Sugarcane Leaf Disease Detection

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Abstract - *India is a cultivated country and agriculture has a huge share in the economy of India. Since sugarcane is a perennial crop, it is cultivated on a large scale in agriculture. Less labor and high yields have resulted in more farming. But natural disaster, crop pests, planting costs, pesticide spraying, and wage reduction benefits are very low. It also decreases the quality of the crop due to crop disease. It is important to identify and control disease in order to increase the quality of the crop and its yield. Therefore, it is possible to increase the yield and quality by proper medication. It is possible to diagnose disease through our system at least in the near future. By adopting various methods, we will try to diagnose the disease. In this paper, we propose a system which will help farmers to detect the disease at early stages to minimize the loss. For detecting the disease we have used a hidden Markov model and anisotropic diffusion algorithm. The proposed system can detect disease with 75% accuracy.*

*Key Words***:** Disease detection, Spot disease, Sugarcane disease, Agriculture, Image processing.

1. INTRODUCTION

Sugarcane is a renewable, natural agricultural resource because it produces sugar, biofuel, fiber, fertilizer. Sugarcane juice is used for making white sugar, brown sugar (Khandsari), Jaggery (Gur) and ethanol. We also get bagasse and molasses as a byproduct of sugarcane. Molasses is can be used as raw material in preparation of alcohol. Excess bagasse is now used as raw material in the paper industry. The disease on sugarcane is not only affecting the production but also degrade the variety. To minimize this we need to detect the infection on yield and treated earlier.

There are various types of diseases but major 3 diseases are rust spots, yellow spot and ring spot.This diseases can be identified by spots of sugarcane leaf. It is possible to identify the disease by the naked eye but the identification using system will give a best-estimated result. The current system uses the digital image of leaf to detect disease but it will not possible for everyone to get a high definition digital image. We proposed a new system to detect and classify the disease using a hidden Markov model and anisotropic diffusion algorithm. The system will allow the user to capture an image using a mobile camera as well as the image can be selected from the gallery.

2. LITERATURE SURVEY

1. In the paper Sugarcane leaf disease detection and severity estimation based on segmented spots image by Evy Kamilah Ratnasari, Mustika Mentari, R. V. Hari Ginardi, Ratih Kartika Dewi they propose a model to identify the disease based on spots on leaves. From L*a*b color space they get a segmented spot by thresholding a* component and they used different classification method to detect the exact type of disease.

2. In the paper Red edge point detection for mulberry leaf by Kavita Bhosle, Vijaya Musande they used various techniques to finding stress on mulberry, cotton and sugarcane plants as peak derivative, linear interpolation, linear extrapolation. They also calculated the dryness of plant using remote sensing the data.

3. In the paper Detection of an unhealthy region of plant leaves using image processing and genetic algorithm by Vijai Singh, Varsha, A K Misra they have used a genetic algorithm for image segmentation to detect the disease in a plant.

4. In the paper Plant, Leaf Disease Detection and Classification Based on CNN with LVQ Algorithm by Melike Sardogan, Adem Tuncer, Yunus Ozen they used a convolutional neural network for extraction of spots on leaves and classification disease. Further, they used the Learning Vector Quantization algorithm for training the network of convolution part.

3. METHODOLOGY

We have studied different paper on disease detection and we decided to use the Hidden Markov Model, Anisotropic Diffusion Algorithm and Convolutional Neural Network. Using the system user is able to detect the disease in 2 approach - select symptoms by comparing sugarcane (static approach) and select image from gallery or capture an image directly using a camera (dynamic approach). The basic equation of anisotropic diffusion equation is presented as:

$$\frac{\partial I}{\partial t} = \mathrm{div}\left(c(x,y,t)\nabla I\right) = \nabla c \cdot \nabla I + c(x,y,t)\Delta I$$

It helps to remove noise from the digital image without blurring edges. Using edge seeking diffusion coefficient for a certain number of iteration it detects the edges. Anisotropic diffusion is regularly executed by methods for a guess of the summed up dispersion condition: each new picture in the family is processed by applying this condition to the last picture. Hence, anisotropic diffusion is an iterative procedure where a moderately basic arrangement of calculations are utilized to figure each progressive picture in the family and this procedure proceeds until an adequate level of smoothing is obtained.

The Hidden Markov Model is used for image segmentation. It works pixel by pixel for selecting the pixel from the digital image for processing. After selecting the necessary part i.e diseased part, we mask the green part of a leaf. It results in an enhanced image of a leaf (image 1). A concealed Markov model can be viewed as speculation of a blended display where the shrouded factors (or inactive factors), which control the blended segment to be chosen for every perception, are connected through a Markov procedure as opposed to free of one another.

$$(f * g)(t) \stackrel{\mathrm{def}}{=} \int_{-\infty}^{\infty} f(\tau)\, g(t - \tau)\, d\tau$$

The equation used for convolutional neural network. It reduces the preprocessing compared to other algorithms of image classification. The prior knowledge and human effort in design is a major advantage for the classification of the images. A convolutional neural system comprises of information and a yield layer, just as various shrouded layers. The concealed layers of a CNN normally comprise of convolutional layers, RELU layer, for example, initiation work, pooling layers, completely associated layers, and standardization layers. Depiction of the procedure as a convolution in neural systems is by tradition. Scientifically it is a cross-relationship as opposed to a convolution.
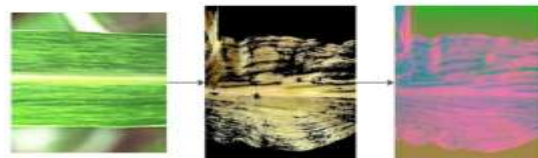

Fig.1.: Preprocessed leaf

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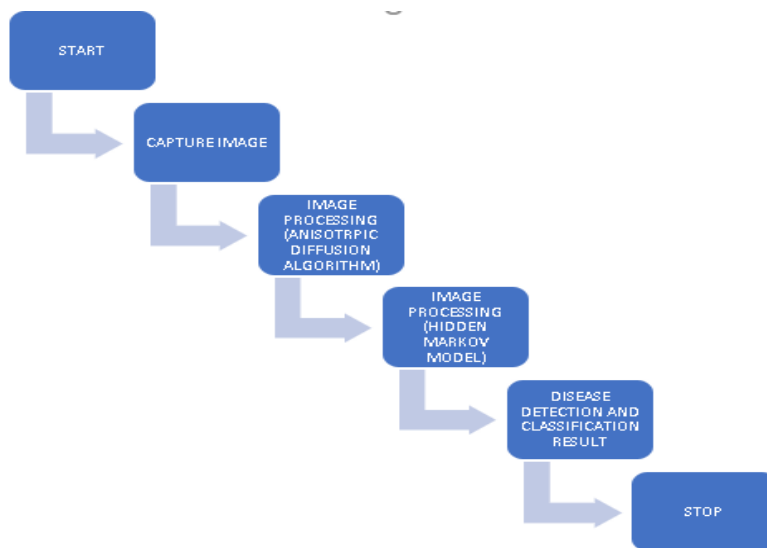
4.1 FLOW OF THE SYSTEM

Fig.2. : Flowchart of the system

The comparison of different diseases based on the symptoms is shown as below:

Table(a): Comparison of Diseases on symptoms

Disease Symptoms/ Disease Name	Dried Leaves	Internal Red Tissues	shrinkage of Cane	Yellow Leaves	Thin canes	Elongated/ Reduced Internodes	Pale Green leaf
Red Rot	*	*					
Wilt	*		*	*			
Grassy Shot			*	*			
Mossaic Shot	*	*					
PokkahBoeng	*		*				
Rust				*			
Yellow Leaves				*			
Smut					*	*	
Leaf Scald Disease							*
Red Striped Disease	*	*		*			

4. CONCLUSION

Many farmers spend money on disease management but without adequate technical support it results in poor disease control. The proposed approach helps farmers to detect disease more correctly with less effort. It reduces the time required to detect the disease. The application also provides prevention and treatment methodologies. The application can be used in both ways online as well as offline. The application can be developed in multiple languages understood by farmers as per their requirement or region. In future, if they need any help we can add a contact of the nearest offices with their permission for guidance.

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