Real-Time Surveillance for Identification of Fruits Ripening Stages and Vegetables Maturation Stages with Infection Detection

Methodology

The combined method of mixing the texture and color features is used. It begins with recognition of fruits with different colors. To identify the images and remove the background edge detection is used.

Pros

Pros of the system are:

- Pre & post-harvest cost is less,
- Farmers will get more profit,
- Reduction in manpower,
- Post-harvest quality of the fruits and vegetables will be increased,
- Agriculture growth in the country would be developed.

Drawback

The drawback in the earlier system was:

- In Banana identification, if it has black sparks, it will be considered as infected,
- Can't identify every breed of fruits and vegetables,
- Proper Network coverage is needed to get the output messages.

System Design

- The synchronous messages are between Robot and computer.
- The asynchronous messages are between computer, ARDUINO, and Farmer.
- The Reflexive messages are there only on the computer.

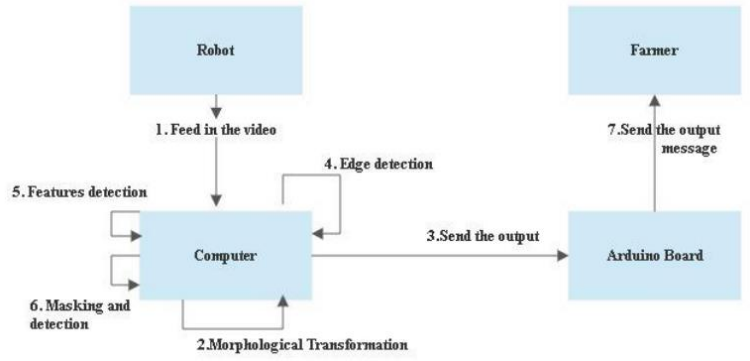

Figure 1: System Design in Communication

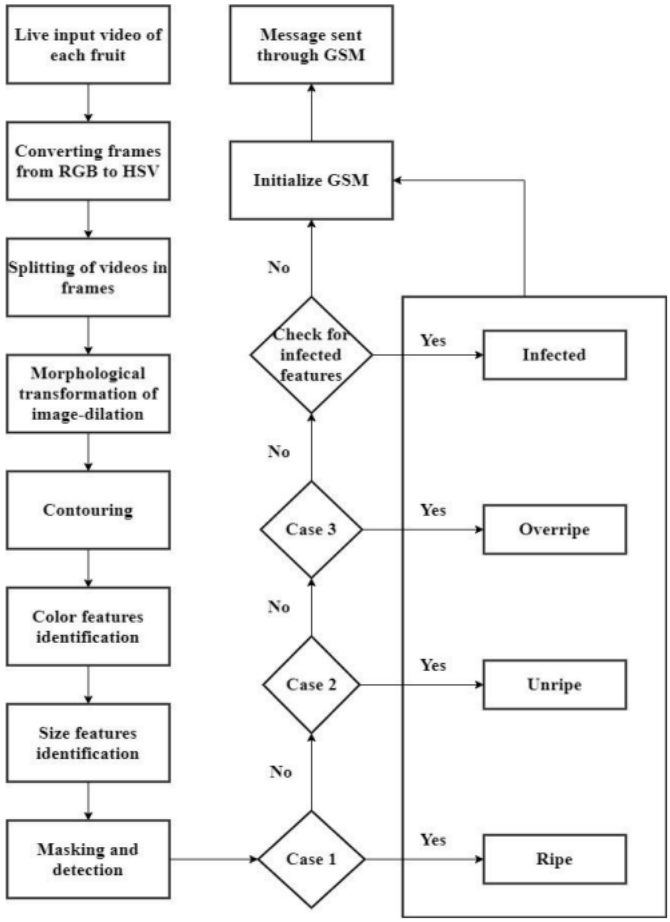

Figure 2: Proposed System Architecture

Equation

Step 1: Working of Surveillance System

Step 2: Morphological Transformation

$$dst(x,y) = max_{(x',\ y'):\ element(x',y') \neq 0}\ src(x+x',y+y') \quad (1)$$

Step 3. Contouring and Features Detection

$$m_i^A = sign\left(h_i^A\right).\log h_i^A \quad (2)$$

$$m_i^B = sign\left(h_i^B\right).\log h_i^B \quad (3)$$

Step 4. Masking and Detection

$$g(i,j) = \sum_{k=-n/2}^{n/2}\sum_{l=-n/2}^{n/2} h(k,l)f(i-k,j-l) \quad (4)$$

Step 5. GSM Initialization and Message Communication

Component Used

- ARDUINO
- HSV color Algorithm

- OpenCV library in Python
- Wireless Internet Network

Findings

- Comparing processing time of various methods, we get to know our proposed idea processing time is 1.57 seconds.
- Comparing various researcher algorithms get to know that the proposed work takes only 350 MBS. So, we may conclude the proposed work uses minimal amount of memory.

Novelty

Initially, the algorithm which was proposed can be made better to layout a robotic crop health surveillance in the near future. [1]
The future scope is for the development of this method for other fruits rather than lemon. [2]
The accuracy achieved at gross is greater than 95% and the proffred algorithm could process three images with resolution (640×480pixels) per second. [3]
This process is done by image classification method based on CNN- Convolution Neural Network. The dataset in this method contains three types of classes. The accuracy of the classification increased by using three features, a RGB color, histogram and a centroid obtained from K-means clustering. The accuracy achieved is 95 percent. [4]
In reference to the above discussions, the proposed system is better than the conventional method of counting, which is manual.

Analysis

The overall accuracy of the proposed method for three classes of fruits and vegetables is 96 percent. The time taken for processing per frame is 1.1s, which is the quickest when compared to the other methods. The memory taken is 300 mbs which is least used when compared to the other methods.

Problem Faced

In the method main challenge arises when we have to count fruits when it is not fully ripe.

Future Work

The future work for this project is the automation of robots. Intelligent robots which are capable to be laborers and pluck the fruits as ordered by farmers. These robots will automize the farming process. The identification ripening stages for vegetables and fruits can be found as planned in scope. The Infected fruits diseases should be included. Top ten diseases of all fruits and vegetables can be included and improved. The stages of crops also can be included based on requirements. This project can be implemented for other breeds of vegetables and fruits as this specifically done south Indian breeds of fruits and vegetable.

References

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