APPLICATION OF AN ENHANCED CNN FOR PRECISION AGRICULTURE

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***Abstract* — Rice is a primary food and Encounter has an Essential role in providing food security worldwide. However, the existing Disease diagnosis method for rice is neither accurate nor efficient, and special equipment is often required. In this study, The disease classification is done by an SVM classifier and therefore the detection accuracy is improved by optimizing the info exploitation. In this proposed system we are using image processing techniques to classify diseases. This approach will enhance the productivity of crops. Furthermore in precision agriculture, The accurate segmentation of crops and weeds has been always been the center of attention. This work proposes a segmentation method based on a combination of semantic segmentation and the K means algorithm for the segmentation of crops and weeds in the color image. The proposed algorithm provided more accurate segmentation in comparison to other methods with a maximum accuracy of equivalent to 99.19% the result indicates that the proposed method successfully provided accurate results for the segmentation of crop and weed in the image with a complex presence of weed.**

Keywords: semantic segmentation; k-means algorithm; precision agriculture; leaf disease detection SVM.

1 .INTRODUCTION

Rice is an important crop in agriculture however, crop diseases can significantly reduce its yield and quality, which is a great threat to food supplies around the world. Through early detection search for diseases and remedial steps took a timely can avoide huge loss and can yield good crop that is high in quantity and best quality. Research in agriculture aims to improve the productivity and quality of the crop yield with less expenditure and good yield. There is a variety of plant diseases such as viral bacterial fungal and these can damage different plant parts above and below the ground. The spread of various diseases in rice leaf is increased in recent years. Identifying the correct disease symptoms and understanding when to control these diseases is difficult. During this process, the advanced techniques of the Support vector machine play a key role in disease classification.

Weeds are unwanted plants and can significantly reduce crop yield. The broad categories of weeds found in paddy fields are grass, sedges, and broadleaved weed.

It would beneficial if each of these weeds are treated with a specific type of herbicide application. Therefore it would be of great help for the farmer if this task of classification of weeds in paddy fields were done automatically. This paper focuses on Implementing a deep learning-based computer vision technique for the automatic classification of paddy crops and two types of weeds, namely broadleaved weed and sedges weed. The standard way of handling weed in India is hand weeding mechanical weeding and herbicides. Hand weeding is a time-consuming and labor-intensive job. Mechanical weeding is carried out using a machine called a rotary weeded. Herbicides have an ill effect on the environment. When controlling weeds with herbicides, it is important to know the species of the weed so that the right herbicides. The proposed method brings up promising techniques for the segmentation of crops and weeds. The result of semantic segmentation and the separation of crop and weed allows us to analyze the shape, detect weed and make an accurate analysis of weed control operation in precise agriculture...

LITERATURE REVIEW

Savita .N.Ghaiwat describe the different type of Technique classification & identification of green foliage of the plant. for class estimation, they use K nearest neighbor technique as the beat method.

K. Jagan Mohan, M.Balasubramanian, and S.Palanivel describe scale-invariant feature transform (SIFT) as used to get a feature for recognition and detection of disease.

Y. J. Shang & L. Way describe the scheme in their paper as using a KNN classifier for plant disease identification & detection where a developed algorithm can work for five dissimilar varieties of maize disease.

Dipak Kumar Kole and Diplest Majumdar gave a solution that applies image processing & ANN mechanism to detect disease in various commonly grown plants resulting in an accuracy of 99%.

Bakshipour A. & Jafari.A. provide the classification of sugar beet crop & four types of weed done using an SVM & artifi cial neural network classifier using shape feature. The correct identification of weed by ANN & SVM was 92% & 93%.

Solidago W.E.Leite, N.J.Teruel, B.J.Kerleth discrimination of Rice seedling & weed done using the deep FCN.FCN model had an accuracy of 83% for soil background, 92% for rice & 92% for weeds.

Abdalla. An H.Cen, L.Wan, R. RASHID, H. Waleng. took advantage of a convolution neural network for semantic segmentation of oilseed rape images. In their study, the beat accuracy that was achieved amounted to 96%.

Majeed. Y, M.Karkee, Q.Zhang, M.D.Within their study determine grapevine Corden shape using semantic segmentation & deep learning. The result of the study could fit about 80%.

Richle.D, D.Reiser, H.W.Griepentrong. used an index-based Semantic method for the plant background segmentation in RGB image plant segmentation was done successfully accuracy of 97.4%.

C. Polena, D. Nardi, P.A.Jaly. In Fast & accurate crop & weed identification with the summarized train set for precision agriculture. applied CNN on RGB images for the identification Of weed images of different datasets were used and & the accuracy was 98.7%.

PADDY DISEASE AND ITS SYMPTOMS :

Lessening the yield due to paddy leaves affected with a disease can cause damage to plants to a great extent and affect the entire Crop if not timely diagnosed. Paddy disease is due to many Constraints such as insect pests, deficiency of nutrients, pathogen C And unusual environmental conditions. This section provides Information about the paddy disease with its appearance. Detailed as follows:

1.Brown spot(BS)

2.bacterial leaf blight(BLB)

3.leaf smut(LS)

A) BROWN SPOT:

This disease occurs on the leaves of rice plants. This is a fungal disease that infects the entire crop that can be easily identified in the early stage. The symptoms of the disease are round to oval shape with dark brown Lesions.

B) BACTERIAL LEAF BLIGHT

Dew drops with bacterial masses can be seen on fresh lesions early in the morning. a narrow yellow border the surrounding lesion also characterizes these spots.

The lesions turn the entire leaf into white or straw-colored on a sheath of leaf disease.

C) LEAF SMUT(LS)

The wounds of LS on the leaves may be oval or Circular in shape or irregular in shape with a kind of rough Surface. Heavily infected leave turn yellow, and the leaf tips Die and turn gray.

WEED IN PADDY FIELD

Weeds in the paddy field can be broadly categorized into 3 types,

1. Broad-leaved weed.
2. Grasses
3. Sedge

a) BROAD LEAVE WEED

Broadleaf plants have relatively broad leaves. Leaves of the broad leaf have one main vein from which smaller veins branch. Broad-leaved weeds are usually dicot with the taps roof system.

b) GRASSES

Annual summer grass that germinates throughout the season, Capable of producing 1501000 seeds per plant, per season. Short, flat, purplish-green steams perennial grass most active During the cool spring and fall season.

c) SEDGE

Sedge is a perennial plant that is found in moist soil. They are grass-like in appearance & often grow in a thick cluster. Depending on the species these weeds can research reach up to Four feet in height.

PROPOSED METHOD:

SYSTEM architecture

We use a plant dataset containing rice plant species Digital cameras were used to capture the image in The paddy field under natural lighting conditions Some of them were healthy & some were affected by various Disease. Different growth stages of paddy have consisted By the image. The image was saved in RGB color space (540x733) In JPG format. PYTHON 3.7 was used to process the Image. The sample image was resized when working With python 3.7 . to overcome reflection, a shadow of a plant, & unwanted objects here the field problem, we segmented The ground object from the background by using YCBR Model. The Support vector machine is a supervised classifier The SVM with radial basis function(RBF) kernel was used. In this approach, a support vector machine was designed for Classification to achieve the classification of paddy leaf disease. SVM classifier is approached to maximize the classification Accuracy, & minimize the available dataset.

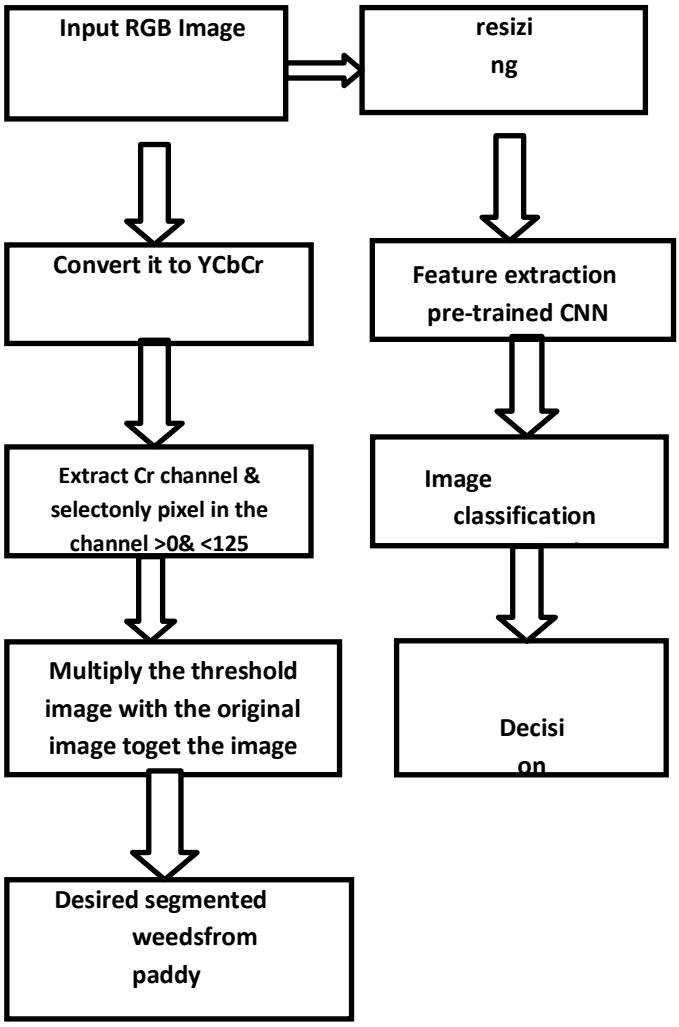
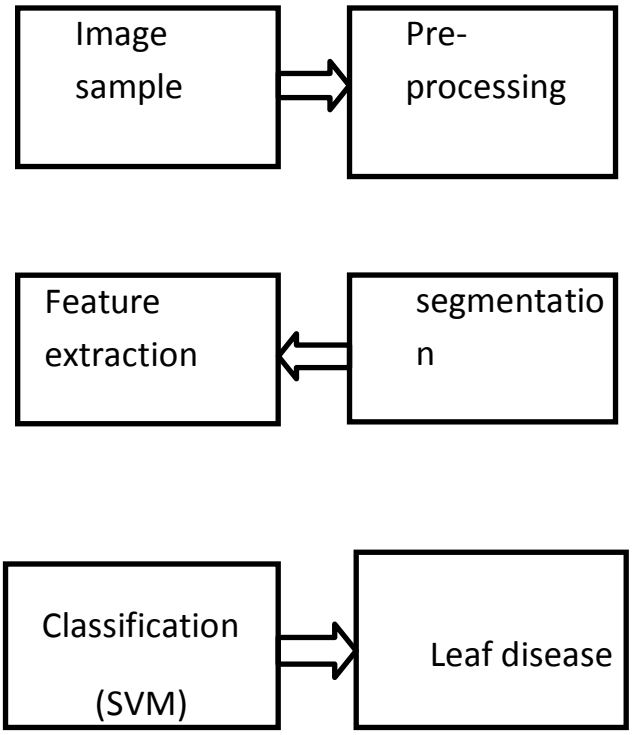


Image-segmentation- Keras APIs were used for the Implementation of a different model. In the model, transfer learning was used to get a better result. each RGB original image has a corresponding annotated Image with the same format. weight obtained from the ADE-20 k dataset was used as the initial weight in the Model. Semantic segmentation models are built upon A standard CNN network.ADE-20K dataset weights Are trained on 150 different classes. Deep learning is a subset of machine learning. many Research used convolutional machine learning techniques In combination with image features to accomplish the Task of weed recognition. These techniques can work With smaller data sizes and are not computationally Intensive.

BLOCK DIAGRAM FOR CLASSIFICATION USING SVM



SUPPORT VECTOR MACHINE(SVM):

When your data has exactly two classes and support vector machine used.

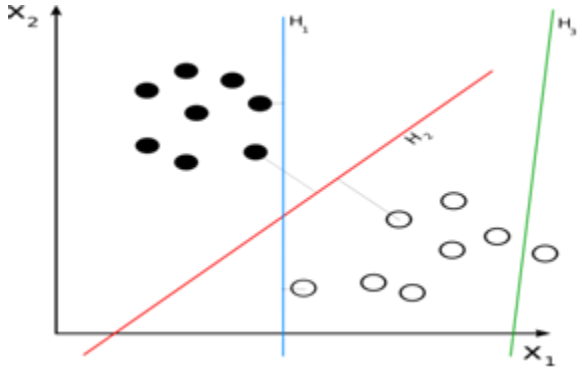


IMAGE ACQUISITION:

The image acquisition stage is the first stage of any vision system. in real-time application. Photographs of rice plant leaves are collected using a high-resolution digital camera. In addition, this stage includes the preprocessing undertaking, for example, image, and scaling. A dataset containing the image of both normal and diseased leaves was in the analysis process.

PRE-PROCESSING:

An input image has some unwanted noise as well as redundancy present in it. Images in the dataset were scaled to a uniform size of 300x450 pixels to limit demands for storage and processing power. It is a sort of signal dispensationin which the input is the image, like a video edge or photo and the result may be a picture or characteristics related to that image. Accordingly. The RGB image was first converted into HSV images next, the S value (saturation) was used to account for the presence of excess exposure.

FEATURE EXTRACTION:

Extracting the relevant information from the input images Is called a process of feature extraction. The color was also used to define share and feature. The importance of feature data. Component extraction is a core limit in various image-processing applications like Remork detecting, biomedical imaging, and object-based image. Using GLCM features image analysis techniques are used to extract contrast, correlation, and homogeneity of the image.

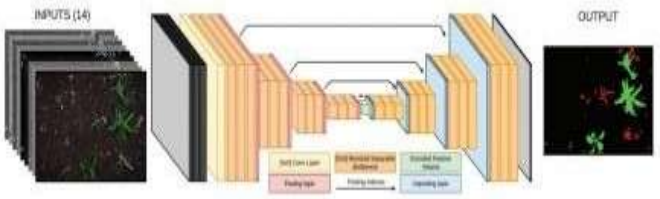
SEGMENTATION

The main goal of the segmentation is to extract meaningful and useful information from the iq2mage concerning certain features. The centroid value was used to make accurate segments for resolution randomness issues by constructing a histogram of hue components. It is a standout among the most troublesome errands in computerizedimage processing. When your data has exactly two classes Support vector machine (SVM) is used

CLASSIFICATION:

The classification technique is used for both the training and testing process. A time training model was then used to determine how well the model could be generalized to different plant species datasets. So the support vector machine technology is used for the classification of leaf disease. The trained classifier is used to group different pictures. For this purpose, the training image was divided into two denoted as ds1 and ds2. SVM is a binary classifier that used a hyperplane this hyper plan is a line in each class way

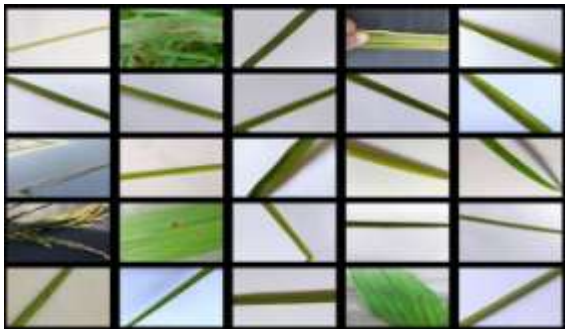
Architecture for pixel-wise segmentation

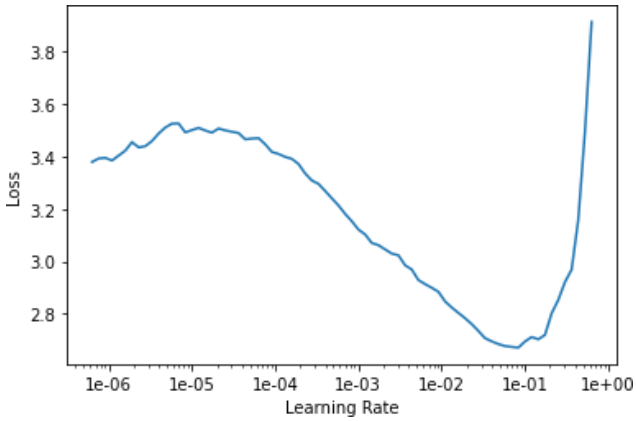


EXPERIMENTAL RESULT:

The system accepts the input image, these images are unknown to the SVM classifier compares the image feature based on the previously Trained image feature, and produce the output. The input leaf Image for the system taken are The image was classified into 8 classes: bacterial leaf blight, brown spot, false smut, healthy, Hispa, leaf blast, neck blast, and sheath blight rot.

Sample for disease detection in paddy leaves.





CONCLUSION:

Detection & identification of leaf disease using multiclass SVM plays a very important role in agricultural solutions to their problems. the algorithm predicted the rice leaf disease with varying degrees of accuracy. It is observed that the CNN model with a high-level fusion technique is the best solution with test accuracy exhibiting. This approach facilitates the use of simplistic statistical learning techniques together with a decreased computational workload to ensure both high efficiency and high classification accuracy. Overall results indicate that deep-based semantic segmentation of paddy crops and weeds can be used. And this is towards safe food production. the pre-trained U Net model was chosen for feature extraction since it provided a promising performance in the general texture dataset evaluation and exhibited the smallestprocessing time. Hence in future work, the quality of the solution image will be improved by using the quality of the enhancement methods. Also, the proposed method will be used for crop weed segmentation in multi-spectral images.

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