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ADVANCEMENTS IN TOMATO HAVESTING: A GLOBAL PERSPECTIVE

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ABSTRACT

Tomato sorting is one of the key elements to implement in order to improve tomato quality. At the moment, many sorting systems are done by hand, which can be time-consuming and problematic. By classifying tomato anecdotage using a Convolutional Neural Network (CNN) system, one sorting scheme may be imposed. The classification of tomato anecdotes based just on their color is the ultimate goal of this investigation. Three color positions are distinguished: green for raw tomatoes, turning for half-ripe tomatoes, and red for ripe tomatoes. In order to conduct this investigation, the following research methods were used: CNN model, training data, data pre-processing, and image preservation. 1148 photos were utilized in this investigation. The photographs were captured manually in an outdoor setting using a smartphone camera. CNN model was constructed using these photos. The investigation's findings demonstrate that ten tomato photos were tested, yielding raw tomatoes that scored nearly 90, ripe tomatoes that scored nearly 90, and half-ripe tomatoes that scored slightly under 80. CNN can be an effective choice for image bracket jobs based on the results.

Keywords: CNN model, Classification, Tomato Ripeness, Image Processing.

1.INTRODUCTION

Agriculture plays an important part in the country's frugality. It has several agrarian products including mangoes, bananas, papayas, durians, salak, tomatoes, and others. Tomato is a fruit that's extensively consumed in the world and one of the fruits that has a certain position of maturity in a short period of time. The external features of tomatoes are extensively used to assess their anecdotage, which is judged by color, size and shape. The maturity of tomatoes is generally determined by the color of the face area because it's veritably important in assessing the quality or anecdotage of tomatoes, and utmost buyers frequently choose tomatoes grounded on their color.

Tomatoes are one of the fruits that are veritably sensitive in the planting process. thus, the quality of tomatoes needs to be maintained constantly to increase the selling value of tomatoes by paying attention to the position of tomato anecdotage. preliminarily, homemade determination of the anecdotage of tomatoes had its downsides. The process takes a fairly long time, requires a lot of labour, and can beget inconsistencies in determining the anecdotage of tomatoes. Determination of the anecdotage of tomatoes can be done by using automatic discovery system. Digital image can be used for automatic discovery system. A digital image is a representation, likeness, or reproduction of an object. Image affair of data recording systems can be optic in the form of prints, digital which can be directly stored on a storehouse medium.

2.OBJECTIVE

Harness the Power of Technology for Quality Tomato Harvesting. Develop New and Innovative solutions for Tomato Harvesting. Encourage High-Quality Tomato Production on a Global Scale. Labor Shortage Mitigation.

Harvesting too early or too late can affect flavor, texture, and shelf life. So harvesting tomatoes at the right stage of ripeness is better. Gentle handling helps maintain the fruit's integrity and extends its shelf life. Machines reduce labor costs and increase work pace for greater productivity.

3.PROPOSED SYSTEM

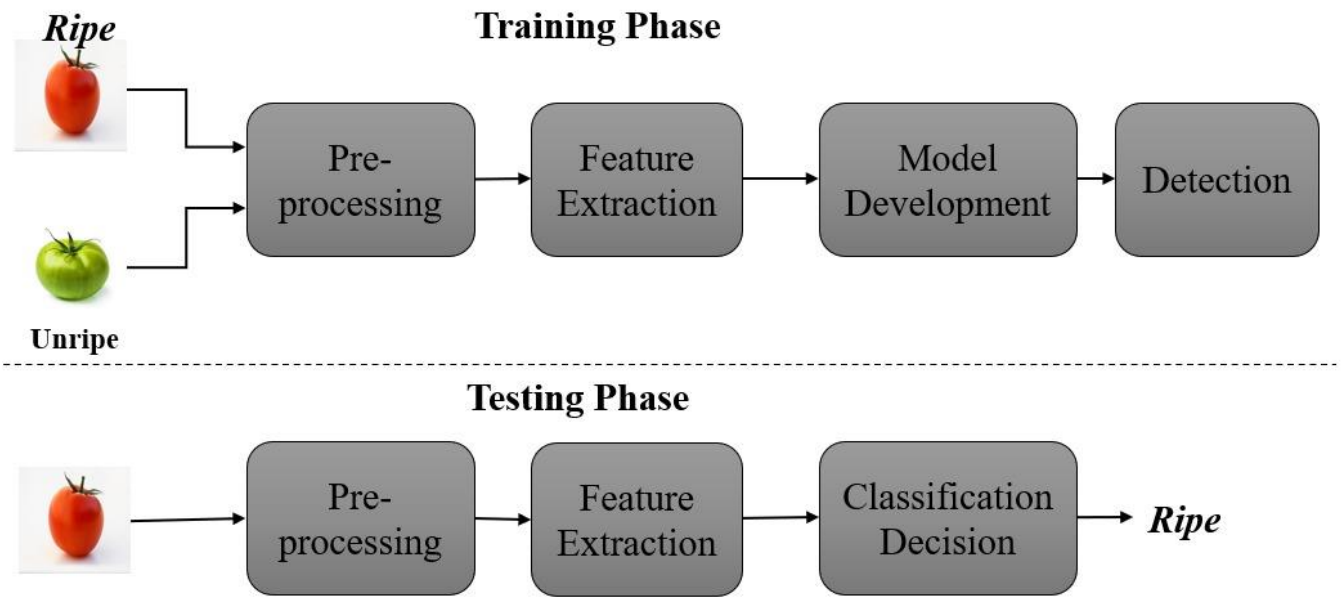
Automatic Discovery system of the anecdotage of tomatoes is used in tomatoes sorting system to achieve better quality of tomatoes. currently, homemade system is used to sorting the anecdotage of tomatoes. Tomatoes are named manually one by one according to the position of maturity from color, shape or size. This system spends a lot of time and hamstrung. The result to this problem is to make a tomato sorting system automatically by enforcing Convolutional Neural Network (CNN) to classify the maturity of tomatoes. CNN, a type of Artificial Intelligence, uses Deep Learning algorithms that can take image input and can classify an object.

CNN's main task in Image Bracket is to admit image input and follow the meaning of the image. The system can fete the quality of tomatoes according to three orders raw, partial-ripe and ripe. Using tomato images as a control system isn't an easy challenge. This is due to the presence of tomatoes taken with colorful backgrounds, changing lighting conditions and different colors of tomatoes. The maturity of tomatoes by color was also defined in by using CNN. They used red, green, and unheroic color to separate the maturity of tomatoes automatically.

4. METHODOLOGY

We use various algorithms to train the software. We collected data on different tomatoes and divided them into two categories (ripe and unripe). They undergo preprocessing, where the images are filtered for noise, followed by extracting vegetative and immature features and processing the extracted features through an algorithm, creating a model and inserting weights. These features are stored as weights which the trained model over our system. Later the trained model is used to detect the feature whether it is ripe or unripe. The model we trained is based on the convolutional neural network algorithm. Use the dataset to train and classify the model. We collected a total of about 250 images and preprocessed each image into a set of desired formats that removed noise. The model is trained and saved so that it can be used as a trained model for the testing process.

5.BLOCK DIAGRAM



Pre-Processing: We collected data on different tomatoes and divided them into two categories (ripe and unripe). They undergo preprocessing, where the images are filtered for noise.

Feature Extraction: Pre-Processing followed by extracting vegetative and immature features and processing the extracted features through an algorithm. Creating a model and inserting weights.

Model Development: These features are stored as weights which the trained model over our system. The model we trained is based on the convolutional neural network algorithm. Use the dataset to train and classify the model.

Detection: The trained model is used to detect the feature whether it is ripe or unripe.

6.ADVANTAGES

1. Efficiency: Automating the sorting process using CNN can significantly increase efficiency compared to manual sorting, saving time and labor costs.

2. Accuracy: CNN can classify tomatoes based on color with high accuracy, ensuring that only ripe tomatoes are selected for harvesting, thus improving overall quality control.

3. Scalability: Once implemented, the CNN system can be scaled up easily to handle larger quantities of tomatoes, making it suitable for commercial farming operations.

4. Consistency: CNN-based sorting systems can maintain consistent quality standards across batches of tomatoes, reducing variability in the final product.

5. Cost-effectiveness: While initial setup costs may be involved, in the long run, automated sorting using CNN can lead to cost savings by reducing reliance on manual labor and minimizing waste.

7.APPLICATIONS

1. Agriculture industry: The technology can be applied in large-scale tomato farms to automate the sorting process and improve overall efficiency and quality control.

2. Food processing plants: Tomato sorting using CNN can be integrated into food processing facilities to streamline operations and ensure that only high-quality tomatoes are used for further processing.

3. Research and development: The project can serve as a basis for further research into using CNN for fruit ripeness classification, potentially leading to advancements in other agricultural sectors.

4. Technology integration: The use of CNN for tomato ripeness classification can pave the way for integrating similar technologies into other areas of agriculture, such as fruit and vegetable sorting.

5. Sustainability: By optimizing tomato harvesting and reducing waste through accurate ripeness classification, the project contributes to sustainability efforts in agriculture by minimizing resource usage and maximizing yield.

8.CONCLUSION

The bracket of tomato anecdotage using the Convolutional Neural Network model had been done successfully. We designed a CNN model with a suitable number of convolutional layers and completely connected layers for small datasets. From the results, we can conclude that CNN is stylish for bracket of tomato ripeness with delicacy ranging from 86%- 90%.

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