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Computer Science

IDENTIFICATION OF CROPS AND WEEDS USING IMAGE PROCESSING TECHNIQUES

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ABSTRACT Image processing techniques are one of the fastest developing technologies in the current world. These techniques encompass generic enhancement operations on images that make images viable for extractions of required information (Maier et al., 2019; Fernández-Pacheco et al., 2014). They are core research areas within the disciplines of engineering and computer sciences. Computer algorithms essentially process digital images using various tasks including reconstructions, restorations, compressions, enhancements, estimations of spectrums in images. Executions of these tasks result in analyses or classifications or detections of objects in digital images. Though image processing techniques can contribute towards growth of agriculture and specifically in determining weeds in cultivations, classification of weeds from images is a huge challenge. This chapter details on classification of crops and weeds using image processing techniques while focusing on improving classification accuracies using preprocessing, feature extractions, optimizations of feature selections, classifications, and deep learning approaches.

KEYWORDS : classifications, Image, weed,

1. Role Of Image Processing In Agriculture

The evolution of digital image processing techniques can primarily be attributed to three factors namely evolutions of technology, advancements in the field of mathematics, specifically discrete mathematics theories and every increasing demands for new applications. Digital image processes have been used in the domains of agriculture, military and healthcare. Image processing tasks have been excellent instruments for analyses due to the availability of communication networks where expert opinions can be acquired quickly in cost effective manners (Barbedo et al., 2016).

Image processing techniques have also shown excellent analytic results in variety of agricultural domains and applications (Eerens et al., 2014). Farmers engaged in agriculture measure their outputs using metrics like canopies, yields, and qualities. Different kinds of imaging technologies have also been major contributors to processing evolutions and include Thermal, fluorescence, hyper-spectral and photometric imaging. Image processing techniques are used in agriculture for management of crops, identification of nutritional shortages, detections of weeds in cultivated lands and grading of fruits (Arkeman et al., 2017).

1.1. Crop And Weed Management System

Increasing productivities and modernizing plantation systems are amongst the top priorities in advancing agricultural growths. The rising population of the world also calls for innovative farming practices to ensure agricultural outputs match growing needs. Thus, maintaining agricultural productivity while reducing environmental damages becomes imperative. Controlling the growth of weeds are important steps in autonomous farming as they directly impact health and productivity of crops. Weeds are pests to agriculture and multiply in agricultural fields. They impede agricultural growths by competing for water, light, soil nutrients, and space resulting in stunted agricultural outputs. If weeds are not noticed and eliminated at the right time, agricultural outputs reduce between 10 to 95 percent.

Reliability and preciseness are essential characteristics for efficient treatments of weeds in cultivated lands after their detections. Treatments of weeds can be done using selective stamps or spot sprays or mechanical tillage as these methods cause very little damage to adjacent plants. Weeds can also eliminated manually by people on slowly moving trucks (Louargant et al.,2018). Recently, automated machine vision systems that detect crops and weeds from digital images have been used to manage herbicide usage and have found to be economically viable (Wu et al., 2020). The classification accuracies of deep learning algorithms can be enhanced by using image preprocesses, feature extractions, feature selections and classifications (Elstone et al., 2020; Hlaing &Khaing 2014).

1.2 Identification Of Crops And Weeds Using

Identification of weeds is a core agricultural activity of farmers which can be digitized and automated. Herbicide toxicity found in crops is a major health issue where human interventions can be reduced by automations which can result in reduced herbicide usage. Identifications of weeds and crops are also challenging tasks in digital image processing as several significant crops are missed in stored crop or weed image databases (Tang et al., 2016). There are several gaps found in discriminations of crops and weeds which need to be addressed. Though deep learning techniques are new tools for automating agricultural applications, they seem to be promising techniques as they are more accurate when compared to previously used approaches.

1.1.1. Pre-Processing

Pre-processes are key steps in many image applications as they eliminate noises and reduce distortions. The outcome of these processes result in improved image qualities. Preprocessing functions are compulsory preludes to data analyses and information extractions. These functions can be classified as radiometric or geometric adjustments. Image processing techniques can be defined as processes that result in making raw images more suitable for image processing (Ma et al., 2018). Picture enhancement techniques like contrast or intensity adjustments are used to improve quality of images.

Contrast Adjustment

The distributions of dark and bright pixels in images can be used to compute visual contrasts Low contrast images have minimal differences between bright and dark pixel values. The histograms are also very narrow. Since, human eyes are more sensitive to contrasts than absolute pixel intensities, expanding image histograms are needed to encompass dynamic ranges of the images for resultant superior outputs.

Intensity Adjustments

Intensity enhancements can also be defined objectively like raising signal to noise ratios or subjectively like making modifying colours or intensities for better visual appeals. Intensity adjustments transform image pixel intensity values to new ranges. Low contrast image histograms have all values congregated around the middle of intensity ranges.

Histogram Equalizations (HE)

Histogram Equalizations (HE) distributes mage pixel intensity values uniformly for examining complete ranges of intensities. This approach often results in enhancements of image global contrast values, particularly when image data is represented as pixels near contrast values. Intensities of images in histograms have better spreads with equalizations. This technique results in poor or low local contrast images to have enhanced contrasts (Sada et al., 2018).

Binarization

Binarization is model driven approaches that primarily use image intensity distributions to generate its binary versions.

Morphological Operations

Image textural properties can be processed using morphological reconstructions and extended maxima transformations with thresholding where extended maxima transformations are regional maxima computations of H-maxima transformations. The resultant images of these techniques produce binary images. The properties and positions of items in images are analyzed using connected component labelling procedures.

Filtering Methods

Irregularities of brightness or colours in images are referred to as image noises. Image noises are unnecessary by products that occur in image captures. Noises can also be caused by uncertainties in signals caused by random fluctuations due to variety of factors (Fan et al., 2019). The presence of noises in images turns them into either mottled or grainy or textured or snowy images.

Filters are applied on images for suppressing high image frequency values (smoothing) or enhancing low frequency values (highlighting) or detecting object/image edges (Saba et al.,2014). For example, systems filter images to emphasize certain features or remove them. Many filtering techniques are available and their usages are based on their applications. Image filters can be applied for smoothing/ sharpening images or removing noises from them or detecting their edges.

Wiener Filters:

Wiener filtering algorithms eliminate additive noises from images while also inverting their blurred effects. These filters achieve best compromises between inverse filters and noise smoothing. Their performances are best in terms of reduced mean square errors i.e. they minimize total mean square error values with their inverse and smoothing processes (Chen et al.,2016).

Median Filters:

These filters are applied to rectangular areas in images and result in altering the sizes of image sizes based on certain conditions. Pixel median values of their 3x3 neighbourhoods are stored in output pixels. The comparison of pixel values with adjacent pixel values helps in identifying noises. Median pixel values that pass noise label tests in the neighbourhood are used to replace noisy pixels. The size of neighbourhoods and comparative thresholds of median filters can be customized in applications. Impulse pixels differ from majority of their neighbours and do not align physically with pixels with which they are comparable (Pilevar et al., 2015).

Adaptive Median Filters:

These filters are based on selective spatial processes where decisions on pixel's impacts by salt and pepper noises are taken. When noisy pixels are found, they are compared with their surrounding pixels. The key advantage of selective adaptive median filters is their ability to discover and decide on noisy pixels within windows which are replaced with current window median values. These filters also change their window sizes automatically when required.

Gaussian filters:

Gaussian smoothing are essentially local filtering approaches for de-noising images. These filters are widely recognized for their excessive smoothing of images which may lead to severe loss of information, specifically, information on sharpness of edges may be lost (Li, Qiang and JinghuaiGao, 2013). Gaussian smoothing are low pass filters that suppress high-frequency information in images including noises and edges, while maintaining low frequency values of images which do not drastically change (Shinde et al., 2012).

REFERENCES

1. Bakhshipour, A and Zareiforoush, H, (2020). Development of a fuzzy model for differentiating peanut plant from broadleaf weeds using image features. Plant Methods, vol. 16, no. 1, pp. 1-16.
2. Barbedo, J.G.A, (2016). A novel algorithm for semi-automatic segmentation of plant leaf disease symptoms using digital image processing. Tropical Plant Pathology, vol. 41, no. 4, pp. 210-224.
3. Chen, B, Xing, L, Zhao, H, Zheng, N and Prı, J.C, (2016). Generalized correntropy for robust adaptive filtering. IEEE Transactions on Signal Processing, vol. 64, no. 13, pp. 3376-3387.
4. Chetty, S and Adewumi, A.O, (2013). Studies in swarm intelligence techniques for annual crop planning problem in a new irrigation scheme: case study. South African Journal of Industrial Engineering, vol. 24, no. 3, pp. 205-226.
5. Chuanlei, Z, Shanwen, Z, Jucheng, Y, Yancui, S and Jia, C, (2017). Apple leaf disease identification using genetic algorithm and correlation based feature selection method. International Journal of Agricultural and Biological Engineering, vol. 10, no. 2, pp. 74-83.
6. Dr. S. Prabhu, Mr. K. Madheswaran, Mr. Sathish, Abnormal Chromosome Identification and Centromere Detection Using Genetic Algorithm. International Journal Of Scientific Research, vol - 11 issue – 08.
7. Dr. S. Prabhu, Mr.V. Suresh Kumar, Mr. E. Sathishkumar, Abnormal Chromosome Identification and Centromere Detection Using Genetic Algorithm. Paripex - Indian Journal Of Research Vol - 11 Issue – 08
8. Mr. H. Ramprasanth, Dr. R. Divya, Dr. S. Prabhu , Pixel Classification Methods For M-Fish In Chromosomes Image Analys. Paripex - Indian Journal Of Research Vol - 11 Issue – 0.
9. Dr. S. Prabhu, Mr. K. Madheswaran, Image Processing Technique For Thyroid Using Improved Hill Climbing Algorithm, International Journal of Computer Science Engineering and Technology, Vol - 8 Issue – 6.
10. Dr. S. Prabhu, Dr. R. Divya, Medical Image Processing Usind Deep CNN, International Journal for Research in Science Engineering & Technology, Vol - 9 Issue – 6.