Abstract

One of the important quality features of fruits is its appearance. Appearance not only influences their market value, the preferences and the choice of the consumer, but also their internal quality to a certain extent. Color, texture, size, shape, as well as the visual flaws are generally examined to assess the outside quality of food. Manually controlling external quality control of fruit is time consuming and labor-intensive. Thus for automatic external quality control of food and agricultural products, computer vision systems have been widely used in the food industry and have proved to be a scientific and powerful tool for intensive work over decades. The use of machine and computer vision technology in the field of external quality inspection of fruit has been published based on studies carried on spatial image and spectral image processing and analysis. A detailed overview of the process of fruit classification and grading has been presented in this paper. Detail examination of each step is done. Some extraction methods like Speeded Up Robust Features (SURF), Histogram of Oriented Gradient (HOG) and Local Binary Pattern (LBP) are discussed with the common features of fruits like color, size, shape and texture. Machine learning algorithms like K-nearest neighbor (KNN), Support Vector
Machine Vision based Fruit Classification and Grading - A Review

Machine (SVM), Artificial Neural Networks (ANN) and Convolutional Neural Networks (CNN) are also discussed. Process, advantages, disadvantages, challenges occurring in food-classification and grading is discussed in this paper, which can give direction to researchers.

References

17. Dong Zhang et al.,"Date maturity and quality evaluation using color distribution analysis
18. Uravashi Solanki et al., “A Survey on Detection of Disease and Fruit Grading”,
19. C. S. Nandi et al., "Machine Vision Based Techniques for Automatic Mango Fruit Sorting
and Grading Based on Maturity Level and Size", DOI: 10.1007/978-3-319-02315-1_2, Springer
International Publishing Switzerland 2014.
20. Giacomo Capizzi et al., "A Novel Neural Networks-Based Texture Image Processing
Algorithm for Orange Defects Classification”, IJCSA, 2016.
21. Jana, Susovan, and Ranjan Parekh. "Intra-class Recognition of Fruits using Color and
Texture Features with Neural Classifiers." International Journal of Computer Applications
22. Dr Vishwanath.B.C, S.A.Madival, Sharanbasava.Madole, "Recognition of Fruits in Fruits
Salad Based on Color and Texture Features", International Journal of Engineering Research &
23. G.P. Moreda et al, "Non-destructive technologies for fruit and vegetable size
24. Rashmi Pandey, “non-destructive quality grading of mango (mangifera indica l.) Using
image processing”, A dissertation submitted to Uka Tarsadia University, May 2014.
and Quality Evaluation of Fruits and Vegetables”, doi 10.1007/s11947-010-0411-8, Food
26. Ghulam Muhammad, “Date fruits classification using texture descriptors and shape-size
features”, Engineering Applications of Artificial Intelligence, 37, 361–367, 2015.
27. Sapan Naik and Bankim Patel, “Thermal imaging with fuzzy classifier for maturity and
size based non-destructive Mango (Mangifera Indica L.) grading”, 2017 International
28. Katrin Utai et al.,"Development and assessment of different modeling approaches for
size-mass estimation of mango fruits (Mangifera indica L., cv. ‘Nam Dokmai’)", Computers and
29. Longsheng Fu et al., "Classification of Kiwifruit Grades Based on Fruit Shape Using a
31. Kyosuke Yamamoto et al., "Strawberry cultivar identification and quality evaluation on
the basis of multiple fruit appearance features", Computers and Electronics in Agriculture,
32. Muhammad, Ghulam. "Date fruits classification using texture descriptors and shape-size
33. Yudong Zhang et al., “Fruit classification using computer vision and feedforward neural
for Tropical Fruits of Maharashtra”, Critical Reviews in Food Science and Nutrition Vol. 55 , Iss.
12, 2015.
35. F.S.A. Sa’ad et al.," Shape and weight grading of mangoes using visible imaging",
43. Konaje, Nayan Kumar. "Food recognition and calorie extraction using Bag-of-SURF and Spatial Pyramid Matching methods."
56. Gonzalo Pajares, Xavier P. Burgos-Artizzu, Angela Ribeiro Alberto Tellaeche, "A


Index Terms

Computer Science

Artificial Intelligence

Keywords

Fruit, Classification, Grading, Machine and Computer Vision.