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Application of Multi-Atlas Segmentation in Image Processing

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Abstract:
Multi-atlas based method is commonly used in image segmentation. In multi-atlas based image segmentation, atlas selection and combination are considered as two key factors affecting the performance. Recently, manifold learning based atlas selection methods have emerged as very promising methods. However, due to the complexity of structures in raw images, it is difficult to get accurate atlas selection results only measuring the distance between raw images on the manifolds. Although the distance between the regions to be segmented across images can be readily obtained by the label images, it is infeasible to directly compute the distance between the test image (gray) and the label images (binary). Here is a small try to solve this problem by proposing a label image constrained atlas selection method, which exploits the label images to constrain the manifold projection of raw images. Compared with other related existing methods, the experimental results on prostate segmentation showed that the selected atlases are closer to the target structure and more accurate segmentation were obtained by using our proposed method.
We present a multi-atlas-based framework for accurate, consistent and simultaneous segmentation of a group of target images. Multi-atlas-based segmentation algorithms consider concurrently complementary information from multiple atlases to produce optimal segmentation outcomes. When segmenting a group of target images, most current methods consider these images independently with disregard of their correlation, thus resulting in inconsistent segmentations of the same structures across different target images.

Keywords: Multi-Atlas, Structures, image, Segmentation, Projection

Introduction:

Accurate segmentation of the image can be helpful for assisting the diagnosis of the disease on plant leaf. Traditionally, the affected plant image segmentations are performed manually by experts. However, manual segmentation is tedious, time consuming, and not reproducible. To overcome these shortcomings, a large number of automated image segmentation methods have been proposed [2]–[3]. Although these existing methods are effective in some cases, automated segmentation of plant image is still very challenging due to the unclear boundary information in some areas.

The diseases on the cotton leaves are classified as

- Bacterial disease: e.g. Bacterial B light, Crown Gall, Lint Degradation.
- Fungal diseases: e.g. Anthracnose, Leaf Spot.
- Viral disease: e.g. Leaf Curl, Leaf Crumple, Leaf Roll.
- Diseases Due To insects: e.g. Whiteflies, Leaf insects.

Out of the above types of disease these diseases dramatically affect the leaf of cotton plant and its leaves. We go through the selective type of diseases on the cotton leaves. And further we discuss the ANN image, segmentation method to detect the diseases on cotton plant by scanning of cotton

leaves through our portable dedicated scanner or specially designed camera.

Various diseases are found on the cotton plant out of this we discuss the diseases. one of the major diseases which are often found on the leaves of cotton are discussed further.

3. Literature Review:

Viral disease: Cotton leaf curl Gemini virus (CLCuV) causes a major disease of cotton in Asia and Africa [2]-[4]. Leaves of infected cotton curl upward Figure 1. And bear leaf-like enations on the under side along with vein thickening Figure 2. Plants infected early in the season are stunted and yield is reduced drastically. Severe epidemics of CLCuV have occurred in Pakistan in the past few years, with yield losses as high as 100% in fields where infection occurred early in the growing season. Another cotton Gemini virus, cotton leaf crumple virus (CLCrV), occurs in Arizona, California, and Mexico. CLCrV symptoms are distinguishable from CLCuV symptoms in that infected leaves curl downward accompanied by inter vein hypertrophy and foliarmosaic Figure 3, both CLCrV and CLCuV infect dicotelydonous plants and are whiteflytransmitted(Brownetal.,1983;Mansoretal.,1993).Previ ous studies(BrownandNelson,1984;1987; Hameedetal. 1994; Mansoret al.,1993) suggested that they belong to the sub group III Gemini viruses. However, little information is available on the relationship of these two viruses with each other and with other subgroup III Gemini viruses.

Figure 1 cotton curl

Figure 2 vein thickening

Figure 3 Vein hypertrophy

Bacterial disease: Bacterial B light starts out as angular leaf spot with are brown border [2]-[4]. The angular appearance is due to restriction of the lesion by fine veins of the cotton leaf. Spots on infected leaves may spread along the major leaf veins as disease progresses, leaf petioles as shown in Figure 4. The angular leaf spot, results in premature defoliation and stems may become infected resulting in premature defoliation.

Figure 4 leaf petioles

Figure 5 leaf Spot

Figure 6 affected leaf

Fungal diseases: The disease affects older leaves of mature plants. The spots are round or irregular in shape yellowish brown ,with purple, dark brown or blackish borders and white centers affected leaves become pale in colour and finally fall off[2]-[4] as shown in Figure 5.

As shown in Figure 6, small, pale to brown, round or irregular spots measuring 0.5-3 mm in diameter and cracked centers appears on the affected leaves of the plant. Affected leaves become dry and fall off [3]-[6]. The disease may cause cankers on the stem. The infection spreads to the bolls and finally falls off.

Diseases Due To insects: More than 25% of leaf coverage by the whitefly pupae on the under surface of leaves of middle plant canopy and flight of white adults visible on a single stroke of the plants should be used to decide the insecticidal applications. The severity of whiteflies is seen after the crop growth crosses 10 nodes on the main stem. (Figure 7, Figure 8)

Figure 7 white fly

Figure 8 adult white fly

System Architecture:

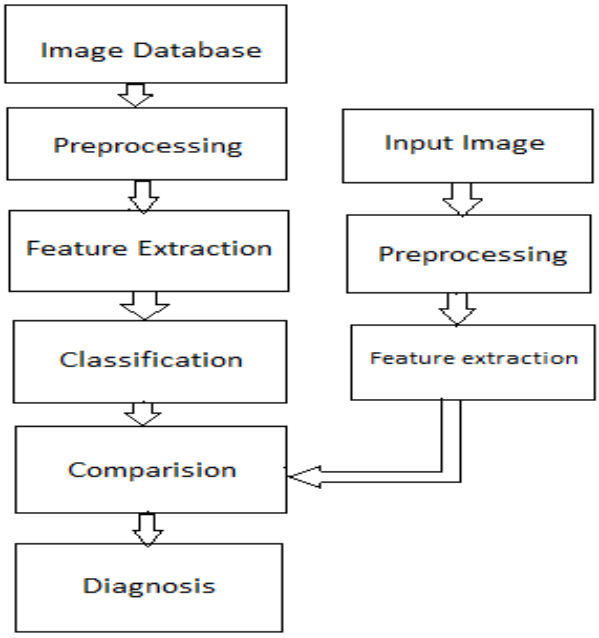

Figure 9 Block Diagram

When crops suffer from many diseases, batches (spots) often happen on leaves [7]. Leaf spots are considered the important units indicating the existence disease and regarded as indicator of crops disease. In order to classify disease leaf samples category, a set of spot features for classification and detection of the different disease leaves, are investigated [9]. Spot features are extracted from images in the appropriate image processing method. These features are very important for the colour and morphology of the leaf spots and they provide critical information about its visual representation. The features correspond to colour characteristics are the mean and variance of the gray level of the red, green and blue channel of the spots; and other features correspond to morphological and geometrical characteristics of the spots. By using segmentation technique it is easy for us to extract the features of disease leaf of the image.

There is main feature related to colour of leaf image i.e. infected part of the particular disease leaf image is having the variations in its RGB values, means that variations is certain, i.e. that variation of RGB values i.e. combined RGB value is not repeated with an other diseased leaf image RGB value

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