A RESERCH ON VARIOUS IMAGEPROCESSING TECHNIQUES

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ABSTRACT

Digital image processing deals with the manipulation of digital images through a digital computer. It is a subfield of signals and systems but focuses particularly on images. DIP focuses on developing a computer system that can perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms and gives an image as an output. The most common example is Adobe Photoshop. It is one of the widely used applications for processing digital images. The image processing techniques play a vital role in image Acquisition, image pre-processing, Clustering, Segmentation, and Classification techniques with different kinds of images such as Fruits, Medical, Vehicle, and Digital text images, etc. In this study, the various images remove unwanted noise and performance enhancement techniques such as contrast limited adaptive histogram equalization.

Keywords

Image Acquisition, Image preprocessing, Image enhancement, Clustering, Region of Interest (ROI) Classification.

1. INTRODUCTION

In this paper study on the analysis of image processing techniques with various images has been discussed. One of the image processing techniques apply in disease identification of fruit or vegetable images in the agriculture industry and classify the different variety of fruits like apples and bananas which can be used to identify the fruit and generate its price automatically in a shop or supermarket with help of automation machine vision **1**. Digital images are effective in identifying and classifying the defects in any fruit like apple depending upon the size, colour, shape. Different kinds of defects can be identified such as rot, blotch, cork spots, scab, fungi attack, bitter pit, bruising, punches, insect holes, and growth defects. An apple detecting defects in fruits at an early stage can help to reduce infection spreading to other parts of the fruit which will help the agricultural industry. Computer vision to get closer to human levels of recognition, to use different applications related to food items which are based on image processing techniques such as fruit grading, yield mapping, robot harvesting, leaves disease detection, weed detection, etc**. 2.** In terms of the bagging green apple images in the work, Segment the fruit regions via common fruit colour or texture features and sub-region extractions. Another method is to segment the image by BP neural network or support vector machine Classifier, hybrid classifier, K-means clustering segmentation constructed through the training and integration of fruit shape and colour features. Histogram equalization **CLAHE** algorithm uses fruit green region and improves edge definition in the image, and then the **R-B** colour image based on **CLAHE** image was obtained. The linear contrast of the original **RGB** image was enhanced to improve colour in the normal light regions of fruits and leaves **3.** A bayberry image segmentation method based on salient object detection homomorphic filtering and performs image enhancement and binary segmentation algorithms. It performs a different type of fruits segmentation such as apple, lychee, and orange. Apple segmentation was achieved using the method based on the adaptive mean-shift. The colour features and surface texture were used to segment apples and extract the colour and edge features **4.** The vein images use spatial domain and frequency domain to enhance the vein patterns in hand image and captured hand image to detect the vein patterns to remove unwanted noise in hand image which result to

avoid false detection of veins. It applies pre-processing and improves the image for visual perception of humans and making further easy processing steps on the resultant images by machines, it gives exact information about

the vein pattern in the captured image. As a result, the vein can be detected using this technique appears to be clearer and would provide ease further analysis in vain applications **5.** Segmenting brain tumor and their regions using deep learning methods in MRI sequences and providing clear tumor regions **6**. The traffic is the world's vast problem to control the traffic with the help of License Plate. The locating license plate, fetching characters in the license plate and extracting the license plate number, and displaying them using an enhanced threshold technique. It classifies the vehicle license plate using K-nearest neighbour Classifier, and the subtraction method is being used to count the vehicle in a motion video to give good accuracy **7.** To enhance and detect text in digital images and have some shimmer and shades. Some complex background to detect a text to enhance a text by removing noise using filters and improves the sharpness by gradients using Sobel and Laplacian method. This method provides better results by improving blurred and shimmer-based digital text images as well as it is applicable for normal text images. Similarly, numbers are also applicable. In recent days all the processes are moving to digital processes like swiping, ATM, mobile, and LED boards in railway stations and buses. Since it is necessary to enhance and detect texts in digital images.

This paper presents a study on various image Processing Techniques using images to apply different techniques. The rest of the paper is organized as follows:

Section II describes related work done in this area.

Section III explains the various existing methods.

Section IV shows the observation of previous experiments

and finally, Section V yields the conclusion.

2. RELATED WORK

Figure 1 illustrates the general framework of different kinds of images such as fruit images, medical images, vehicle images, digital text, etc. The traditional steps followed to apply various image processing algorithms in a given image are as described below:

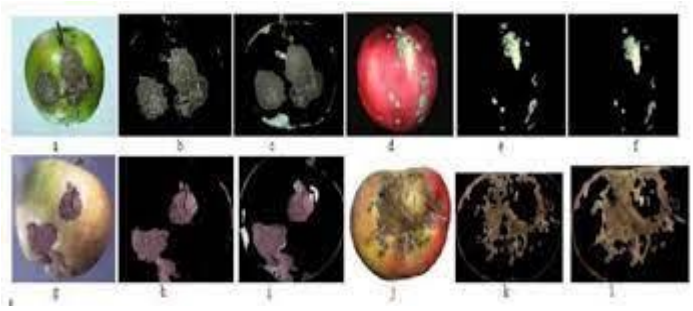


Fig1: Apple images with defects, fruits, Digital text, braintumour (MRI)

1. **K SMITH,** et al., has introduced fruit detection using the morphological image processing technique and proposed a new method for fruits recognition system **9**. **Anujua David**, et al., The automated machine test and classify the defects fruits and vegetables using computer vision techniques. This paper presents a detailed overview of various methods namely pre-processing, segmentation, feature extraction, a classification that addressed fruits and vegetable quality based on color, texture, size,

shape, and defects. In this paper, a critical comparison of a different algorithm proposed by researchers for quality inspection of fruits and vegetables has been carried out **10**.

2. **Ghobadi et al.,** The researcher has taken six apples and found the defects with the help of CCD matrix camera, then the shape of apple images is extracted by Active Counter Model [ACM] algorithm in the pixel values have been counted and measure the statistical histogram-based EM algorithm accuracy for healthy pixel and **93.76% 11**.
3. In the vehicle images, all the license plates are rectangular and find the edge information using the plate. Multinational vehicle license plates have been detected based on rear lights and Heuristic Energy Map of vertical edge information and using a unique histogram approach **12**. The license plate is detected in both morning and night-time using the line and clip functions to analyze Gaussian function **13**. A method for recognizing the vehicle number plate based on template matching using modified Otsu's method algorithm for threshold partitioning with normalized cross-correlation **14.**

4. Tumour Regions in MRI images: In this tumor images are collected, and extract tumor features automatically using deep learning-based convolutional neural networks (CNN), it automatically segments the regions and classifies particular regions in an effective manner 15.

5. Digital text image: The text images are divided into three types such as document images, scene images, and digital images. Document images contain text and graphics, these images are originated by scanners and cameras. Scene images can have text images such as advertising boards and banners 16 and it applies gradients using Sobel and Laplacian methods to extract the noise text regions using segmentation method to enhance those text and visible on the machine.

3. IMAGE ACQUISITION

Pol elex et al., [1] **RGB** color images can be acquired using a Digital camera using an illumination chamber. The researcher using images research work images size is 800 x 800 pixels.

Anuja et al., 10 the fruits and vegetables find the defects in light systems. The light system inspects surface quality attributes are front lighting is color, texture, and skin defects. However, backlighting inspects the boundary quality attributes like size and shape with help of image acquisition tools. The image acquisition tools used are camera, ultrasound, magnetic resonance imaging (MRI), and electrical tomography, and computed tomography (CT).

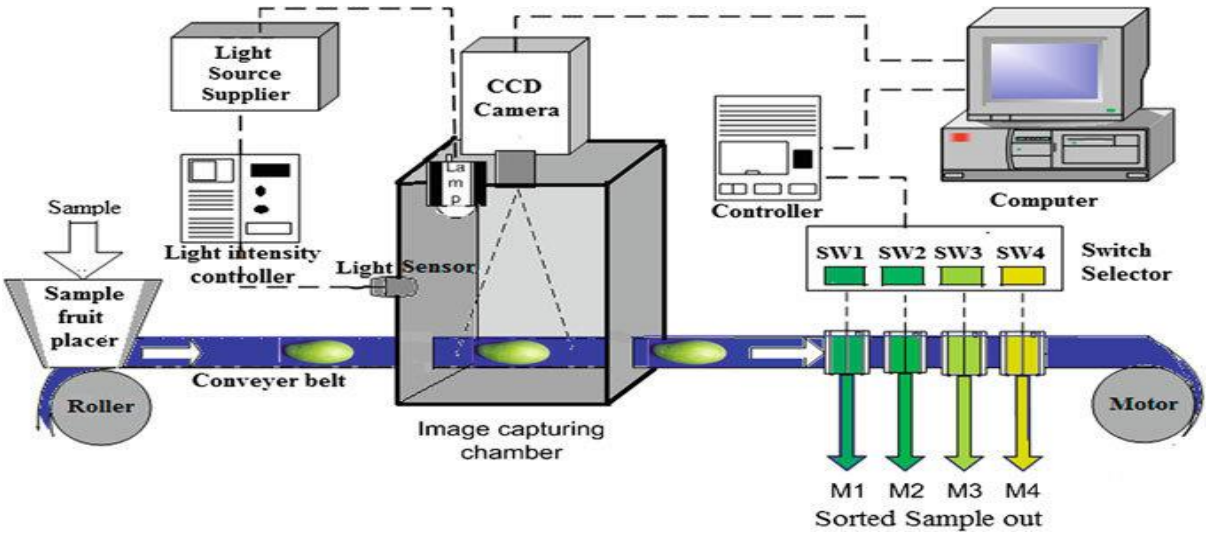


Fig 2 Automatic machine to find defects in fruit

4. IMAGE PRE – PROCESSING

The pre-processing technique is used to remove unwanted noise and improve images by using image processing techniques that are smoothing and sharpening. Image Pre-processing techniques used are scaling, transforming, zooming, resizing, and converting images to grey scale images.

4.1 IMAGE ENHANCEMENT

Image enhancement is used for improvising the quality of the image. This technique is most widely used in many applications. Sometimes images captured from satellites and digital cameras is having less contrast, brightness, and noise because of illuminations. The main goal of image enhancement is to improvise the blurred and noisy image by sharpening and removing noise in the image. Here, this paper suggests some image enhancement techniques such as histogram equalization, filtering to remove salt and pepper noise, and sharpening using Text images and bib numbers.

4.2 NOISE REMOVING FILTERS

To remove noise like salt and pepper, and Gaussian noise in an image usually mean and median filters are used. The image processing techniques perform median filter to remove noise and to make sharpness in the image it includes Sobel and Laplacian filters to improve quality of the image. Noise occurs usually variation in brightness of color information. It typically uses a median filter that takes the midpoint value in each set of values. Sometimes median filter works better than the average filter.

4.3 SHARPENING

The digital images have some lighting conditions, color contrast, and resolutions. The sharpening in two ways by gradient direction and gradient magnitude by using Sobel and Laplacian with sharpening an image. Sharpening of an image is generated the low-level frequencies. Similarly, smoothing of an image is produced by suppressing the high-level frequencies.

4.4 FEATURE EXTRACTION

The Feature extraction classifies the apple and banana samples using Wavelet transformation, Statistical features Texture features. Wavelet transformation is DWT (Discrete Wavelet Transformation) performscoefficients of diagonal, vertical and horizontal pixel values. Statistical features second level decomposition of the segmented image and its measures the mean and standard deviation. Texture features like Energy, Homogeneity, Contrast, and correlation. The Correlationmeasures the segmented image, M x N size of the image with M rows and N columns.

4.5 REGION OF INTEREST

PL. Chaetae et al., [1] the researcher classifies the apple/banana and vegetable images [17] to extract the

ROI. The RGB image was converted into HSI color space. It takes the Hue component images and subtracts those image values Otsu's method.

$$S(x,y) = \begin{cases} 1 \; if \;\; gri(x,y) > Th \\ 0 \; if \; gri(x,y) \geq Th \end{cases}$$

Then 'Th' value was obtained using. Here gri(x,y) was the background-subtracted image.

4.6 CLUSTERING

PL. Chithra1et al., [2] the pixels are exchanged by cluster. Pixels may belong together because of the same color, texture, etc., it is identifying the diseased part in any fruit [18]. Food image clustering is an efficient method. This method classifies pixels into different groups called clusters. The cluster measures the distance. Partitioning the pixel set into k subsets is often referred to unsupervised learning. The clustering algorithm assumes that a vector space is formed from the pixel features and identifying a cluster is a very fast procedure and an attractive one. When color histogram in different color space that L*a*b provided better feature space for segmentation of color images. L* is the lightness factor, a*and b* are the chromaticity coordinates. L*(lightness) axis – 0 is black; 100 is white.

$$L^* = 116\left(\frac{y}{yn}\right)^{1/2} - 16$$

The Median measures the intensity level of the pixel are high-intensity value pixels from lower intensity value pixels. It is one of the statistic filter and rank filters is the median filter. It works by selecting the middle pixel values that measure the arithmetic average. This filter simply sorts all values within a window, finds the median value and replaces the original pixel value with the median value, and gives a good result.

5. IMAGE SEGMENTATION

Anuja et al., [10] the author applies the segmentation process in pre-processing, classification, and clustering using the Otsu method. The cluster minimizes and maximizes threshold values and an unsupervised algorithm for fuzzy clustering is used to segment color images of apples which increases accuracy in the segmentation algorithm [22]. It evaluates the MFIS model as more accurate (86.00%) color and fungal disease it extracts fungus attributes and stem depth of tomato and identifies fungus by using segmentation [23]. In this method, thresholding and k-means clustering algorithm are used for segmentation of images and identifying fungus using automatic machines and provide 97.98% accuracy, although the nearest neighbor technique is also extended with 92.93% accuracy it depicts the accuracy of different Segmentation techniques implemented for quality analysis of fruits and vegetables.

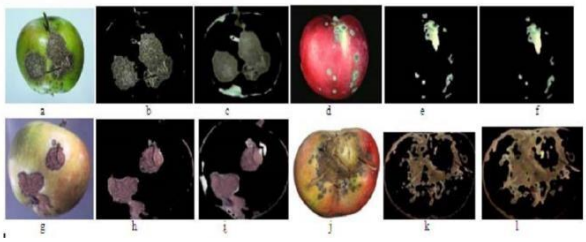
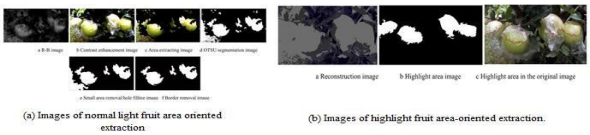


Fig 8: Segment the defected fruit.

Jidong L [3] the natural environment, the image of bagging green apple tended to show highlighted area, the researcher difficult to segment fruit area. In the work, the fruit area was extracted in two kinds of ways. One method is to extract the normal-light area of fruit surface and another method is to extract the Highlighted fruit area-oriented extraction. The actual images convert the binary images and also use the K- means cluster segmentation base on the R-B model.



(a) Images of normal light fruit area oriented extraction.

(b) Images of highlight fruit area-oriented extraction.

Fig 9: R-B model images.

Liming et al., [4] The researcher designed bayberry image segmentation the natural environments illumination will affect the detection of the salient target and the effect of image segmentation [21]. This work applies an image enhancement algorithm, homomorphic filtering, to conduct light compensation. As it measures visual saliency computation, Superpixel with uniform size and similar image features of a red bayberry image is obtained using the SL

IC (simple linear iterative clustering) segmentation algorithm. In this model select the superpixel nodes and apply binary segmentation. Otsu's method is used to conduct binary segmentation of the obtained saliency maps, achieving segmentation of the red bayberry.

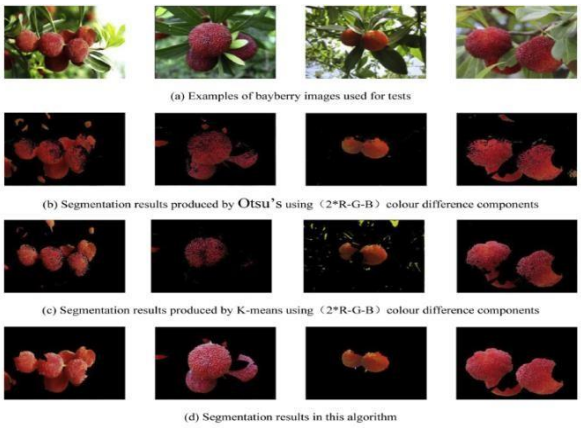


Fig 10: segmentation results produced by differentalgorithm.

PL.Chithra1 et al.,[6] the researcher analyzed segmenting brain tumor images in deep learning techniques based on a Convolutional neural network[19]. It is very difficult to segment the brain tumor so the researcher applies more than one convolutional layer for segmenting and classifying brain tumors automatically [20]. It uses the layered model in each image to do contrast (FLAIR) for non-enhancing and enhancing tumors and produce a better result.

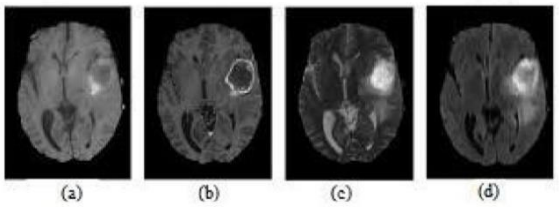


Fig 11:Four imaging modalities: (a) weighted MRI (b) weighted MRI (c) FLAIR and (d) FLAIR with contrastenhancement.

6. CLASSIFICATION

The SVM Classifier Support Vector Machines are based on the concept of decision planes that define decision boundaries. Feature values were extracted after applying wavelet transformation on the segmented image using the Haar filter. The researcher works those methods to apply defective fruit images to provide 100% accuracy.

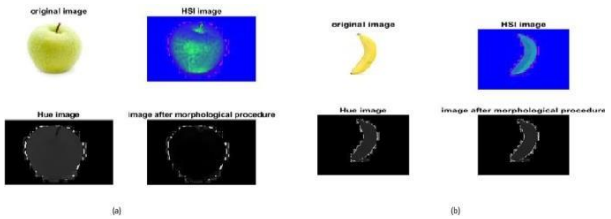


Fig 12: RGB image original image, converted HSI imagebanana and apple sample.

The KNN based on the feature classification in the number plate find the exact match or the nearest match, vehicles. Some of the old lists of vehicles in the database can be cross-validated and produce the match's solution for the case. After extracting the number of the license plates, the extracted number is passed as input to the KNN Classifier to produce the best match relevant from the plate number given as input. In this proposed method the contour hierarchy function is used. The input passed to the contour hierarchy must be of black background and white text, to satisfy this condition the input image is pre-processed to a gray scale and then an adaptive threshold is applied [28].

Fig 13: Number plate classifier

7. OBSERVATION

PL.Chithra et al., [1] A machine vision system for segregating/ classifying apple fruit and banana fruit was developed and tested for 100% accuracy using a KNN classifier. The researcher classifies defective fruits in the easiest way using a mechanical system. Liming Xu et.al [4]. segmentation of bayberry images to produce average values of Precision, Recall and F-measure values are 0.93, 0.83, and 0.90, respectively performing more effectively than Otsu's and K-means segmentation algorithms. Jidong et.al [3] the average values of Af, FPR, and FNR were reduced by 32.68%, 5.97%, and 2.14% and Compared with the results of the K-means clustering segmentation algorithm based on R-B, the average values of Af, FPR and FNR were reduced by 18.17%, 5.86%, and 7.73%, respectively.

CONCLUSION

This study paper focuses on image processing techniques are image Acquisition, image preprocessing, Clustering, segmentation, and classification to perform different kinds of images and it produces better performance. The different kinds of researchers use those techniques and apply the different types of images and give better accuracy. The quality of images is based on clarity using the best techniques. Our future work will be focusing on an efficient algorithm for image processing techniques for automated sewer pipe defects using CCTV image

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