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A DEEP LEARNING ALGORITHM FOR AGRICULTURAL PEST IDENTIFICATIONAND PESTICIDE RECOMMENDATION

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ABSTRACT

Tree physiology and condition are closely correlated with the immediate environment and therefore is linked to climate effects in that environment. Automatic plant disease identification and recognition tools have proved to be a valuable source of data that assist decision making in farms. Artificial intelligence tools like Deep learning and Convolutional Neural Network (CNN) are gaining popularity in this field as they provide optimum solution for plant disease identification. Earlier, pest detection was done by manual observation. This method is arduous and prone to error. Several plant diseases cannot be recognized by bare human eyes. Early disease occurrences are minute in nature. In order to improve the quality of production and yield in plants, it is essential to identify the symptoms in their initial stages and treat the diseases. Diagnosis is always a concern for farmers in India. At the same time due to fear of attack of pests/diseases, farmer uniformly sprays pesticides/fertilizers in whole farm which may lead to damage of soil as well as plant. The aim of this project is to make the farmer to spray a limited and enough pesticide/fertilizer at a specified target area where either pest/disease is present or maybe an occurrence of attack in future. In this project we can implement features extraction and classification algorithm to identify the tree leaves diseases and recommends the fertilizers to provide alert system.

Keywords: **Agriculturalpest super-resolution classification, object instance segmentation, deep learning, quadra attention, residual and dense fusion.**

INTRODUCTION

The accelerated population growth and the continuous shortage of labor in the area of agriculture, are two of the main motivations for the growingly interest in the area of robotics and precision farming. Here, agricultural vehicles play a very important role, and a lot of research activities related to navigation, path planning and control have been increasingly taking place in the past recent years. For instance, presents a new concept with a fleet of small robots providing a solution for soil compaction in a scalable and energy-efficiently manner. In the same line of small vehicles, here we present a controller for a skid-steered robot used for corn seeding tasks.

The production of crops is associate with many factors, for example, climate change, plant diseases, and insect pests. According to recent researches, about half of the crop yield in the world is lost to pest infestations and crop diseases. Crop pests cause significant damage to crops and mainly affect the productivity of crop yield, whether in developing or developed countries. Hence, it is of great significance to identify insects in the crops at an early stage and select optimal treatments, which is an important prerequisite for reducing crop loss and pesticide use. There are too many types of insects and the number of individuals which belongs to the same species is enormous. However, traditional pest identification of insects is typically time-consuming and inefficient. Therefore, in order to improve the efficiency of agricultural production, a new effective recognition method should be proposed.

In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Images are also processed as three-dimensional signals with the third-dimension being time or the z-axis. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging. Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans). In modern sciences and technologies, images also gain much broader scopes due to the evergrowing importance of scientific visualization (of often large-scale complex scientific/experimental data). Examples include microarray data in genetic research, or real-time multi-asset portfolio trading in finance. Image analysis is the extraction of meaningful information from images; mainly from digital images by means of digital image processing techniques. Image analysis tasks can be as simple as reading bar coded tags or as sophisticated as identifying a person from their face.

One of the most useful tasks drones can take on is remote monitoring and analysis of fields and crops. Imagine the benefits of using a small fleet of drones instead of a team of workers spending hours on their feet or in a vehicle travelling back and forth across the field to visually check crop conditions. This is where the connected farm is essential, as all this data needs to be seen to be useful. Farmers can review the data, and only make personal trips out into the fields when there is a specific issue that needs their attention, rather than wasting time and effort by tending to healthy plants.

The majorities of the solutions mentioned above are either used for trajectory tracking or require complex operations. This means that using embedded control units (ECU) with limited resources may not provide enough computing power. Therefore, the motivation for the solution presented here was to find a more practical approach for path following control in order to provide a way to simplify the design and implementation by using less complex modeling and operations. This comes with the cost of not considering non-linearities and uncertainties in the model which might lead to instability in terrains where the slippage is very high, or in situations where one wheel loses contact with the terrain. Nevertheless, the simplified optimal problem presented here, allows for the use of only one ECU with limited resources and might cover the big majority of terrain situations. Here, we present a linear solution with an optimal controller, applied to a first order digital model approximation based on the kinematics presented, that calculates the parameters online based on the speed changes.

We have therefore created an automated robotic system that can spray pesticides in restricted quantities only if pests are discovered to solve the above-mentioned problems. Not only does this save the farmer from life-threatening illnesses and physical issues, but it also saves his cash because of restricted pesticide use. That is why it helps farmers, in turn the nation, to develop economically. Using this form of robots Time consumption is decreased in spraying the pesticide liquid and it will also assist farmers to decrease the workload and in any season and conditions to do job.

In India, farming is performed using worldly methods. The absence of adequate understanding for most of our farmers makes it even more erratic. The projections are based on a big part of farming and agricultural Operations, which sometimes fail. Farmers must bear enormous losses and sometimes the source of suicide. Since we know the advantages of proper soil moisture and its consistency, air quality and irrigation, these criteria cannot be ignored in crop growth. Therefore, we produced a fresh concept of using IoT to monitor crops and to use intelligent farming. Because of its reliability and remote monitoring, we think our idea will be a benchmark in the agribusiness. Our concept is digitalization of agriculture and farming operations so farmers can track crop requirements and predict their development correctly. Surely this idea will speed up their company to achieve new heights and be more lucrative as well. Implementing our project relies mainly on farmers consciousness, which we think will be readily generated owing to its countless benefits.

EXISTING SYSTEM

Leaves are the most obvious and widespread choice for tree species recognition, even though the botanical classification was not built upon their properties. They can be found almost all year long, are easy to photograph, and their shapes present well studied specificities that make the identification, if not trivial, possible. Digital image processing will improve the quality of the image by removing noise & other unwanted pixels and obtain more information from image. Image segmentation is a mid-level processing technique used to analyze the image and can be used to classify or cluster an image into several disjoint parts by grouping the pixels to form a region of homogeneity based on the pixel characteristics like gray level, color, texture, intensity and other features. The main purpose of the segmentation process is to get more information about the image, the region we are interested in and to clearly differentiate the object and the background

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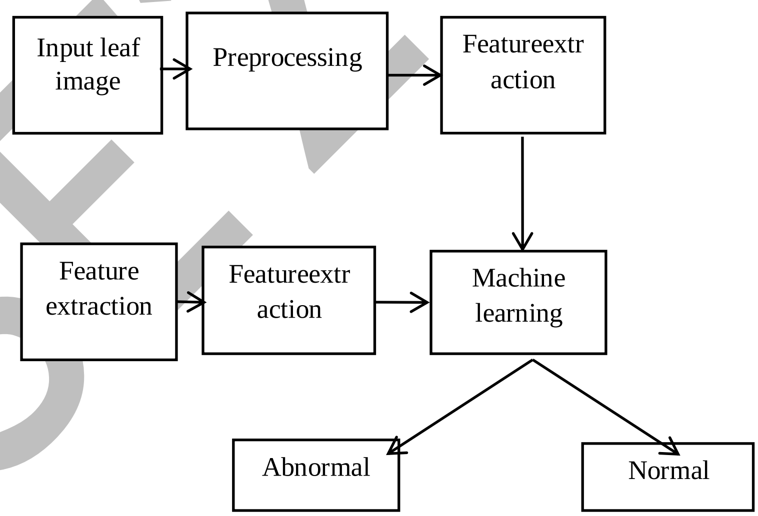
in an image. The criteria for segmenting the image is very hard to decide as it varies from image to image and also varies significantly on the modal quality of image. In some cases interactive methods can be laborious and time consuming and in some cases manual interaction to segment the image may be error-prone while the fully automated approach can give error output. Machine Learning and Artificial Intelligence are applied in agriculture for several purposes. IoT in combination with machine learning can also help control of farm equipment thereby creating a smart farm environment. The flexibility of manual control based on the processed data received will be of great help to the farmers to even remotely access the farm equipment.

BLOCK DIAGRAM

PROPOSED SYSTEM

*E*ven when considering trees only, leaves show an impressively wide variety in shapes. It is however necessary to come up with a representation of what a leaf is, that is accurate enough to be fitted to basically any kind of leaf. The general shape of a leaf is a key component of the process of identifying a leaf. Botanists have a whole set of terms describing either the shape of a simple leaf, of the lobes of a palmate leaf, or of the leaflets of a compound leaf. The problem being that the borders between the different terms are not well defined, since leaves can naturally have non-canonical, intermediate shapes. The margin of the leaf is also a very important feature to spot. Its shape can be determining when trying to discriminate two species that have more or less the same global shape. It may consist of teeth of various sizes and frequencies, regularly arranged or not, from large spiny points, to small regular saw-like teeth, or even to a smooth entire border. We present a study on segmentation of leaf images restricted to semi-controlled conditions, in which leaves are photographed against a solid light-colored background. Such images can be used in practice for plant species identification, by analyzing the distinctive shapes of the leaves. We restrict our attention to segmentation in this semi -controlled condition, providing us with a more well-defined problem, which at the same time presents several challenges. The most important of these are: the variety of leaf shapes, inevitable presence of shadows and secularities and the time constraints required by interactive species identification applications. We evaluate several popular segmentation algorithms on this task. In everyday more urbanized and artificial world, the knowledge of plants, that used to constitute our most immediate environment, has somehow been lost, except for a handful of specialists. What is allegedly seen as unquestionable progress also scattered away the names and uses of so many trees, flowers and herbs. But nowadays, with a certain resurgence of the idea that plant resources and diversity ought to be treasured, the will to regain some touch with nature feels more and more tangible. And making it possible, for whoever feels the need, to identify a plant species, to learn its history and properties, is as much a way to transmit a vanished knowledge, as to allow people to get a glance at nature's unfathomable richness. The identification of species is the first and essential key to understand the plant environment. Botanists traditionally rely on the aspect and composition of fruits, flowers and leaves to identify species. But in the context of a widespread non-specialist-oriented application, the predominant use of leaves, which are possible to find almost all year long, simple to photograph, and easier to analyze



from two-dimensional images, is the most sensible and widely used approach in image processing. In the process of tree identification from pictures of leaves in a natural background, retrieving an accurate contour is a challenging and crucial issue. In this paper we introduce a method designed to deal with the obstacles raised by such complex images, for simple and lobed tree leaves.

A first segmentation step based on a light polygonal leaf model is first performed, and later used to guide the evolution of an active contour. Combining global shape descriptors given by the polygonal model with local curvature-based features, the leaves are then classified over leaf datasets. In this project we introduce a method designed to deal with the obstacles raised by such complex images, for simple and lobed tree leaves. A first segmentation step based on graph cut approach is first performed, and later used to guide the evolution of leaf boundaries. And implement classification algorithm to classify the

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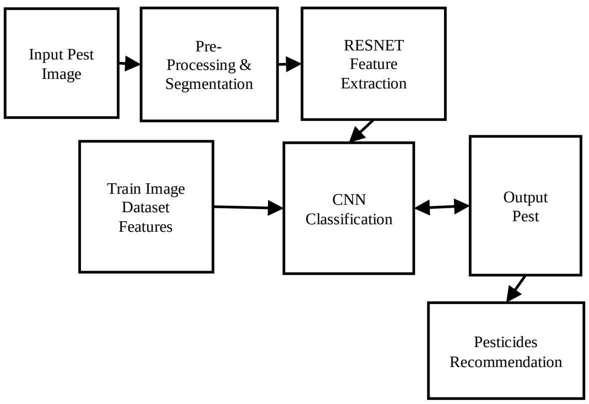
diseases and recommend the fertilizers to affected leaves.

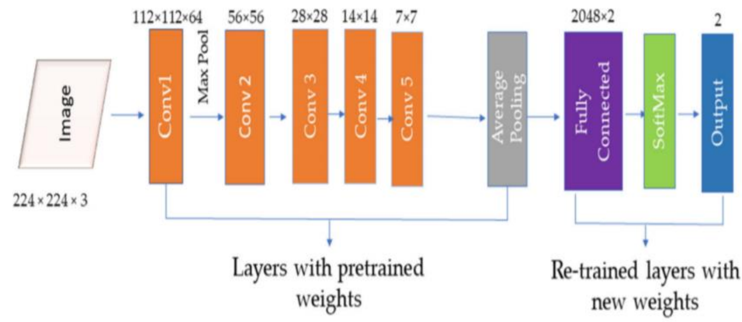
BLOCK DIAGRAM



In this architecture, we can split the diagram into two phases such as training and testing phase. In training phase, user upload leaf dataset and also implement preprocessing steps to eliminate the noises in images. Then perform segmentation algorithm to cluster the leaf and label the diseases. In testing phase, user input the leaf and classifies the diseases with improved accuracy rate.

OVERALL ARCHITECTURE

Our proposed RESNET consists of a generator and discriminator. The generator network of our RESNET is shown in Figure 1; low-resolution images were put into the generator network and divided into two branches. One was put into the upscale module after the first convolution layer in the generator network and then, this branch went through the self-attention module. The other was fed into the reconstruction net to predict the details after went through the second convolution layer and PReLU activation layer. And the reconstruction net used the global residual learning and combined the upscaled images and edges with the predicted details before a convolution layer to generate the high-resolution images.



The customized architecture deployed in the proposed RESNET

To discriminate real high-resolution (HR) images from generated super-resolution (SR) images. Here we use Leaky- ReLUactivation and avoid max-pooling throughout the network. The discriminator network is trained to solve the maximization problem. It is made up of seven convolutional layers with an increasing number of filter kernels, increasing by a factor of 2 from 64 to 512 kernels. Stridden convolutions are used to reduce the image resolution each time the number of features is doubled. The resulting 512 feature maps are followed by a final ReLu activation function and two linear layers to obtain the probability for sample classification.

RESIDUAL AND DENSE FUSION

With the deepening of the network, the phenomenon that the accuracy of the training dataset decreases and the error of rate rises is the problem of degeneration. It stands to reason that a deeper model should not have a higher error rate than its shallower model. This is not due to over fitting, but because when the model is complex, optimization becomes more difficult, resulting in a model that is not good

.*RESULT AND DISCUSSION*

The false rejection rate is the measure of the likelihood that the disease prediction will incorrectly reject an access attempt by correct diseases. A system's FRR typically is stated as the ratio of the number of false rejections divided by the number of disease prediction

FALSE REJECT RATE = FN / (TP+FN)

FN =Genuine Scores Exceeding Threshold

TP+FN = All Genuine Scores

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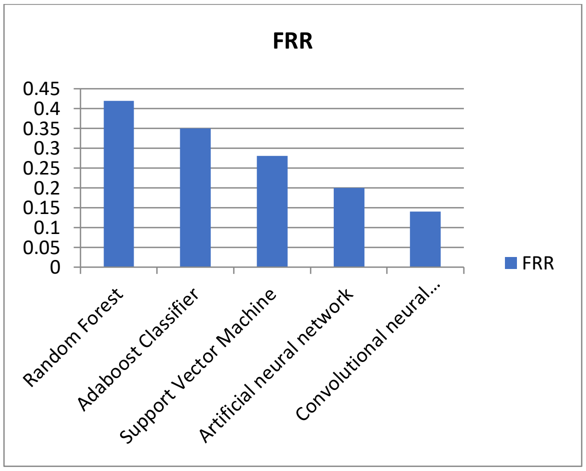
The proposed system can be provide less number of rejection rate than the existing algorithms such as Support Vector Machine, Random forest,Adaboostclassifier and Convolutional neural network algorithm



CONCLUSION AND FUTURE ENHANCEMENT

In this project, we overview the various techniques and algorithms are proposed for segmentation and classification methods for improve the quality of segmentation. But the result shows that segmentation algorithms do not work properly and can't implement in large datasets rather than proposed graph cut model. We have presented a method designed to perform the segmentation of a leaf in a natural scene, based on the optimization of a polygonal leaf model used as a shape prior for an exact active contour segmentation. It also provides a set of global geometric descriptors that, later combined with local curvature-based features extracted on the final contour, make the classification into tree species possible. The segmentation process is based on a color model that is robust touncontrolled lighting conditions. But a global color model for a whole image may sometimes not be enough, for leaves that are not well defined by color only. The use of an additional texture model or of an adaptive color model could lead to a good improvement. Finally implement neural network classification algorithm to classify the leaf diseases as bacteria, fungi and virus. Then recommend the fertilizers to affected leaves based on measurements

FUTURE ENHANCEMENT

We can extend the framework to implement various classification algorithms and also classify the diseases not only leaves also in various vegetables and fruits with improved accuracy rate

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