A Study on IoT based system to test ripening of fruits

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Abstract:

In ancient days or even today the parameter to find out the ripening of fruit is its color, which is the basic physical parameter. In agricultural field the students use a table or a kind of sheets of paper to identify the color of fruits. But it is a manual work and it has chances of getting wrong answers depending on the user’s view. Generally we check for one fruit in lab and then we pluck them in the field manually, by using our hands. In this paper, we reviewed different articles related to ripeness of fruits and various technologies used to check the ripening of fruits. The findings and the conclusions of the study, examining the use and effect of conclusion are incorporated as literature review.

Keywords: Agriculture, IoT, Ripeness, Physical Appearance of fruit.

1. Introduction:

Ripening is the process by which fruits achieve their flavor, color, quality and other textual properties. The process of ripening of fruits is directly related to the change in the biochemical composition of the fruits that is, conversion of starch into sugar. The ripened fruit can be judged by its color, firmness, and biochemical properties like total soluble solids, vitamin C, and Acidity or Total sugars.

We have two different kinds of fruits available in the market. First, Climacteric fruit and non-climacteric fruit. Climacteric fruits continue to ripen even after they get harvested while non-climacteric fruits do not ripen after it get harvested.

Currently ripening of fruits is tested with the help of its color by a manual collection of color code known as Horticulture color code, by the firmness of the fruit with the help of a penetrometer that is also a manual process. Ripened fruits can also be tested with the help of some bio-chemical test like testing TSS (Total Soluble solids), Vitamin C, Acidity and Total Sugars.

2. Literature Review

[1] Iqbal et.al, 2018, proposed an image processing approach in automated system to detect the diseases in citrus fruits like lemon, oranges etc. He carried out a survey to find detailed taxonomy of citrus fruit and leaf diseases. He studied different image processing, feature extraction and classification methods to find out the diseases in fruits.

[2] Liu et.al, 2018, focussed on the color space of the fruit mainly pomelo fruits. He is talking about the ripened fruit and it harvest by robots. In his proposed solution he is converting the RGB images in CbCr space. The method he proposed is better approach in finding the mature fruit from the field. This method is mainly used with precision agriculture.
3] **Reddy et.al, 2018**, focused on image indexing and retrieval. He suggested that the color images can be used for the purpose of image indexing and retrieval. He used LEPCI (Local edge patterns for color images) for retrieval and indexing of images. He is converting the RGB and LEPCI codes to OR operation between the middle pixel of the each coloration plane.

4] **Joseph et.al, 2018**, worked on the image extraction. He mainly focused on extraction the image with clear background and then show it to the retailers so that they can sell their product in a more precise manner. As per author most of the product images are present with diverse background and it is a challenge to separate the foreground and background and then enhance the image. The author used the Computer vision and machine learning to carry out the research process.

5] **Jackson et.al, 2018**, focused on the combination of image processing and other techniques to find out the yellow flag Iris in plants it is used with aerial techniques like drone to find out images or to take images of plants. The author focused on the technique of image processing and this image processing helps in preparing images for classification and to find the colour it is also used for colour thresholding and helps in random forest classifier.

6] **Beniwal et.al, 2018**, is talking about the fruit quality of Apple basically how apple can be stored at the room temperature so that it not get spoiled. The author is using gas sensors to find the quality of the fruit. The author is using a rotten apple and monitor it by detecting it with the help of ethylene and NiSnO2 sensor. It is a simple sensor that is prepared with the help of SOL gel spin coating. Finally the author concluded that the new technique introduced can be used to detect the fruit quality at room temperature with the proper use of sensors.

7] **Agarwal et.al, 2018**, The proposed technique depends on nondestructive methodology. In which, apple pictures are first preprocessed with the goal that undesirable noise would be expelled. For division, different strategies are there like Otsu, wavelet-based multivariate measurable yet k-means clustering is utilized to identify the imperfect segment of the apple organic product since it is best perfect with the database and the classifier. The cluster determination was done after the division.

8] **Carolan and M, 2018**, focused on the use of Big Data in retail sector, He critically examined the fact that how retail firms utilize Big Data. He critically examined the techniques and technologies that exists in the food world. He focused on two sets of Data (1) interviews with personnel who work in this field. He interviewed twenty-one individuals who helped in real setting of data. (2) different consumer groups who regular purchase goods from food chains.

9] **Kurniasih et.al, 2018**, shows the potential claimed by the Bulurejo town in the field of Agriculture and Livestock field. The authors directed an examination to decide the results of potential Bulurejo town dependent on criteria, for example, potential in the field of horticulture, field of huge steers and little domesticated animals and poultry utilizing fluffy rationale strategy. So from the aftereffects of these investigations there are consequences of the estimation of 74.29 which is incorporated into the capability of a decent town. The utilization of fluffy rationale technique in deciding the potential estimation of the village as per the criteria has been effectively settled, with the goal that the fluffy
rationale strategy is appropriate for the computation of the indexed lists from the capability of Bulurejo town.

[10] **Ge et.al, 2018**, accordingly lead an overview on Big Data advances in various IoT spaces to encourage and invigorate learning sharing over the IoT areas. In light of author’s survey, this paper talks about the similitudes and contrasts among Big Data advances utilized in various IoT areas, proposes how certain Big Data innovation utilized in one IoT space can be re-utilized in another IoT space, and builds up a theoretical system to layout the basic Big Data advances over all the evaluated IoT areas.

[11] **Liu X. et.al, 2019**, focussed on color of apples and suggested that the color of apple cannot define the ripeness of fruit because most of the mature apples are not completely red. He tried to find out the ripeness by shape features of the apple. The author proposed a method to detect the color and shape features of a certain kind of apple that are not completely red. The author used the technique known as SLIC(Simple Linear Iterative Clustering) to segment images taken into super pixel blocks. After extracting the image the author transferred the image to the histogram gradient oriented where he analyses the shape of the fruit.

[12] **Putra et.al, 2019**, talked about the sortation of ripened fruit and unripen fruit. The author is suggesting that a sortation tool will help farmers to detect the ripened and unripened fruit and help them to sort them easily. This process will speed up the sortation process. He proposed the fruit sorting tool that will help the fruit farmers on the basis of the fruit size. He also analysed that ripened fruit are more prone to damage than unripen fruit because unripen fruit is hard.

[13] **Alaya M et.al, 2019**, presents the method of sorting the food products with the help of color sensor. He used a color sensor namely TCS3200 which helps in analyses if the product on the basis of its color. This sensor not only analyses the color but it will help in sorting the product with the help of servo and stepper motors. The system proposed here will be controlled by a simple card computer. It works with the frequency of the wavelength obtained by the reflection and provides the information to the processing logic which is used to translate the #D RGB cube data.

[14] **Fahad et.al, 2019**, focussed on the sensor to detect the full fruitness of Palm fruit. The author is proposing an automated system to detect the full fruitness of the Oil palm. The new proposed model will remove the drawbacks of the conventional model. A sensor is used with the palm to detect its ripeness. The author tested the system successfully on seeds of Oil Palm with different degrees of maturity.

[15] **Mangla et.al, 2019**, proposed an automated system to detect the disease on the leaf by the process of machine learning and image processing. This system will detect and diagnose the whole plant and give the result in the form of disease from which plant is suffering from. This tool will also help in increasing the produce. The author used binary image feature extraction technique to analyse the disease.

[16] **Baru et.al, 2019**, is presenting a study and which a simple method is introduced to test the sulfite bleach in a test kit. Colorimetric technique is used to change the colour it is used to measure the
change of colour, The colour matrix sensors are very easy to use, it is a very simple method to measure and no complicated tools are used, It is a low cost analysis and can be widely applied with fruits for the crops.

[17] **Singh et.al, 2019**, Presented this study to evaluate the phytochemical constituents high performance liquid chromatography (HPLC) and antioxidant activity with the analysis of glycoside components in apple fruit and avocado fruit. The author concluded that the apple and avocado fruit have the glycoside component Apple has higher glycoside component while avocado has least glycoside component.

[18] **Liu et.al, 2019**, proposed a new algorithm for automatic detection of riped tomato using its colour. This technique will reduce the influence of illumination colour similarity and the effect of occlusion. In this method a support vector machine with histogram of oriented gradients was used to detect tomatoes, a colour analysis and false positive removal technique is also used to analyse the tomato colour. The author also said that this algorithm displayed a fruitful improvement in detection of tomato.

[19] **Lin et.al, 2019**, proposed a framework to detect the cylindrical and spherical fruits by the robots automatically. He used segmentation method to segment the fruit into red, green and blue color as binary mask. He used a 3D shape detection method to detect the fruit. He concluded that the proposed framework is robust and can be directly used in field.

[20] **Bai et.al, 2019**, investigated the natural molecular structure for the firmness and ripeness of fruit. relative transcriptome examination was utilized to create transcriptome profiles of two ordinary wild varieties of Fragaria pentaphylla at three organic product formative stages (green organic product arrange, turning stage, and ready organic product organize). Time course examination identified countless differentially communicated protein-coding qualities and IncRNAs related with natural product advancement and aging in both of the F. pentaphylla varieties.

3. **Discussions and Conclusion**

What if, ripening can be detected with the help of a device or an automated system? The task will become easy and the fundamental thing behind it is that it must be cost effective. The manual way to find the ripening of fruit is to focus on the color of the fruit but in our case we are using other biochemical parameters, like, Total soluble solids (TSS), Acidity, Vitamin C and Total sugar content. One of the physical parameter that we are using is firmness present in the fruit. The paper reveals a picture that there are a lot of technologies present to test the ripening of fruit. But the outer appearance of fruit must not be the only parameter to test the ripening of fruit. We must focus on biochemical parameters to test the ripening.

**References:**


