

Farm to Plate: Food Quality Analysis

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Abstract— Quality is the key factor today as the emphasis on being physically fit and thus maintaining one's health has bolstered. In this system, we propose to allow the organization to monitor the food items from the time they get loaded into the vehicle responsible for transportation i.e. vehicle tracking with the help of GPS will be provided. Once the products arrive to the destination, their quality will be determined. We aim to determine the quality of food items using image processing. The information about the food items along with the quality will be displayed on the website and also a notification will be sent as soon as the fresh stocks of these food items arrive.

Keyword— Image processing, GPS, k-means, quality detection

I. INTRODUCTION

1.1 Background

Now-a-days quality is the most important factor for agricultural and food products because high quality products are significant for success in today's highly competitive market. In the food industry, the quality evaluation still heavily depends on manual inspection, which is tedious, laborious, and costly, and is easily influenced by physiological factors, inducing subjective and inconsistent evaluation results. The quality of a product especially fruits is often classified by their texture, shape and color. These features are usually observed using human's vision particularly in determining the ripeness of fruits. However, the method of human grading is tedious and may be erroneous. This leads to extensive researches on automated raw food grading using modern technologies such as digital image processing. It is believed that the use of non-contact image sensing technology combined with robust computing and decision processes provides automated, non-destructive and cost-effective method to determine the quality of agricultural and food products.

Image processing is a technique to enhance the input image to provide a clearer data. The digital images are processed and composed of large number of elements called pixel, each pixel represents the image detail. Computer vision system deals with processing of image data with various steps. It provides a clear vision and high reliability in data processing as compared to human vision system for the data analysis. It is defined as the method of automating and integrating a wide range of processes and it performs various typical tasks like image capturing or image acquisition, preprocessing, image segmentation, feature extraction and feature classification

applications range from various tasks like machine vision system, food quality evaluation, and pattern recognition [1].

1.2 Motivation

The detection of the food items is mostly done under human vision system which might provide inaccurate results and is also time consuming. This led with an idea for detecting the quality of food items in improved and efficient way by using modern technology.

Transportation of the food items also comes under the picture for maintaining quality of the food, during transportation the shelf life of the food also reduces and sometimes food gets spoiled by the time it reaches to its destination if any problem occurs in the temperature, humidity, etc. of the environment. Tracking of the food transportation will give advantage to the organization as it provides the information about goods delivered properly and safely to their destination. This system integrates the process of both food quality analysis and vehicle tracking system. It gives altogether a new way to food industry for maintaining quality and satisfy customer.

1.3 Objectives and Goals

1. *To improve the food analysis technique in efficient way:* The result obtained by analysing food using digital image processing is more accurate and cost effective as it can be automatically extracted and analysed from an observed image.

2. *To reduce the manual efforts:* This provides fully automated system which reduces the manual effort for quality analysis.

3. *To analyse the quality without touching and cutting the food items:* The system takes the image of the food item and then process for quality classification.

4. *To track the food transportation truck or vehicle:* This system tracks the food truck which is highly used to ensure that the goods had reached to its destination and also helps to maintain the shelf life of the food items which is sent, this gives the overall information to the organization about the transportation.

5. *Provide the customer with the good quality of food items and satisfy them:* Provides the quality food items which make them healthy and thereby satisfying the expectations on the quality of food products.

1.4 Customers and Users

The Customers of Farm to Plate: Food Quality Analysis, are as follows:

1. The retailers which orders the food items
2. The organization which process and send the food items in the market.

1.5 Problem Statement

Many problems of food quality and safety have occurred in recent years. The quality analysis of the food items has thus become increasingly important. The system tries to provide the customer with highly improved and good quality of food using the modern technology of image processing and also the GPS technology for tracking food transportation. This would provide an improved way for quality analysis reducing manual efforts and error.

1.6 Scope

- Replacing the manual effort of analyzing the quality of the food items in new and improved way.
- Tracking the vehicle loaded with the food items for transportation using GPS tracking.
- Provide notifications about the quality of the items available.
- Customer satisfaction for the quality of food they are getting.

II. PROPOSED SYSTEM

The Farm to Plate: Food Quality Analysis tries to use the modern technology of image processing and the image analysis technique to discriminate the quality of food classes and varieties. The size distribution and shape analysis is required in several areas. The properties of such food items are important for variations in the size, color and shape that can result in significant change in their value.

The ability to identify the fruits based on quality in the food industry is the most important technology It would aid in monitoring the food item from the time it gets loaded into the vehicle for transportation till it reaches the destination. The quality can then be determined after capturing the image of food items and making it go through a series of steps for quality detection. Once the quality is determined, it is uploaded on the website to notify the users. The implementation of the above system is explained in detail below.

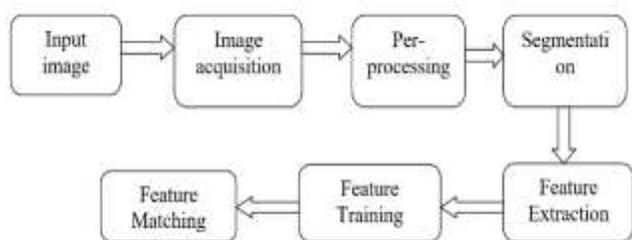


Figure1. Block diagram of phases of image processing

A. Image Acquisition

An image is analyzed as it is clicked. Here the input image got is an RGB image. [2]

B. Pre-Processing

Basically the images which are obtained during image acquisition may not be directly suitable for identification and classification purposes because of some factors, such as noise, weather conditions, and poor resolution of an images and unwanted background etc. The steps involved in pre-processing are:

1) RGB Image

RGB is one of the formats of color images. Here the input image is represented with three matrices of sizes regarding the image format. The three matrices in each image corresponds to the colors red, green and blue and also says that of how much of each of these colors a certain pixel should use.

2) Background Subtraction

Background subtraction is a process of extracting foreground objects in a particular scene of an image. A foreground object is defined as an object of attention which helps in reducing the amount of data to be processed.

3) Gray Image

Gray scale images have one color which is a shade of gray in various ranges in between. Monochrome image is another name of gray image. This denotes the presence of only one (mono) color (chrome). To convert any color image to a gray scale representation of its luminance, we must obtain the values of its red, green, and blue (RGB) primaries in linear intensity encoding, by gamma expansion.

4) Binary Image

A Binary Image is a digital image which has two assigned pixel values. Typically the two colors used for a binary image are black and white. The gray image of Fruits is converted to binary image this means that each pixel is stored as a single bit (0 or 1). Binary images used in digital image processing as masks or as the result of some frequent operations such as segmentation, thresholding, and dithering.

5) Filtering

The purpose of filtering is to smooth the image. This is done to reduce noise and improve the visual quality of the image. Often, smoothing is referred to as filtering. Here filtering is carried out by median filter since it is very useful in detecting edges.

Median Filter

The best known order-statistics filter is the median filter, which replaces the value of a pixel by the median of the gray

levels in the neighborhood of that pixel The original value of the pixel is included in the computation of the median. Median filters are quite popular because, for certain types of random noise they provide excellent noise reduction capabilities, with considerably less blurring than linear smoothing filters of similar size. The median value is not affected by the actual value of the noise cells. The Median filter is particularly good at removing isolated random noise.

C. Segmentation

The purpose of image segmentation is to divide an image into meaningful regions with respect to a particular application. The segmentation is based on measurements taken from the image, may be grey level, color, texture, depth or motion. Here edge-based segmentation is properly suitable .As edge detection is a fundamental step in image processing, it is necessary to point out the true edges to get the best results from the matching process.

D. Feature Extraction

Feature extraction is defined as grouping the input data objects into a set of features. The features extracted carefully will help to extract the relevant information from the input data in order to perform the feature matching. Using this we can reduce the representation input size instead of the full size input. Here clustering process has been used to extract features form good and bad fruits. [5]

E. Feature Matching

Feature matching methods essentially consist of identifying features in images that can be matched with corresponding features in the other images from which a transformation model can be estimated. Feature matching is an important task in the area of image processing. Here correlation method is used for feature matching. Here the clustered values of good and bad fruits are taken more in number. With the extracted features each value are correlated with one another and we get a specific value for good and bad fruit. With these values we can identify good and bad fruits.

III. SYSTEM DESIGN

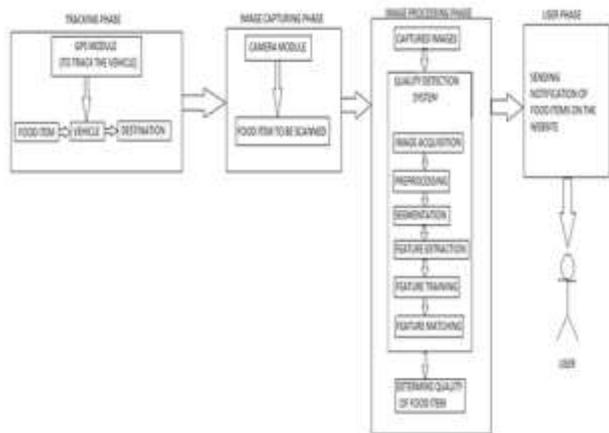


Figure 2. Architecture diagram of the system

IV. RESULTS

Farm to Plate for the detection of food quality is designed to ensure quality of the food delivered to the consumers, and improve their health. It is able to detect spoilage of common household items like fruits, meats, bread and other food items. The display system approximately displays the quality level of the food, enable consumers to be well aware of the quality of food. This design is simple, effective, feasible and cost effective.

V. CONCLUSION

The accuracy of the quality for the food items can effectively be done by using the image processing techniques. With this software we can calculate the accuracy and classify accordingly. This is also more accurate than the human visual inspection. All this leads to better quality in food analyzing by image processing.

REFERENCES

- [1]. Jagdeep Singh Aulakh, V. K. Banga. Percentage Purity of Rice Samples by Image Processing. International Conference on Trends in Electrical, Electronics and Power Engineering (ICTEEP'2012).
- [2]. The quality identification of fruits in image processing using MATLAB- Alok Mishra, Pallavi Asthana, Pooja Khanna- June 2014.
- [3]. Automation of food processing: FOOD ENGINEERING – Vol. IV -Automation of Food Processing - Gunasekaran, S. Department of Biological Systems Engineering, University of Wisconsin-Madison, USA.
- [4]. Samir Dani:”Food Supply Chain Management And Logistics”.
- [5]. Shelf-Life Estimation of Perishable Fruits in Cold Storage using Image Processing Techniques: Volume 5, Issue 4, April 2015 : 2277 128X International Journal of Advanced Research in Computer Science and Software Engineering.