

FOOD(FRUIT) QUALITY RECOGNITION BY EXTERNAL APPEARANCE AND INTERNAL FLAVOR FACTORS

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Abstract: In recent years, automatic visual inspection technology has become more potential and important to fruit grading applications. This is due to that the quality of fruits are the important factor for the consumer and so essential for marketing a uniform high quality products. The automated fruits grading technique have been set up to reduce the production costs and improve fruit quality and replace the manual technique for grading of fruits as manual inspection is facing problems in maintaining consistency and uniformity. The fruit which has been inspected in this project is Orange. A prototype of an automated fruit grading system is designed and developed in this paper to detect the defects on of the surface of fruits. The system is capturing the fruit's image using camera and the fruits are placed onto of a rotating desk. The image is transmitted then to the processing level where the grading is done using MATLAB. The quality of the fruits is important for the consumers and become the requirement from the suppliers to provide fruits with high standards quality .So, in the past few years, fruit grading system have established to fulfill the need s of the Fruit processing industry inspection .Besides that, the process of fruits involves several steps that can generally be classified into grading, sorting, packaging, transporting and storage. The grading are considered as the most important steps towards the high standard of quality. Fruits are almost graded The fruit grading by visual inspection suffers from the problem of inconsistency in judgment by different persons. There is a need for an automatic fruit classification machine replacing the expensive human labour with a smart fruit quality classification system. This study proposed a practical real- time smart fruits quality grading system classifying by appearance and internal flavour factors in order to decrease human labour cost in fruit industry. The proposed system applies colour image processing techniques for the computation of the fruits appearance features and the gas sensor analysis methods for the estimation of internal flavour factors. This study also suggests an artificial neural network model in order to be able to classify fruit grading

Keywords: MATLAB SOFTWARE, GAS SENSOR, FRUIT QAULITY PARAMETER TEST,FRUIT GRADING SYSTEM, INTERNAL AND EXTERNAL FLAVOR.

1. INTRODUCAATION:

The quality of the fruits is important for the consumers and become the requirement from the suppliers to provide fruits with high standards quality. So, in the past few years, fruit grading systems have established to fulfil the needs of the fruit processing industry inspection. Besides that, the process of fruits involves several steps that can generally be classified into grading, sorting, packaging, transporting and storage. The grading are considered as the most important steps towards the high standard of quality.

Fruits are almost graded manually which is an expensive and time consuming process and labors shortage will affect to the operation during peak seasons. It has become increasingly difficult to hire or train the person who are willing to handle the monotonous task of inspection. In the meanwhile, a cost effective and accurate grading can be performed with automated grading system. Generally, the fruits quality depends on outer parameters (size, color intensity, shape, surface appearances) and inner parameters (sugar contents, acid contents) but color and size is the most important factor for grading and sorting of fruits. Nowadays, the fruit grading system is accomplished based on weight, color and size which are accessible in all fruit processing industries.

The fruit grading system techniques using computer machine vision and image processing play the important role of quality control in fruit processing industries. From the past few years, different techniques have been enhanced to grade and evaluate the quality of fruits. These methods can help to detect different physical properties of fruits and with certain quality factors. For example, the vision-based systems include CCD or CMOS sensors that are used to estimate the size and shape of fruits. It helps to predict the size of the fruits from its RGB image frame with the help of CCD camera. Software plays an important role in this color classification system. The software system is almost designed in MATLAB to detect the color and size of the fruits. Color is very important in the sorting of fruits but due to the similarity of colors between some fruits, the size also helps in solving the problems.

2. GAP IDENTIFICATION

Food quality management system that is additionally higher traditional content to the individuals that has been survived the parameter analysis . Everywhere across the

globe some management of food is basic need in day to day life. Food quality grade is additionally very important as a result of the standard of food is decided and price is more practical to the current food mistreatment food grade. This additional advanced work that's simply born-again. This system proposes a practical real-time smart fruits quality grading system classifying by appearance and internal flavour factors in order to decrease human labour cost in fruit industry. The proposed system in this paper applies colour image processing techniques for the computation of the fruit appearance features and the gas sensor analysis methods for the estimation of internal flavour factors. We designed and tested the proposed smart fruit quality grading system performance with Apple. It computes length of the long and short axis, volume of a apple and discovers the defects or bruise, and crack of a fruit from the external shape image. It also estimates values of its internal quality factors using the gas sensor analysis methods. This study also suggests an artificial neural network model in order to be able to classify fruit grading. Main hardware components of the proposed smart fruit quality grading system are mechanical part such as rotating desk that act as a place for inspection; electrical parts such as DC motor, Arduino, gas sensor, a color CCD camera and a LCD display .The software components of the proposed system are an external appearance measurer, defects detector, appearance classifier, internal flavour measurer, the final grading classifier. The proposed real-time smart fruit quality grading system is expected to be useful for the quality evaluation of the fruits in many aspects and farmers gives ability to classify mass fruits in real time. Adaptation of the system to the modern fruit farms where limited human labours are available may improve the efficiency of the production and lower the production costs by eliminating the labour-intensive process of manual fruit sorting.

The maturity of fruits is defined as following parameters

- a. Colour: Verities of fruits having different color. It measures fruit in various classes that is dark, medium, light green color of fruits.
- b. Size: It measures diameter, size by (x,y) coordinators. Fruits size is determined by maximum diameter of fruits. It will be measured as center of the origin.
- c. Shape: It will be measured for aspect ratio, roundness of the fruit.
- d. Data: Some fruit images have been collected for fruits quality System. These fruit images will be classified into high quality, medium quality and low quality of fruit. Fruit images are required to be sent in and processed by the system when develop

the classification algorithm for the fruits quality system. RGB Values for every fruits pixel computed by using mean function provided.

3. PROBLEM STATEMENT:-

- 1) The proposed system applied colour image processing techniques for the computation of the fruits shape features and the gas sensor analysis methods for the estimation of internal flavour factors. The proposed system computed and estimated automatically external appearance of a fruit as well as internal flavour factors. This study suggested an artificial neural network model in order to be able to classify fruit grading.
- 2) The proposed ANN model in this study was trained for inputs as well as outputs to adjust weights for the apple quality grade classification. From exploitation this survey food quality parameter check is additionally vital that higher food of uptake in standard of living.so higher quality of food which may be analysis is best ways in which, therefore artificial intelligence and automation technology is additional. This will appropriate to analysis the food content. therefore this is often main task of our system

4. SCOPE:-

Food quality management system that is additionally higher traditional content to the individuals that has been survived the parameter analysis some massive task additionally favour this method. Everywhere across the globe some management of food is basic day to day life activity which always required to attain the target and maintain the food style. In several business of food which may strictly checked the standard of food grading currently some work has finished.. Indian government additionally provides this method to food business .My basic survey apply to the food quality presentation and maximum level of accuracy of food grading which is vital in food industry management system.

5. BASED ON PROBLEM STATEMENT:-

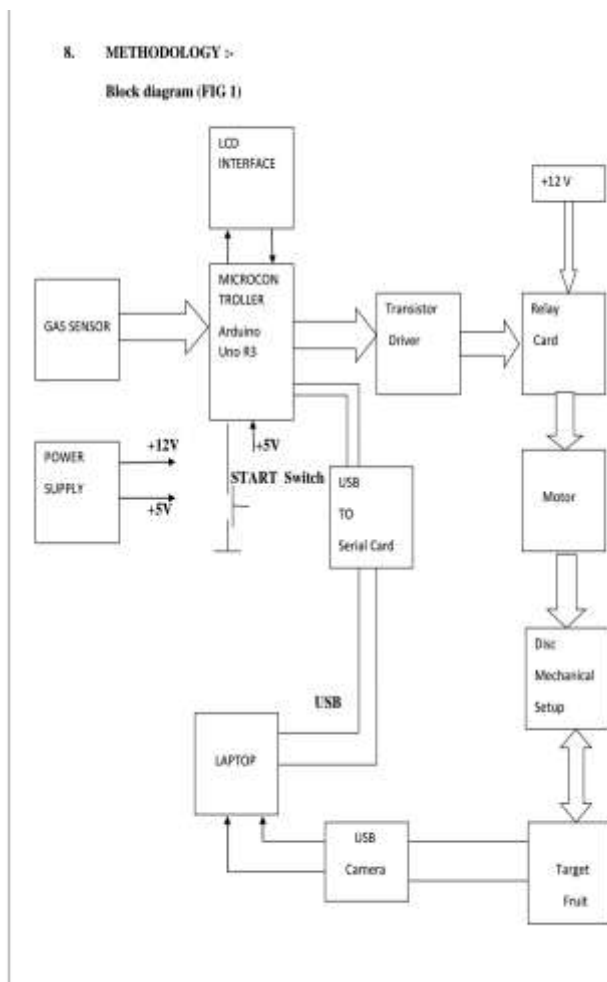
The proposed real-time smart fruit quality grading system is expected to be useful for the quality evaluation of the fruits in many orchards and farms given its ability to classify mass fruits in real time. Adaptation of the system to the modern fruit farms where limited human labours are available may improve the efficiency of the production and lower the production costs by eliminating the labour-intensive process of manual fruit sorting. Main hardware components of the proposed smart fruit quality grading system are composed of mechanical part such as rotating desk that act as a place for inspection; electrical parts such as DC motor, Arduino, LCD display computer software such as image processing in MATLAB. The software components of the proposed system are an external

appearance measurer, defects detector, appearance classifier, internal flavor measurer, the final grading classifier, measured data analysis and LCD display interface. From exploitation this survey food quality parameter check is additionally vital that higher food of uptake in standard of living, so higher quality of food which may be analysis is best ways in which, therefore artificial intelligence and automation technology is additionally appropriate to analysis the food content.

6. OBJECTIVE :-

- 1) Time and energy saving of grade
- 2) Increase reliable ness Compared to manual testing.
- 3) Higher Accuracy than manual Sorting

7. METHODOLOGY



8. Working of block diagram:-

MECHINICAL DISC SETUP :- firstly the fruit is brought manually to the rotating desk which is connected to the shaft of the 12V dc motor .the dc motor is then set by the Arduino to rotate the shaft of 12V dc motor.in order to able to detect the defect surface of fruit.

USB CAMERA DEVICE :-A USB camera is a compact digital camera we can hook up to broadcast video images in real time (as they happen). Just like a digital camera, it captures light through a small lens at the front using a tiny grid of microscopic light-detectors built into an image-sensing microchip (either a **charge-coupled device (CCD)**).

GAS SENSOR: -As detectors measure a specified **gas** concentration, the **sensor** response serves as the reference point or scale. ... Electrochemical **sensors** or cells are most commonly used in the detection of toxic **gases** like carbon monoxide, chlorine and nitrogen oxides. They Function via Electrodes Signals when a gas is detected.

ARDUINO CONTROLLER :-The advanced controllers which send the information from the digital display interface of laptop screen to LCD and message show on the screen.

USB TO SERICAL CARD:- USB to serial adapters are cables that convert the data sent by a serial-enabled device for use by a USB port. The serial end has a DB9 connector, which plugs into the serial device. The USB connector plugs into the computer's USB port or a connected USB.

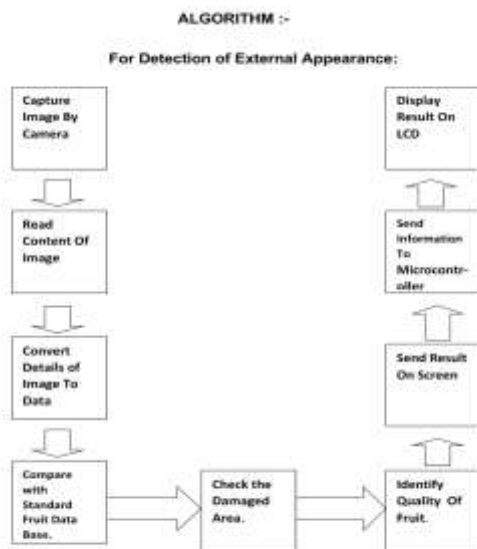
TRASISTOR DRIVER: It is generally used as current amplifying device The input is usually from low current source such as logic gate or sensor it usually drives higher current devices such as bulbs and motors.

RELAY CARD:-It works on the **principle** of an electromagnetic attraction. When the circuit of the **relay** senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the **relay** armature for opening or closing the connections. Thus relays are switches that open or close circuit by opening and closing contacts in another circuit.

MOTOR :A DC motor is an electrical machine which **converts electrical energy into mechanical energy**. The working of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force.

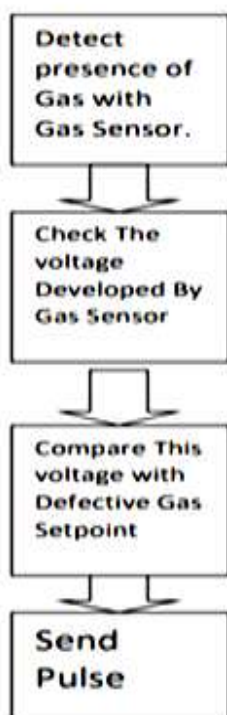
LCD INTERFACE:-It is commonly used to display data of many electronic devices .LCD screen conjointly show the output on the screen as a result of food quality analysis based on result of comparison of different quality fruit.

9. FLOW CHART FOR EXTERNAL APPEARANCE



ALGORITHM

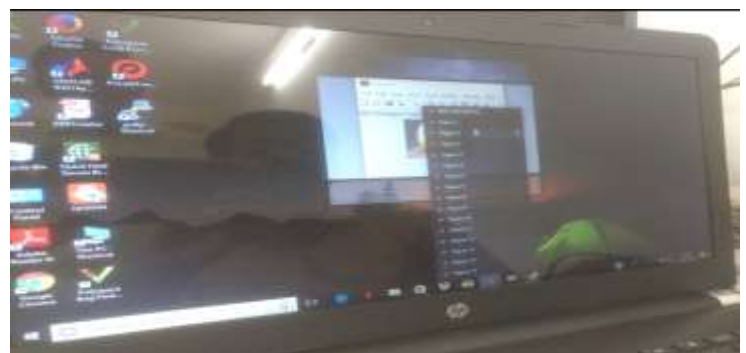
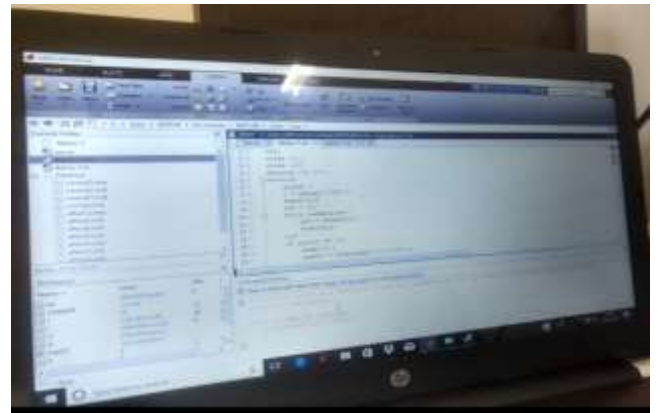
For Detection of Internal Flavour:



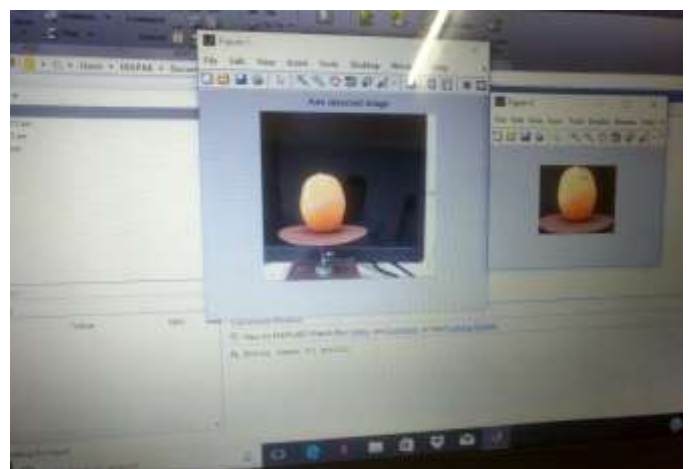
10. RESULT

Determination of Fruit Quality by External Appearance.

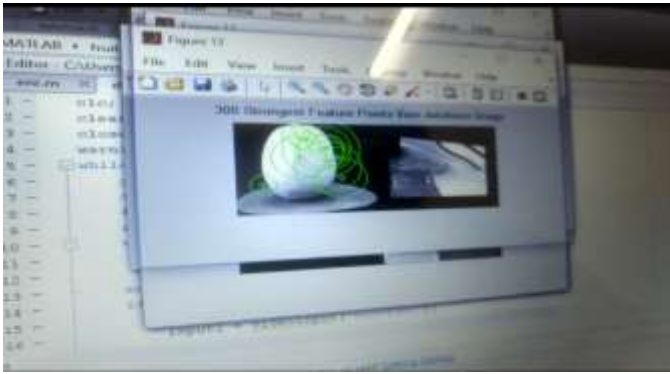
A. In first step database is created for normal and affected fruit. This is shown in following fig.



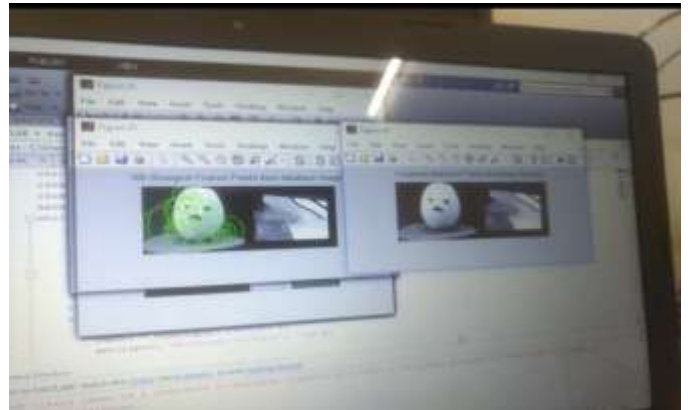
B. Testing of Normal Fruit.



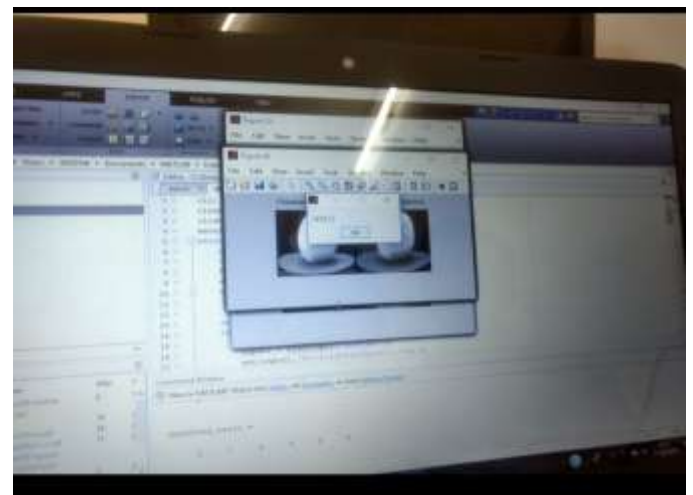
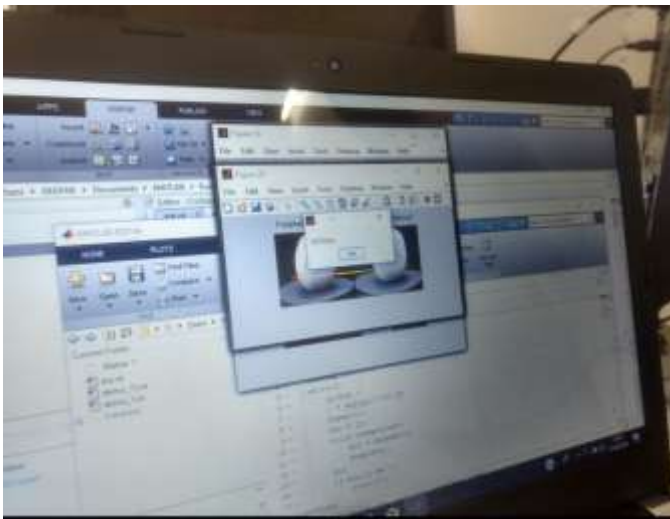
GUI for Orange without defect.



B. OUTPUT IMAGE



GUI for Orange with defect



As shown in above fig. if fruit is normal based on result of comparison of captured real time image and recorded database result will be displayed as Normal.

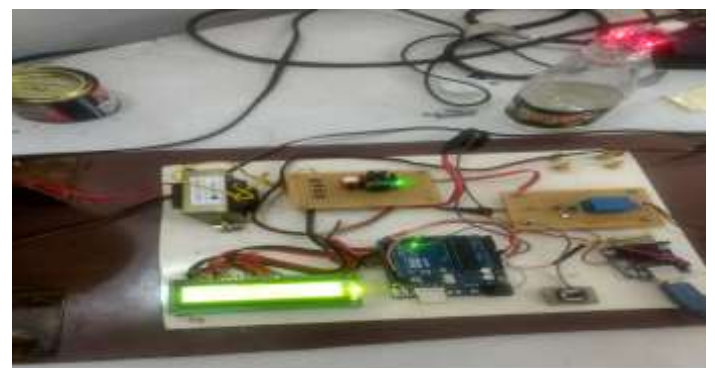
C. Testing of Affect Fruit



Fig. shows the black patches occurred in the first half side of orange however there is no black patch at the second half side of orange. By result, there are defects on the first half side but no defect on the second half side of orange. As shown in above figures the captured real time image of affect fruit will be compared with database of affect fruit and result will be displayed as Affect.

Determination of Fruit Quality by Internal Flavour Factor with the use of GAS Sensor.

The setup for this testing is as shown in following fig.





As shown in above fig.as soon as Rotten Fruit detected result will be displayed as ROTTEN FRUIT.

11. CONCLUSION:-

An automatic fruit quality recognition system has been developed. This system consists of mechanical part such as rotating desk that act as a place for inspection; electrical parts such as DC motor, Arduino, computer and software such as image processing in MATLAB. This automatic system has been designed to meet the demands in determination of quality of fruits compared to manual fruit quality determination. The quality of the fruits is based on the external quality factor based on surface defect and decay. This automatic inspection system has saved time, effort and better accuracy than manual sorting. This system starts with a DC motor that is programmed by Arduino to rotate for determination of different sides of fruit. The other parameters such as size, shape should also be included in this project in future research. These parameters will play valuable role for quality analysis process. In addition, since there will have same kind of fruits with same color such as tomato and apple, so, there will be having some misclassification. Hence one feature can be added also namely texture while classifying such kinds of fruits the manual fruit quality system by visual inspection suffered from the problem of inconsistency in judgment by different persons. We need for an automatic fruit classification machine replacing the expensive human labour with a smart fruit quality classification system. This study proposed a practical real-time smart fruits quality grading system classifying by appearance and internal flavour factors in order to decrease human labor cost in fruit industry. The proposed system applied colour image processing techniques for the computation of the fruits shape features and the gas sensor analysis methods for the estimation of internal flavour factors. If the proposed system is commercialized, it will improve the efficiency of the production and decrease the production cost by eliminating the labour-intensive process of manual fruit sorting.

12. FUTURE SCOPE



A manufactured proto type Fruit grading system

This study suggested an artificial neural network model in order to be able to classify fruit grading. This quality grading of fruit also completed in future using IOT based system and artificial neural network method as well as using NIR Spectroscopy to achieve higher accuracy rate

3. ACTUAL PROJECT SETUP

FOOD QUALITY RECOGNITION SYSTEM SET



Acknowledgement

We have completed our project based on used references and our knowledge and with the support of our guide prof DR M.SANKAR and our institute AMGOI VATHAR Kolhapur .we have proposed this system for determination of fruit quality analysis and to protect food from adulteration.

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