear darker in appearance till it becomes fully fertilized and ready to hatch.

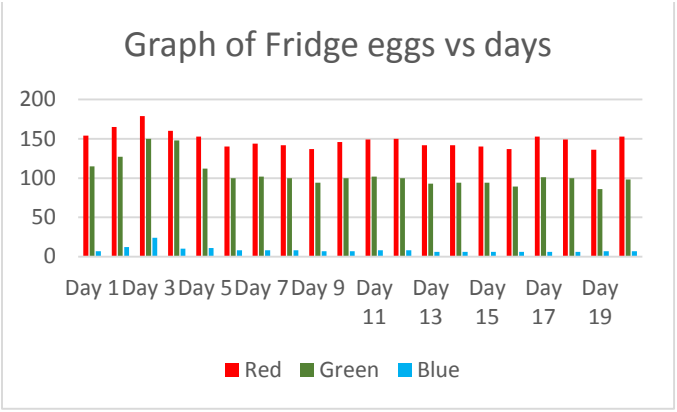

Fig. 5.2 graph of fridge eggs vs days

In the above graph we can see that the Red, Green, and Blue components of the RGB color model are almost the same with a slight decrease in the Red and Green component. The reason for this is that Fridge eggs takes longer time to get spoilt and hence they remain fresh for a longer time. But after day 20, the egg kept in the fridge starts to crack and cracked eggs are not recommended to consume because bacteria may enter inside the egg.

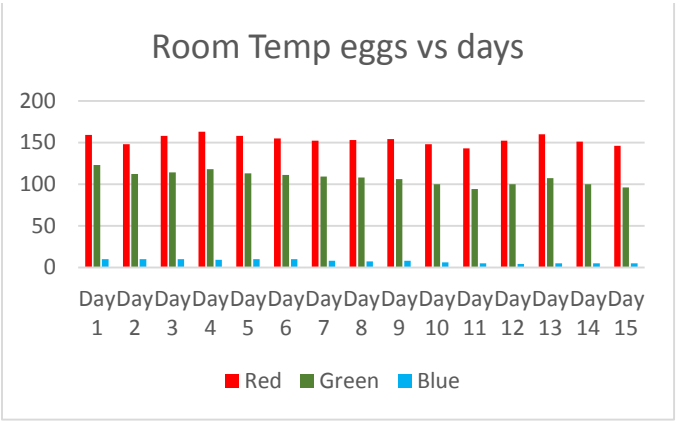

Fig. 5.3 Graph of RGB values of Room Temperature eggs vs Days

In the above graph we can see that there is a slight decrease in the Red component, Green component but the Blue component remains almost the same. The eggs stored at room temperature does not stay fresh for a long time and after day 7 they start becoming less fresh. After two weeks the room temperature eggs are non-consumable and start to rot.

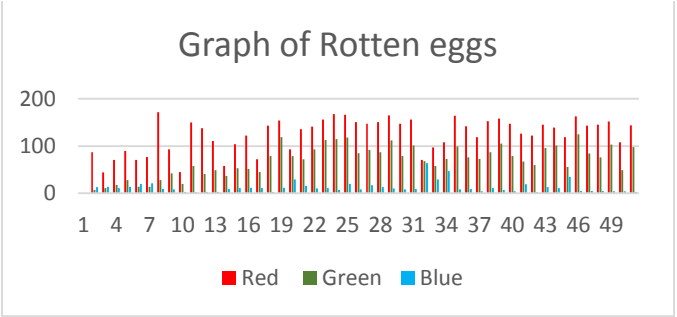

Fig 6.4 Graph of RGB values of rotten eggs

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In the above fig we can see the graph of RGB values of different rotten eggs. The Red component of the rotten egg is always the highest as seen above. Whereas the Blue component is the least. There is no definite pattern in the graph because the rotten egg does not have specific yolk pattern. The yolk inside the egg gets spreaded inside the egg in an irregular fashion and hence we do not get a specific pattern for the rotten egg.

VI. CONCLUSION

In this project, we designed an Android application to distinguish between consumable and non-consumable eggs.We classified the eggs into 4 categories: Fertilized, room temperature, fridge and rotten eggs.The application calculates the RGB values of the input image and compares it with the threshold values stored in the database and outputs it depending upon the categories and day in which the egg lies. Below are the threshold values calculated form the dataset.

	RedMin	RedMax	GreenMin	GreenMax	BlueMin	BlueMax
Day 1	104	183	70	149	2	33
Day 2	99	181	64	142	2	27
Day 3	115	216	54	209	1	61
Day 4	112	211	70	187	2	32
Day 5	106	209	62	184	2	40
Day 6	89	203	59	178	1	29
Day 7	107	205	65	163	1	31
Day 8	113	185	75	160	1	36
Day 9	108	201	47	167	1	20
Day 10	104	184	62	136	1	22
Day 11	106	191	55	141	1	19
Day 12	101	187	58	139	1	21
Day 13	108	185	58	130	1	16
Day 14	108	176	57	132	1	14
Day 15	108	189	60	139	1	14

Fig: 6.1 Threshold values of room temperature eggs

	RedMin	RedMax	GreenMin	GreenMax	BlueMin	BlueMax
Day 1	126	175	11	144	1	23
Day 2	98	215	70	208	1	93
Day 3	116	228	77	225	1	129
Day 4	110	213	64	193	1	47
Day 5	110	204	53	194	1	73
Day 6	102	176	49	143	2	23
Day 7	113	195	65	151	2	19
Day 8	100	186	57	154	2	17
Day 9	100	185	61	141	1	20
Day 10	109	201	49	154	1	21
Day 11	98	211	60	172	2	28
Day 12	104	210	63	166	2	24
Day 13	102	171	63	126	2	17
Day 14	104	178	53	146	1	12
Day 15	108	172	57	138	1	13
Day 16	143	172	61	128	2	20
Day 17	98	110	50	121	2	13
Day 18	104	178	47	123	2	15
Day 19	91	170	34	125	2	24
Day 20	104	178	50	129	2	21

Fig: 6.2 Threshold values of Fridge eggs

	Red Min	Red Max	Green Min	Green Max	Blue Min	Blue Max
Day 1	176	229	37	144	1	7
Day 2	152	210	44	128	1	7
Day 3	147	213	47	147	3	13
Day 4	111	189	18	115	5	15
Day 5	150	203	30	92	2	15
Day 6	130	197	15	89	5	14
Day 7	118	208	18	83	3	18
Day 8	27	194	8	90	4	22
Day 9	29	193	8	96	4	22
Day 10	26	99	7	24	7	32
Day 11	22	98	7	24	7	21
Day 12	21	101	7	23	5	21
Day 13	17	204	6	83	5	37
Day 14	52	197	4	68	5	26
Day 15	37	168	4	32	5	28
Day 16	15	65	8	48	11	47

Fig: 6.3 Threshold values of fertilized eggs

A. *Future Scope*

The image processing technique used in this project to detect the defects in eggs can be further extended by including the edge detection algorithm after applying the RGB color model on the image. Edge detection includes a variety of mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities in one-dimensional signals is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a fundamental tool in image processing, machine vision and computer vision, particularly in the areas of feature detection and feature extraction.

In the ideal case, the result of applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. Thus, applying an edge detection algorithm to an image may significantly reduce the amount of data to be processed and may therefore filter out information that may be regarded as less relevant, while preserving the important structural properties of an image. If the edge detection step is successful, the subsequent task of interpreting the information contents in the original image may therefore be substantially simplified. However, it is not always possible to obtain such ideal edges from real life images of moderate complexity.

Using only the RGB color model in our project may give errors in the output but by extending the project by applying edge detection on the image decreases the error rate as well as improves the probability of correct output, in this case, consumable or non-consumable eggs.

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