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](image-url)
IV. HIERARCHY

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.

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.
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.

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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