DETECTION AND MEASUREMENT OF PADDY LEAF DISEASE USING SVM CLASSIFIER

A Project Report

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In

Electronics and Communication Engineering

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CERTIFICATE

This is to certify that the project report entitled **“Detection and Measurement of paddy leaf disease using SVM Classifier”** is a Bonfire record of work carried out by **B.Naga Mani (19481A0417**), **Abdul Sattar(20485A0401**), **Ch.Jaimini Sowmya (19481A0444**), **Ravi Kiran (19481A0460**) under my guidance and supervision in partial fulfillment of the requirements, for the award of the **Degree of Bachelor of Technology in Electronics and Communication Engineering by Jawaharlal Nehru Technological University, Kakinada.**

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ABSTRACT

Rice is one of the staple foods of the world. But the production of rice is hampered by various kind of paddy diseases. One of the main diseases of paddy is leaf disease. Generally, it is very time-consuming and laborious for farmers of remote areas to identify paddy leaf diseases due to unavailability of experts. Though experts are available in some areas, disease detection is performed by naked eye which causes inappropriate recognition sometimes. An automated system can minimize these problems. In this paper, an automated system is proposed for diagnosis three common paddy leaf diseases (Brown spot, Leaf blast, and narrow_bs) and pesticides and/or fertilizers are advised according to the severity of the diseases. K-means clustering isused for separating affected part from paddy leaf image. Visual contents (color,texture, and shape) are used as features for classifification of these diseases. The type of paddy leaf diseases is recognized by Support Vector Machine (SVM) classifier. After recognition, the predictive remedy is suggested that can help agriculture related people and organizations to take appropriate actions against these diseases

CHAPTER-01 INTRODUCTIO

1.1Background

Image:

An image, from Latin word imago, is an artifact that depicts visual perception, such as a photograph or other two-dimensional picture, that resembles a subject usually a physical object and thus provides a depiction of it. In the context of signal processing, an image is a distributed amplitude of colors. A pictorial script is a writing system that employs images as symbols for various semantic entities, rather than the abstract signs used by alphabets.

Images may be two or three-dimensional, such as a photograph or screen display, or three-dimensional, such as a statue or hologram. They may be captured by optical devices such as cameras, mirrors, lenses, telescopes, microscopes, etc. and natural objects and phenomena, such as the human eye or water.

1.1.1Types of Images:

Based on Colour scale, Images are divided into three types

- Binary Scale
- Grey Scale
- RGB Image

Binary Scale Image:

It is the simplest type of image. It takes only two values i.e, Black and White or 0 and 1. The binary image consists of a 1-bit image and it takes only 1 binary digit to represent a pixel. Binary images are mostly used for general shape or outline. Example of Binary image is shown in the Fig 1.1.

Example: Optical Character Recognition (OCR).Binary images are generated using threshold operation. When a pixel is above the threshold value, then it is turned white('1') and which are below the threshold value then they are turned black('0').

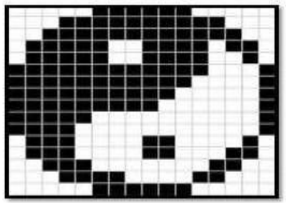


Figure 1.1: Binary Image

Gray Scale Image:

Gray scale images are monochrome images, Means they have only one color. Gray scale images do not contain any information about color. Each pixel determines available different gray levels. A normal gray scale image contains 8 bits/pixel data, which has 256 different gray levels. In medical images and astronomy, 12 or 16 bits/pixel images are used. Example for Gray scale image is shown in Fig 1.1

Figure 1.2: Gray Scale Image

Colour Image:

Colour images are three band monochrome images in which, each band contains a different color and the actual information is stored in the digital image. The color images contain gray level information in each spectral band.

The images are represented as red, green and blue (RGB images). And each color image has 24 bits/pixel means 8 bits for each of the three color band (RGB). Fig 1.3 is the example for the Colour image.

1.1.2Concept of pixels:

In digital imaging, a pixel or picture is a smallest addressable element in a raster image, or the smallest addressable element in an all points addressable display device; so it is the smallest controllable element of a picture represented on the screen.

Each pixel is a sample of an original image; more samples typically provide more accurate representations of the original. The intensity of each pixel is variable. In color imaging systems, a color is typically represented by three or four component intensities such as red, green, and blue, or cyan, magenta, yellow, and black.

In some contexts (such as descriptions of camera sensors), pixel refers to a single scalar element of a multi-component representation (called a photosite in the camera sensor context, although sensel is sometimes used), while in yet other contexts it may refer to the set of component intensities for a spatial position.

The word pixel is a combination of pix (from "pictures", shortened to "pics") and el (for "element") similar formations with 'el' include the words voxel and texel. Pixel is shown in the below figure 1.4.

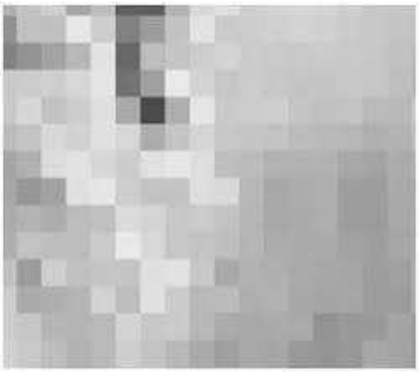


Figure 1.4: Pixel

1.1.3Image Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

Image Processing Overview:

Image processing basically includes the following three steps,

- Importing the image via image acquisition tools.
- Analyzing and manipulating the image.
- Output in which result can be altered image or report that is based on image analysis.

Types of Image Processing:

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction

Analogue Image Processing:

In electrical engineering and computer science, analog image processing is any image processing task conducted on two-dimensional analog signals by analog means (as opposed to digital image processing). Basically any data can be represented in two types named as 1.Analog 2.Digital if the pictorial representation of the data represented in analog wave formats that can be named as analog image. E.g.: television broadcasting in older days through the dish antenna systems. Whereas the digital representation or storing the data in digital form is termed as a digital image processing E.g.: Image data stored in digital logic gates.

Digital Image Processing:

Digital image processing is the use of a digital computer to process digital images through an algorithm. As a sub-category or field of digital signal processing, digital image. processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and distortion during processing. Since images are defined over two dimensions digital image processing may be modeled in the form of multidimensional systems. The generation and development of digital image processing are mainly affected by three factors: first, the development of computers; second, the development of mathematics third.

1.2 Aim of this Project

The main objective of this research is to develop a data mining system to detect the paddy disease which are paddy Blast,narrow_bs,brown_spot. The Methodology involves image acquisition preprocessing and segmentation analysis and classification of the paddy disease. Describes the specific symptoms and signs of rice disease. To know the art of plant disease diagnosis and the importance of correct diagnosis.

1.2.1 Applications of Image Processing:

Due to their flexibility, Image processing is fit for many different fields

Image sharpening- Image sharpening refers to any enhancement technique that highlights edges and fine details in an image. Image sharpening is widely used in printing and photographic industries for increasing the local contrast and sharpening the images. Increasing yields a more sharpened image.

Image restoration- Image restoration is a challenging task in the field of Image processing. The process of recovering such degraded or corrupted image is called Image Restoration. Restoration process improves the appearance of the image. The degraded image is the convolution of the original image, degraded function, and additive noise.

Medical field- Medical image processing encompasses the use and exploration of 3D image datasets of the human body, obtained most commonly from a Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) scanner to diagnose pathologies or guide medical interventions such as surgical planning, or for research purposes.

Remote sensing- Many image processing and analysis techniques have been developed to aid the interpretation of remote sensing images and to extract as much information as possible from the images. The choice of specific techniques or algorithms to use depends on the goals of each individual project.

Transmission and encoding- Progressive image transmission is a method of encoding, transmitting, and decoding digitized data representing an image in such a way that the main features of the image, for example outlines, may be displayed first at low resolution and subsequently refined to higher and higher resolution.

Machine/Robot vision- Robot Vision involves using a combination of camera hardware and computer algorithms to allow robots to process visual data from the world. For example, your system could have a 2D camera which detects an object for the robot to pick up. Without Robot Vision, your robot is essentially blind.

Color processing- Color is a sensation caused by the activation of cone photoreceptors (Photoreceptors) in the retina and the subsequent processing of this activation pattern in the cerebral cortex. The physical property most closely related to color is the reflectance spectrum of a surface.

Pattern recognition- Pattern recognition is used to give human recognition intelligence to machine which is required in image processing. Pattern recognition is used to extract meaningful features from given image/video samples and is used in computer vision for various applications like biological and biomedical imaging.

Video processing- video processing is a particular case of signal processing, in particular image processing, which often employs video filters and where the input and output signals are video files or video streams. Video processing techniques are used in television sets, VCRs, DVDs, video codecs, video players, video scalars and other devices.

Hi-res images are at least 300 pixels per inch (ppi). This resolution makes for good print quality, and is pretty much a requirement for anything that you want hard copies of, especially to represent your brand or other important printed materials.

1.3 Methodology

Data Collection: Collect a dataset of images of paddy leaves both infected and healthy. You can obtain these images by visiting paddy fields or collecting samples from farmers.

Image Preprocessing: Preprocess the collected images to improve their quality, enhance their features, and eliminate noise. Some common techniques for image preprocessing include resizing, color correction, contrast adjustment, and filtering.Image Preprocessing: Preprocess the collected images to improve their quality, enhance their features, and eliminate noise. Some common techniques for image preprocessing include resizing, color correction, contrast adjustment, and filtering.

Model Development: Train an SVM classifier using the selected features. SVM is a powerful machine learning algorithm that can accurately classify data into different categories. You can use libraries such as scikit-learn in Python to develop the SVM classifier.

Model Evaluation: Evaluate the performance of the SVM classifier using various metrics such as accuracy, precision, recall, and F1 score. You can also use techniques such as cross-validation to ensure that the model is not overfitting or underfitting.

Disease Detection and Measurement: Finally, use the trained SVM classifier to detect and measure the severity of paddy leaf disease in new images. You can use the classifier to classify new images as healthy or infected and measure the extent of infection using techniques such as image segmentation and object detection.

1.4 Significance of this work

The detection and measurement of paddy leaf disease using SVM classifier is significant for several reasons:

Early Detection: Early detection of paddy leaf disease can help farmers take necessary preventive measures to control the spread of the disease. By using SVM classifier, we can accurately detect the presence of the disease in its early stages, enabling timely intervention.

Increased Yield: Paddy leaf disease can cause significant yield loss, leading to a decrease in income for farmers. By detecting and measuring the severity of the disease accurately, farmers can take appropriate measures to reduce crop loss and increase yield.

Cost-Effective: Traditional methods of disease detection involve manual inspection of crops, which can be time-consuming and expensive. SVM classifier-based detection is a cost-effective and efficient method that can detect diseases accurately and quickly.

Precision Farming: Precision farming involves using technology to optimize crop production and minimize waste. By using SVM classifier to detect and measure paddy leaf disease, farmers can adopt precision farming techniques and reduce the use of pesticides and other harmful chemicals.

Sustainable Agriculture: Sustainable agriculture involves using methods that are environmentally friendly and economically viable. By detecting and measuring paddy leaf disease accurately, farmers can adopt sustainable agricultural practices, such as using biocontrol agents, to control the spread of the disease.

Overall, the detection and measurement of paddy leaf disease using SVM classifier is significant for ensuring food security, increasing yield, and promoting sustainable agriculture.

1.5 Outline of this Report

Overview of paddy leaf disease detection and measurement, Importance of early detection and accurate measurement.

The objective of the project "Detection and Measurement of Paddy Leaf Disease using SVM Classifier" is to develop a machine learning model that can accurately detect and measure different types of paddy leaf diseases using the SVM classifier algorithm. The scope of the project includes:

Data Collection: Collecting a large and diverse dataset of paddy leaf images with different types ofdiseases, including bacterial leaf blight, blast, sheath blight, brown spot, and narrow brown spot.

Preprocessing: Preprocessing the collected data, including image resizing, normalization, andaugmentation to prepare the dataset for the SVM classifier.

Feature Extraction: Extracting relevant features from the preprocessed images, such as color, texture,and shape features, to use as input for the SVM classifier.

Model Training: Training the SVM classifier model using the extracted features and a subset of thedataset as training data.

Model Evaluation: Evaluating the performance of the SVM classifier model using a separate subset ofthe dataset as testing data and metrics such as accuracy, precision, and recall.

Disease Detection and Measurement: Using the trained SVM classifier model to detect and measure paddy leaf diseases in new images and providing the user with information on the type and severity of the disease.

The project aims to provide a reliable and accurate tool for farmers and agricultural researchers to detect and manage paddy leaf diseases, which can lead to significant yield losses and economic impacts. The developed SVM classifier model can also be used as a basis for further research in the field of machine learning and agriculture.

1.6 Conclusion

This chapter gives the brief explanation of this project like what is it about and what are going to do.

Advantages of detecting and measuring paddy leaf disease using SVM classifier:

- **Accuracy:** SVM is known for its high accuracy in classification tasks. This can help ensure accuratedetection and measurement of paddy leaf diseases.
- **Efficiency:** SVM is also known for its efficiency in handling high-dimensional data. This can be helpfulwhen dealing with large datasets in detecting and measuring paddy leaf diseases.
- **Generalization:** SVM has good generalization properties, meaning it can perform well on unseen data.This can be useful when applying the model to real-world situations.
- **Robustness:** SVM is relatively robust to noise and can handle outliers well. This can help in ensuringreliable results in detecting and measuring paddy leaf diseases.

Disadvantages of detecting and measuring paddy leaf disease using SVM classifier:

- **Training time:** SVM can have longer training times compared to other classification algorithms. This can be a disadvantage when dealing with large datasets.
- **Parameter tuning:** SVM requires careful parameter tuning, which can be time-consuming and requiresexpert knowledge.
- **Interpretability:** SVM models are not easily interpretable, making it difficult to understand how themodel is making its decisions.

Applications of detecting and measuring paddy leaf disease using SVM classifier:

- **Agriculture:** Detecting and measuring paddy leaf diseases using SVM classifier can be useful inagricultural applications, helping farmers identify and treat diseased crops.
- **Environmental monitoring:** SVM classifier can also be used to detect and measure diseases in othertypes of plants, helping to monitor and preserve the environment.
- **Biomedical research:** SVM classifier can be used in biomedical research to identify and classifydifferent types of cells or diseases.

CHAPTER 2

Literature Survey

This chapter briefly reviews, explains and discusses on existing literature review related with the current project which is "Paddy Disease Detection System Using Image Processing" that will be developed later. This chapter comprises three sections. The first section describes the overviews of paddy. The subsections are the definition, type of paddy disease, paddy symptom and paddy management. The second section is the review of some existing system that used same techniques and methods. The third section discusses the review on technique and method used by the system. The subsections are image acquisition, image segmentation and artificial neural network.

2.1 Overview of paddy leaf disease and its impact on agriculture:

Paddy also known as rice is the starchy seeds of an annual Southeast Asian cereal grass (*Oryza sativa*) that are cooked and used for food. This cereal grass that is widely cultivated in warm climates for its seeds and by-products. Rice is one of the most utilized food plants and widely grown originated in ASIA. Rice is an important crop worldwide and over half of the world population relies on it for food. Many people in the world including Malaysia eat rice as staple food.

Paddy leaf disease is a common problem in rice cultivation, which can result in significant yield losses if not managed properly. There are several types of paddy leaf diseases, including bacterial leaf blight, blast, sheath blight, and brown spot, among others.

- Bacterial leaf blight is caused by the bacteria Xanthomonas oryzae and can lead to significant yield losses if not managed effectively. Symptoms of bacterial leaf blight include yellowing and wilting of leaves, water-soaked lesions, and necrosis.
- Blast is caused by the fungus Magnaporthe oryzae and can cause significant yield losses, particularly during the reproductive stage of rice plants. Symptoms of blast include small, oval-shaped lesions on leaves that eventually turn brown and die.
- Sheath blight is caused by the fungus Rhizoctonia solani and can lead to significant yield losses if not managed properly. Symptoms of sheath blight include brownish lesions on the sheaths of rice plants, which can cause lodging and reduce the quality of the rice grains.
- Brown spot is caused by the fungus Bipolaris oryzae and can lead to yield losses if not managed properly. Symptoms of brown spot include small, circular to oval-shaped lesions on the leaves, which can eventually turn brown and cause premature death of the leaves.

The impact of paddy leaf disease on agriculture can be significant, particularly in countries where rice is a staple food. Yield losses due to paddy leaf disease can result in food insecurity, increased prices of rice, and economic losses for farmers. Effective management strategies, including the use of resistant varieties, cultural practices, and chemical control, are essential for reducing the impact of paddy leaf disease on agriculture.

"Arnal barbedo & Jayme Garcia", presents a survey on methods that use digital image processing techniques to detect, quantify and classify plant diseases from digital images in the visible spectrum. Although disease symptoms can manifest in any part of the plant, only methods that explore visible symptoms in leaves and stems were considered. This was done for two main reasons: To limit the length of the paper and because methods dealing with roots, seeds and fruits have some peculiarities that would warrant a specific survey. The selected proposals are divided into three classes according to their objective: detection, severity quantification, and classification. Each of those classes, in turn, are subdivided according to the main technical solution used in the algorithm. This paper is expected to be useful to researchers working both on vegetable pathology and pattern recognition, providing a comprehensive and accessible overview of this important field of research.

"Shenweizheng & wcyachun", Since current grading of plant diseases is mainly based on eyeballing, a new method is developed based on computer image processing. All influencing factors existed in the process of image segmentation was analysed and leaf region was segmented by using Otsu method. In the HSI color system, H component was chosen to segment disease spot to reduce the disturbance of illumination changes and the vein. Then, disease spot regions were segmented by using Sobel operator to examine disease spot edges. Finally, plant diseases are graded by calculating the quotient of disease spot and leaf areas. Researches indicate that this method to grade plant leaf spot diseases is fast and accurate.

"Alhouse, Mark L.G. & Chein-I Chang", Image segmentation is applied widely to image processing and object recognition. Threshold segmentation is a simple and important method in grayscale image segmentation. Information entropy can characterize the grayscale in formation of image and distinguish between the objectives and background. In this paper, we use exponential entropy instead of logarithmic entropy and propose a new multilevel thresholds image segmentation method based on maximum entropy and adaptive Particle Swarm Optimization (APSO). This proposed algorithm takes full account of the spatial information and the grey information to decrease the computing quantity. The APSO takes advantage of the characteristics of particle swarm optimization, through adaptively adjust particles flying speed to improve evolutional process of basic PSO. Standard test images and remote sensing image are segmented in experiment and compared with other related segmentation methods. Experimental results show that the APSO method can quickly converge with high computational efficiency.

" R. Pydipati, T.F. Burks, W.S. Lee" the citrus industry is an important constituent of Florida's overall agricultural economy. Proper disease control measures must be undertaken in citrus groves to minimize losses. Technological strategies using machine vision and artificial intelligence are being investigated to achieve intelligent farming, including early detection of diseases in groves, selective fungicide application, etc. This research used the color co-occurrence method (CCM) to determine whether texture-based hue, saturation, and intensity (HSI) color features in conjunction with statistical classification algorithms could be used to identify diseased and normal citrus leaves under laboratory conditions. The leaf sample discriminant analysis using CCM textural features achieved classification accuracies of over 95% for all classes when using hue and saturation texture features. Data models that relie on intensity features suffered a reduction in classification accuracy when categorizing leaf fronts, due to the darker pigmentation of the leaf fronts. Although, high accuracies were achieved when using an unreduced dataset consisting of all HSI texture features, the overall best performer was determined to be a reduced data model that relied on hue and saturation features.

"J.B. Cunha", The number of applications using machine vision and digital image processing techniques in the agricultural sector is increasing rapidly. These applications include land/aerial remote sensing of crops, detection and recognition of pathological stress conditions, shape and color characterization of fruits, among many other topics. In fact, quantification of the visual properties of horticultural products and plants can play an important role to improve and automate agricultural management tasks. These images are afterwards processed in order to compute some leaf characteristic parameters, such as: leaf area and perimeter, existence of holes, width and length. With the implemented algorithms the errors between the measurements and the real values were typically less than spl mnplus 3% and spl mnplus 2.5% for the area and linear measurements, respectively. These tests and results were realized using sets of known size images and leaf images that were measured with the proposed system and with a commercial calibrated leaf area system LiCor from Delta-T devices.

"K.J. Runtz", It is noted that machine vision systems have the potential as sprayer controllers to reduce farm chemical use and to increase the effectiveness of crop spraying operations. The author examines the issues in developing real-time plant recognition algorithms and associated electronic hardware. A very efficient algorithm for distinguishing between broadleaf and grassy plant species is proposed. Preliminary tests on video images of several types of field crops are reported. These tests show the potential for this and related image processing algorithms as plant classifiers in real-time systems.

" S.Dave and K. Runtz. ", More selective methods for applying agricultural herbicides on fields can result in substantial cost savings. Three image processing methods were tested for their ability to identify four different images of plant species. First two images were different and the other two were similar. The images are pre-processed by segmentation and spatial filtering using the Color Chromaticity Chart. The test results provide evidence that texture-based methods can provide a useful metric for distinguishing between some species of plants.

Note:

Machine learning algorithms are a subset of artificial intelligence that enable computers to learn from data and make predictions or decisions without being explicitly programmed. Machine learning algorithms can be broadly categorized into three types: supervised learning, unsupervised learning, and reinforcement learning.

Supervised learning algorithms are used when the dataset consists of labeled data, where the output is known for each input. Examples of supervised learning algorithms include linear regression, logistic regression, decision trees, random forests, support vector machines (SVM), and artificial neural networks.

Unsupervised learning algorithms are used when the dataset consists of unlabeled data, where the output is unknown. Examples of unsupervised learning algorithms include clustering, dimensionality reduction, and anomaly detection. Reinforcement learning algorithms are used when the agent interacts with the environment and learns by trial and error. Examples of reinforcement learning algorithms include Q-learning and policy gradients.

SVM classifier is a supervised learning algorithm that is widely used in classification problems. The goal of the SVM classifier is to find the hyperplane that maximizes the margin between the different classes in the dataset. The margin is defined as the distance between the hyperplane and the closest data points from each class. The SVM classifier can handle both linearly separable and non-linearly separable datasets by using a kernel function that maps the data to a higher-dimensional feature space. The most commonly used kernel functions are linear, polynomial, and radial basis function (RBF).

The SVM classifier has several advantages over other classification algorithms, including the ability to handle high-dimensional datasets, the ability to handle non-linearly separable data, and the ability to handle datasets with a small number of samples. However, the SVM classifier requires careful selection of hyperparameters, including the kernel function and regularization parameter, and may not perform well on very large datasets due to its high computational complexity.

CHAPTER – 03

WORK TITLE EXPLANATION

This project aims to develop a machine learning-based approach to detect and measure the severity of paddy leaf disease using SVM classifier. The project involves collecting a dataset of images of paddy leaves both infected and healthy, preprocessing the images to enhance their features and eliminate noise, extracting relevant features from the preprocessed images, and selecting the most relevant features to distinguish between healthy and infected paddy leaves. The project also involves training an SVM classifier using the selected features, evaluating the performance of the classifier using various metrics, and using the classifier to detect and measure the severity of paddy leaf disease in new images. The proposed approach can help farmers and researchers to quickly and accurately identify the presence and severity of paddy leaf disease, which can in turn help in developing effective management strategies to prevent yield losses.

3.1SVM Classifier

Support Vector Machine (SVM) is a powerful machine learning algorithm that can be used for classification In the context of detecting and measuring paddy leaf disease using SVM, the SVM classifier is used to classify images of paddy leaves as healthy or infected based ontheir features.

Here's how SVM works in the context of detecting and measuring paddy leaf disease:

Feature Extraction: Extract relevant features from the images of paddy leaves. These features can include color, texture, shape, and size.

Feature Selection: Select the most relevant features that can distinguish between healthy and infected paddy leaves.

SVM Model Development: Train an SVM classifier using the selected features. The SVM classifier tries to find a hyperplane that can separate the data points into different classes (healthy and infected paddy leaves).

Model Evaluation: Evaluate the performance of the SVM classifier using various metrics such as accuracy, precision, recall, and F1 score.

Disease Detection and Measurement: Use the trained SVM classifier to detect and measure the severity of paddy leaf disease in new images. The classifier can classify new images as healthy or infected and measure the extent of infection using techniques such as image segmentation and object detection.

One of the advantages of SVM is that it can handle high-dimensional feature spaces and is effective in dealing with small datasets. SVM can also be used with different kernel functions such as linear, polynomial, and radial basis function (RBF) kernel, to map the data to a higher-dimensional space for better separation. Overall, SVM is a powerful algorithm that can be used for the detection and measurement of paddy leaf disease with high accuracy and precision..

3.2 Kmeans

K-means clustering can be used in the detection and measurement of paddy leaf disease by segmenting images into distinct regions based on their color and texture. This segmentation can help to identify areas of the image that are affected by the disease, making it easier to measure the extent of the damage. After segmenting the image using k-means clustering, features can be extracted from each segmented region, such as color histograms or texture features. These features can then be used as input to a support vector machine (SVM) classifier, which can classify each region as either healthy or diseased. To train the SVM classifier, a dataset of labeled images can be used, where each image is labeled as either healthy or diseased. The features extracted from each segmented region can be used to train the SVM classifier, which can then predict the health status of new images.Once the SVM classifier has classified each segmented region in an image, the extent of the disease can be measured by counting the number of diseased regions and calculating their area. This information can then be used to assess the severity of the disease and make decisions about crop management.Overall, the combination of k-means clustering and SVM classification can be a useful tool in the detection and measurement of paddy leaf disease, allowing for more efficient and accurate monitoring of crop health.

3.3 Fuzzy Logic

Fuzzy logic can be used in the detection and measurement of paddy leaf disease by providing a more nuanced approach to data analysis. Fuzzy logic allows for the consideration of uncertainties and imprecise data, which is particularly important when dealing with complex and variable biological systems. One approach to using fuzzy logic in detecting and measuring paddy leaf disease is to use an SVM (support vector machine) classifier. SVM is a powerful machine learning technique that can be used for classification tasks. It works by finding the optimal hyperplane that separates data into different classes. The SVM classifier can be trained using data that is labeled as either healthy or diseased. To incorporate fuzzy logic into the SVM classifier, fuzzy sets can be used to represent the uncertainty in the input data. For example, the degree of disease severity can be represented by fuzzy sets such as "slightly diseased," "moderately diseased," and "severely diseased." These fuzzy sets can be used as inputs to the SVM classifier.The SVM classifier can then be trained using the labeled data and the fuzzy inputs. The resulting model can be used to classify new data as healthy or diseased, and also to provide a measure of the degree of disease severity.Overall, the use of fuzzy logic in combination with SVM classifiers can provide a more accurate and nuanced approach to the detection and measurement of paddy leaf disease, which is important for effective disease management and prevention.

3.4 Dataset:

Here mainly we focused on three kinds of paddy leaf diseases.They are

3.4.1 Blast:

Rice blast disease is a fungal disease caused by the fungus Magnaporthe oryzae. It can infect all parts of the rice plant, including the leaves, stems, and grains, and is one of the most destructive diseases of rice worldwide. The disease can cause significant yield losses and reduce the quality of the rice crop. Symptoms of rice blast disease on paddy leaves include elliptical or spindle-shaped lesions that are gray to brown in color and have a brownish-yellow border.

Figure 3.1:Blast

Paddy Blast Symptoms

- Disease can infect paddy at all growth stages and all aerial parts of plant (Leaf, neck and node).
- Among the three leaves and neck infections are more severe.
- Small specks originate on leaves - subsequently enlarge into spindle shaped spots (0.5 to 1.5cm length, 0.3 to 0.5cm width) with ashy center.
- Several spots coalesce means big irregular patches.
- Avoid excess N - fertilizer application

Management

- Apply nitrogen in three split doses.

- Removes weed hosts from bunds.
- Use of tolerant varieties (Penna, Pinakini, Tikkana, Sreeranga, Simphapuri, Palghuna, Swarnamukhi, Swathi, Prabhat, Co 47, IR - 64, IR - 36, Jaya)
- Burning of straw and stubbles after harvest
- Dry seed treatment with Pseudomonas fluorescently formulation @10g/kg of seed.
- Stagnate water to a depth of 2.5cm over an area of 25m2 in the nursery. Sprinkle 2.5 kg of P. fluorescens (talc) and mix with stagnated water. Soak the root system of seedlings for 30 min and transplant.
- Spray P. fluorescens talc formulation @ 0.5% from 45 days after transplanting at 10-day intervals, three times.
- Seed treatment at 2.0 g/kg seed with Cap tan or Carbendazim or Thiram or Tricyclazole.
- Spraying of Tricyclazole at 1g/lit of water or Edifenphos at 1 ml/lit of water or Carbendazim at 1.0 gm/lit.
- 3 to 4 sprays each at nursery, tillering stage and panicle emergence stage may be required for complete control.

Nursery stage

- Light infection - Spray Carbendazim or Edifenphos @ 0.1 %.

Pre-Tillering to Mid-Tillering

- Light at 2 to 5 % disease severities - Apply Edifenphos or Carbendazim @ 0.1 %. Delay top dressing of N fertilizers when infection is seen. Panicle initiation to booting
- At 2 to 5% leaf area damage spray Edifenphos or Carbendazim or Tricyclazole @ 0.1 %.

F**lowering and after**

At 5 % leaf area damage or 1 to 2 % neck infection spray Edifenphos or Carbendazim or Tricyclazole @ 1 g /lit of water.

3.4.2 Brown_spot:

Brown spot is a common paddy leaf disease caused by the fungus Bipolaris oryzae. It is prevalent in tropical and subtropical regions and can cause significant yield losses in rice cultivation. The disease typically occurs during the early vegetative stage of the plant, and its severity can be influenced by several factors, including temperature, humidity, and soil moisture.

Figure 3.2:Brown_spot

Symptoms

- Initial lesions are water-soaked to greenish gray and later become grayish white with brown margin.
- Lesions on leaf sheaths near waterline
- Presence of sclerotia
- Lesions may coalesce death of the whole leaf
- Partially filled or empty grains

Management

- Apply FYM 12.5 t/ha or green manure 6.25 t/ha to promote antagonistic microflora.
- Soil application of P. fluorescens @ 2.5 kg/ha mixed with 50 kg FYM after 30 days of transplanting.
- Foliar spraying of P. fluorescens @0.2% at boot leaf stage and 10 days later.
- Avoid flow of irrigation water from infected to healthy field.
- Carbendazim (1 g/lit), Propiconazole (1ml/lit) may be applied.
- Spraying of infected plants with fungicides, such as Benomyl and Iprodione, and antibiotics, such as Validamycin and Polyoxin, is effective against the disease.
- Reduce Nitrogen dosage and skip top dressing.

3.4.3 Narrow_bs:

Figure 3.3:Narrow_bs

"Narrow brown spot" (NBS) is a type of paddy leaf disease caused by the fungus Cercospora janseana. NBS is one of the most damaging leaf diseases in rice cultivation, particularly in Asia, where rice is a staple food. The fungus infects the leaves and causes small, brownish, and elongated lesions that eventually coalesce and turn the entire leaf brown. NBS can affect all growth stages of rice plants, but the most damage is caused during the reproductive stage, leading to significant yield losses.

Symptoms:

- Short, narrow, elliptical to linear brown lesions.
- usually on leaf blades but may also occur on leaf sheaths, pedicels, and glumes or rice hulls.
- Lesions about 2-10 mm long and 1 mm wide.
- Lesions narrower, shorter, and darker brown on resistant varieties.
- Lesions wider and lighter brown with gray necrotic centers on susceptible varieties.
- Leaf necrosis may also occur on susceptible varieties.
- Lesions occur in large numbers during the later growth stages.

Occurrence:

- The disease is observed on rice crops grown on soil deficient in potassium.
- Temperature ranging from 25-28° C is favorable for the optimum growth of the disease. Susceptibility of the variety to the fungus and the growth stage of the rice crop are other factors that affect the development of the disease. Although rice plants are susceptible to the fungus at all stages of growth, they are more susceptible from panicle emergence to maturity, thus, becoming more severe as rice approaches maturity.

Management

- Cultural practices, such as the use of potassium and phosphorus fertilizers, and planting of early maturing cultivars early in the growing season, are recommended to manage the narrow brown leaf spot.

- The use of resistant varieties is the most effective approach to manage the disease. However, the resistant varieties and lines are only grown in United States and India.
- Spraying of fungicides such benomyl, propiconazole, carbendazim, propiconazole, and iprodione, when the disease is observed in the field is effective.

Any image can be preprocessed and segmented using image processing techniques in order to detect any disease.Some of them are

Masked Image:

A mask image is simply an image where some of the pixel intensity values are zero, and others are non-zero. Wherever the pixel intensity value is zero in the mask image, then the pixel intensity of the resulting masked image will be set to the background value (normally zero).

Fused Image:

The image fusion process is defined as gathering all the important information from multiple images, and their inclusion into fewer images, usually a single one. In computer vision, Multisensory Image fusion is the process of combining relevant information from two or more images into a single image.

Grey Image:

In digital photography, computer-generated imagery, and colorimetry, a grayscale or greyscale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. Grayscale images have many shades of grey in between them.

Filtered Image:

In digital photography, computer-generated imagery, and colorimetry, a grayscale or greyscale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. Grayscale images have many shades of grey in between them.

Enhanced Image:

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

Segmented Image:

Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as image objects). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyse.

Histogram of the Image:

An image histogram is a type of histogram that acts as a graphical representation of the tonal distribution in a digital image. It plots the number of pixels for each tonal value. By looking at the histogram for a specific image a viewer will be able to judge the entire tonal distribution at a glance.

CHAPTER 4

SOFTWARE IMPLEMENTATION

The software required to implement this project is matlab.

4.1 MATLAB:

MATLAB (an abbreviation of "matrix laboratory") is a proprietary multi-paradigmprogramming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages. Matlab logo is shown below

Figure 4.1: MATLAB

Although MATLAB is intended primarily for numeric computing, an optional toolbox uses the MuPAD symbolic engine allowing access to symbolic computing abilities.An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

.Lets see in detail about the installation and use of matlab.

1. Visit the MathWorks website and purchase a MATLAB license or obtain a trial license.
2. Download the MATLAB installer from the MathWorks website.
3. Run the MATLAB installer and follow the prompts to install MATLAB on your computer.
4. Once the installation is complete, launch MATLAB from the desktop shortcut or from the Start menu.
5. To use MATLAB, you can write MATLAB code in the MATLAB Editor, which is the main environment for writing and running MATLAB code. The MATLAB Editor includes a command window where you can run MATLAB commands and see their results.

Here are the general steps for using MATLAB:

1.Open the MATLAB Editor.

2.Write your MATLAB code in the editor window.

3.Click the "Run" button to run your code.

4.View the results of your code in the command window or in any figures or plots that your code generates.

5.Save your MATLAB code and any figures or plots that your code generates.

MATLAB also includes many built-in functions and toolboxes for various applications, such as signal processing, image processing, and optimization. You can access these functions and toolboxes by typing their names in the command window or by using the MATLAB documentation to learn how to use them. Overall, MATLAB is a powerful tool for numerical computation and data analysis, and it canbe used for a wide range of applications in engineering, science, and mathematics.

4.2Flowchart

The following flowchart depicts the steps involved in detecting and measuring paddy leaf diseases.

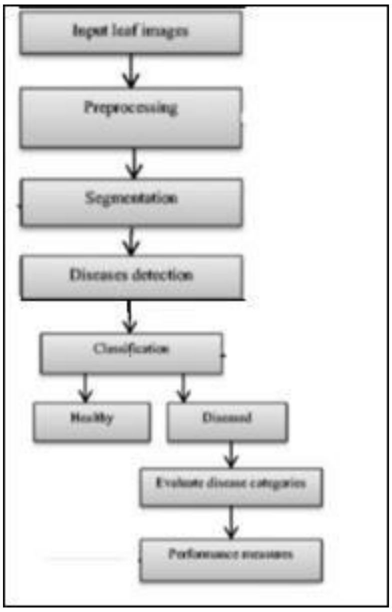


Figure 4.2: Flowchart

1. **Input leaf images:** We collect the images of some diseased paddy leaves.
2. **Preprocessing:** preprocessing is an essential step that can greatly affect the accuracy of the classification model. Preprocessing involves a set of operations performed on the raw data to prepare it for analysis. The following are some of the preprocessing techniques that can be used in the detection and measurement of paddy leaf disease using SVM classifier:Data Cleaning: This involves the removal of any noise, missing or incomplete data, and outliers in the dataset.

3. Segmentation: Segmentation is an essential step in the detection and measurement of paddy leaf disease using an SVM classifier. The purpose of segmentation is to separate the regions of interest (ROIs) from the background and non-diseased regions. Once the ROIs are segmented, features can be extracted from them and used to train an SVM classifier.

There are several approaches to segmenting the ROIs in paddy leaf disease detection, including thresholding, edge detection, and clustering. Thresholding is a simple and effective method that separates the foreground from the background based on a threshold value. Edge detection methods detect edges or boundaries between the foreground and background regions. Clustering methods group pixels with similar properties into clusters, which can then be used to identify the ROIs.Once the ROIs are segmented, features can be extracted from them, such as color, texture, and shape. These features can be used to train an SVM classifier to distinguish between healthy and diseased paddy leaves. The SVM classifier is a machine learning algorithm that can learn to classify data into different categories based on a set of labeled training data.Overall, segmentation is a critical step in the detection and measurement of paddy leaf disease using an SVM classifier. The accuracy of the segmentation process can significantly affect the performance of the classifier. Therefore, selecting an appropriate segmentation technique and optimizing its parameters are essential to obtain accurate and reliable results.

4. Disease Detection: Now it is all set to detect the leaf and can be able to classify whether it is healthyor diseased. If diseased its going to tell the name of the disease, symptoms of it and remedies to cure it. This is the overall explanation of our project and lets see the practical implementation.

Now let us discuss how we run our code in matlab.

Firstly we run the following code which is named as main_gui which results in main_gui.fig that contains two buttons,one is input button through which it takes leaf image and the other is information button which gives information like name of the disease,its symptoms and the remedies to cure it.To know the internal details that is how the image processing can be applied on input image can be known by running code named main.m.

Main_gui.m code:

```
function varargout = main_gui(varargin)
% MAIN_GUI MATLAB code for main_gui.fig
% MAIN_GUI, by itself, creates a new MAIN_GUI or raises the existing
% singleton*.
%
% H = MAIN_GUI returns the handle to a new MAIN_GUI or the handle to
```

```
% the existing singleton*.
%
% MAIN_GUI('CALLBACK',hObject,eventData,handles,...) calls the local
% function named CALLBACK in MAIN_GUI.M with the given input arguments.
%
% MAIN_GUI('Property','Value',...) creates a new MAIN_GUI or raises the
% existing singleton*. Starting from the left, property value pairs are
% applied to the GUI before main_gui_OpeningFcn gets called. An
% unrecognized property name or invalid value makes property application
% stop. All inputs are passed to main_gui_OpeningFcn via varargin.
%
% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
% instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help main_gui

% Last Modified by GUIDE v2.5 26-Aug-2019 16:15:13

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename, ...
'gui_Singleton', gui_Singleton, ...
'gui_OpeningFcn', @main_gui_OpeningFcn, ...
'gui_OutputFcn', @main_gui_OutputFcn, ...
'gui_LayoutFcn', [] , ...
'gui_Callback', []);
if nargin && ischar(varargin{1})
gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
```

```
[varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT



% --- Executes just before main_gui is made visible.
function main_gui_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject handle to figure
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% varargin command line arguments to main_gui (see VARARGIN)

% Choose default command line output for main_gui
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes main_gui wait for user response (see UIRESUME)
% uiwait(handles.figure1);



% --- Outputs from this function are returned to the command line.
function varargout = main_gui_OutputFcn(hObject, eventdata, handles)
% varargout cell array for returning output args (see VARARGOUT);
% hObject handle to figure
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
a=ones(500,500);
axes(handles.axes1);
```

```
imshow(a);
axes(handles.axes2);
imshow(a);
% Get default command line output from handles structure
varargout{1} = handles.output;



% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
[file path] = uigetfile('*.bmp','Select Image');
if path==0
msgbox('Image not selected')
return
end
img = imread(strcat(path,file));
[path,filename,ext]=fileparts(file);
axes(handles.axes1);
imshow(img);
handles.img=img;
handles.name=filename;
guidata(hObject, handles);



% --- Executes on button press in Information.
function Information_Callback(hObject, eventdata, handles)
% hObject handle to Information (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
name = handles.name;
if strcmp(name,'Alternarialeaf')
```

```
msgbox('Disease : Alternarialeaf')
msgbox('Symptoms : Rust coloured spots,Discoloration,Panicles Sterile')
msgbox('Remedies : Carbendazim 50 WP @ 500g/ha,Azoxystrobin @ 500ml/ha,Hexaconazole 75%
WG @ 100mg/lit')
elseif strcmp(name,'applerust')
msgbox('Disease : Applerust')
msgbox('Symptoms : Irregular spots or lesions with yellow with brown margins.')
msgbox('Remedies : Neem oil 3%. Spray fresh cowdung extract 20% twice.')
elseif strcmp(name,'blast')
msgbox('Disease : Blast')
msgbox('Symptoms : Seedling wilt.Water soaked to yellowish strips on leaf blades.Appearance of
Bacterial ooze that look like milky or opaque.')
msgbox('Remedies : * Spray fresh cowdung extract 20% twice.Neem oil 60 EC 3% or NSKE 5% is
recommended.')
elseif strcmp(name,'blightdiseaseofaleaf')
msgbox('Disease : Blight disease of a leaf')
msgbox('Symptoms : Seedling wilt.Water soaked to yellowish strips on leaf blades.Appearance of
Bacterial ooze that look like milky or opaque.')
msgbox('Remedies : Spray fresh cowdung extract 20% twice.Neem oil 60 EC 3% or NSKE 5% is
recommended.')
elseif strcmp(name,'brown_spot')
msgbox('Disease : Brown Spot')
msgbox('Symptoms : Circular spots on Leaves.Brown spots on Grains.Black spots on panicle Glumes.')
msgbox('Remedies : Metominostrobin @ 500ml/ha.')
elseif strcmp(name,'brownspotofleafimages')
msgbox('Disease : Brown Spot')
msgbox('Symptoms : Circular spots on Leaves.Brown spots on Grains.Black spots on panicle Glumes.')
msgbox('Remedies : Metominostrobin @ 500ml/ha.')
elseif strcmp(name,'citruscankersymptoms')
msgbox('Disease : Citrus Canker symptoms')
msgbox('Symptoms : Rust coloured spots. Discoloration from leaf tip to lower portion.Panicles Sterile ')
msgbox('Remedies : Carbendazim 50 WP @ 500g/ha.Azoxystrobin @ 500ml/ha.Hexaconazole 75%
WG @ 100mg/lit')
```

```
elseif strcmp(name,'corkylesionsa')
msgbox('Disease : Corky lesionsa')
msgbox('Symptoms : Initially small,dark green water soaked.Lesions turn Brown.Bacteria ooze out under humid weather')
msgbox('Remedies : Spray fresh cowdung water extract 20%.Copper hydroxide 77 WP @1.25 kg/ha')
elseif strcmp(name,'downymildewdisease')
msgbox('Disease : Downy mildew disease')
msgbox('Symptoms : Growth of velvety spares.Rice grains transformed into yellow bodies.Growth of spores result to broken membrane.')
msgbox('Remedies : Propiconazole 25 EC @ 500ml/ha. Copper hydroxide 77 wp @ 1.25 kg/ha.')
elseif strcmp(name,'earlyblight')
msgbox('Disease : Early Blight')
msgbox('Symptoms : Rust coloured spots.Discoloration from leaf tip to lower portion.Panicles Sterile')
msgbox('Remedies : Carbendazim 50 WP @ 500g/ha.Azoxystrobin @ 500ml/ha.Hexaconazole 75% WG @ 100mg/lit')
elseif strcmp(name,'Leaf_Spot_of_Trees')
msgbox('Disease : Leaf Spot of Trees')
msgbox('Symptoms : Irregular spots or lesions with dark reddish brown margins.Whitish powdery growth.Unemerged panicles rot.')
msgbox('Remedies : Gypsum @ 500kg/ha.Neem oil 3%.Metominostrobin @ 500ml/ha')
elseif strcmp(name,'narrow_bs')
msgbox('Disease : Narrow Brown Spot')
msgbox('Symptoms : Circular spots on Leaves.Brown spots on Grains.Black spots on panicle Glumes.')
msgbox('Remedies : Metominostrobin @ 500ml/ha.')
elseif strcmp(name,'Potatoblightonleaf')
msgbox('Disease : Potato Blight on leaf')
msgbox('Symptoms : Seedling wilt or kresek.Water soaked to yellowish strips on leaf blades.Appearance of Bacterial ooze that look like milky or opaque.')
msgbox('Remedies : Spray fresh cowdung extract 20% twice. Neem oil 60 EC 3% or NSKE 5% is recommended.')
elseif strcmp(name,'potatoleafblightonm')
msgbox('Disease : Potato leaf blightonm')
```

```
msgbox('Symptoms : Seedling wilt or kresek.Water soaked to yellowish strips on leaf blades.Appearance of Bacterial ooze that look like milky or opaque.')
msgbox('Remedies : Spray fresh cowdung extract 20% twice. Neem oil 60 EC 3% or NSKE 5% is recommended.')
elseif strcmp(name,'tissuedisruption')
msgbox('Disease : Tissue Disruption')
msgbox('Symptoms : Rust coloured spots.Discoloration from leaf tip to lower portion.Panicles Sterile')
msgbox('Remedies : Carbendazim 50 WP @ 500g/ha.Azoxystrobin @ 500ml/ha.Hexaconazole 75% WG @ 100mg/lit')
elseif strcmp(name,'Healthy')
msgbox('Disease : healthy')
msgbox('Symptoms : None')
msgbox('Remedies : Not needed')
end
```

Main.m code:

```
clc
clear
close all
warning off

[file path] = uigetfile('*.bmp','Select Image');
I1 = imread(strcat(path,file));
figure,imshow(I1)
title('Input Image')
I1 = imresize(I1,[256 256]);

I  =  rgb2gray(I1);
figure,imshow(I)
title('Grey Image')
I = imresize(I,[256 256]);

I_filt = imadjust(I);
```

```
figure,imshow(I_filt)
title('Fitered Image')

I_adhis = adapthisteq(I_filt);
figure,imshow(I_adhis)
title('Enhanced Image')

[~,I_seg] = kmeans(I_filt,2);
figure,imshow(I_seg)
title('Segmented Image')
ff = imfuse(I1,I_seg);
figure,imshow(ff)
title('Fused Image')

length = sum(I_seg(:,round(size(I_seg,2)/2)));
width  = sum(I_seg(round(size(I_seg,1)/2),:));
area = sum(I_seg(:));

figure,
imhist(I)
title('Histogram of an image')
figure,
imhist(I_adhis)
title('Histogram of an Enhanced image')
his = imhist(I);
```

CHAPTER-05

RESULTS

In this chapter we will discuss the implementation this project.As shown in below figure, in the matlab Run the code named main_gui.m which results in figure 5.2.

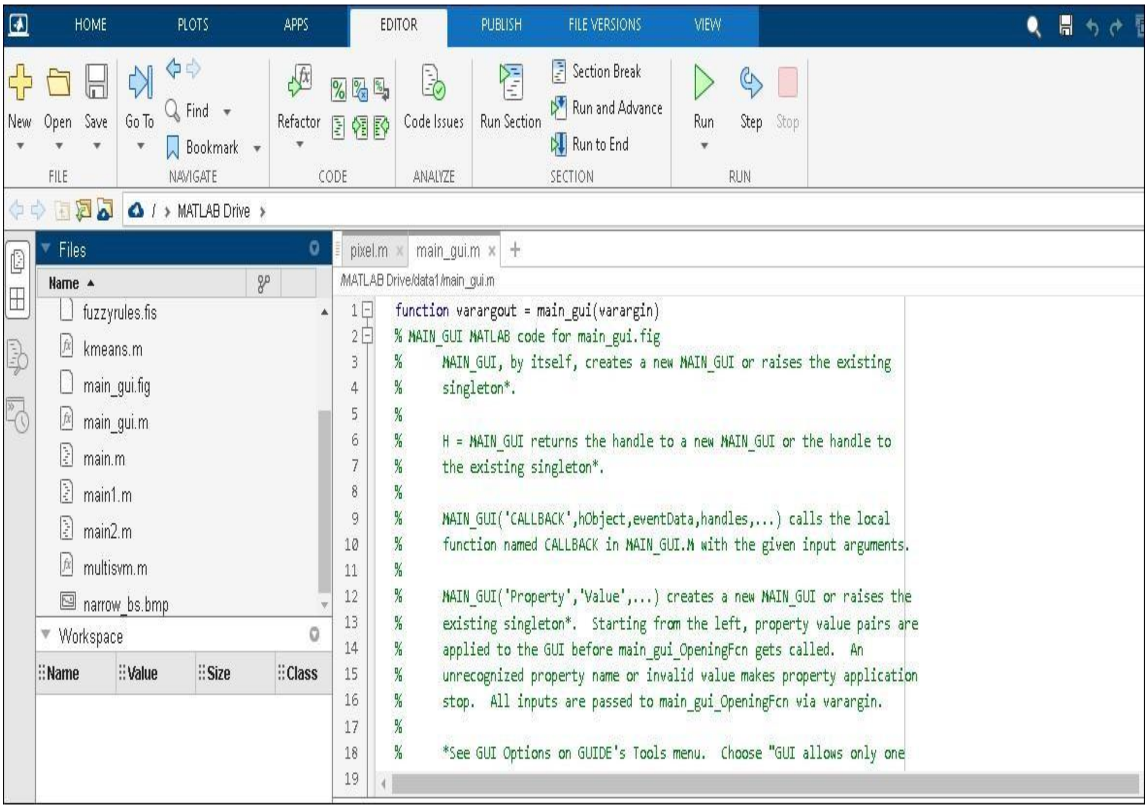


Figure 5.1:main_gui

This code is the design of main_gui.fig which contains two buttons input and information and also information about various diseases.The detailed code of main_gui is shown in chapter-4.It consists of input button and what happens if we click that input button,information button and what happens if we click it and we wrote some of the disease names,symptoms and remedies out of which the leaf we selected will get information of all these three.

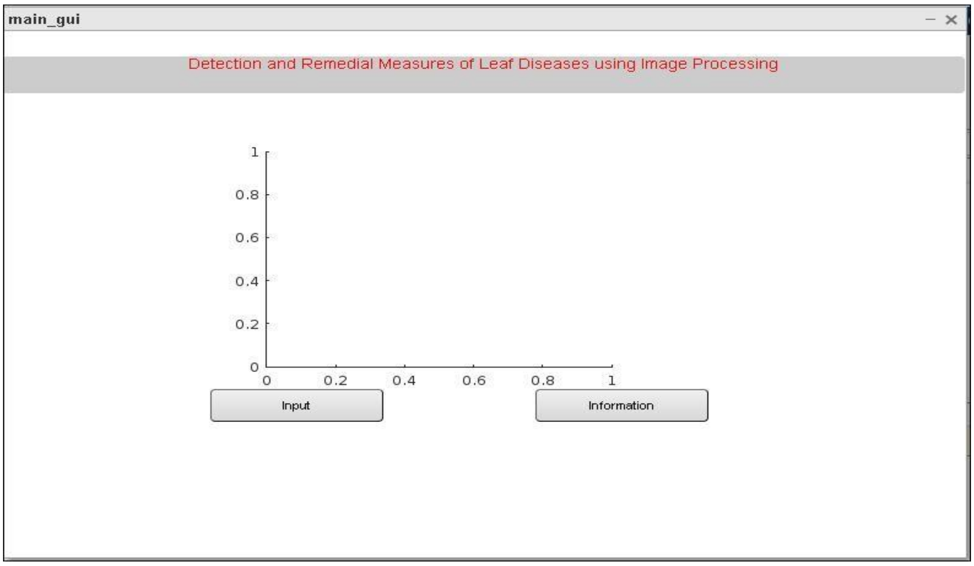


Figure 5.2:Input

When we run the code named main_gui.m in matlab then main_gui.fig gets pop out as output which contains two buttons input and information.

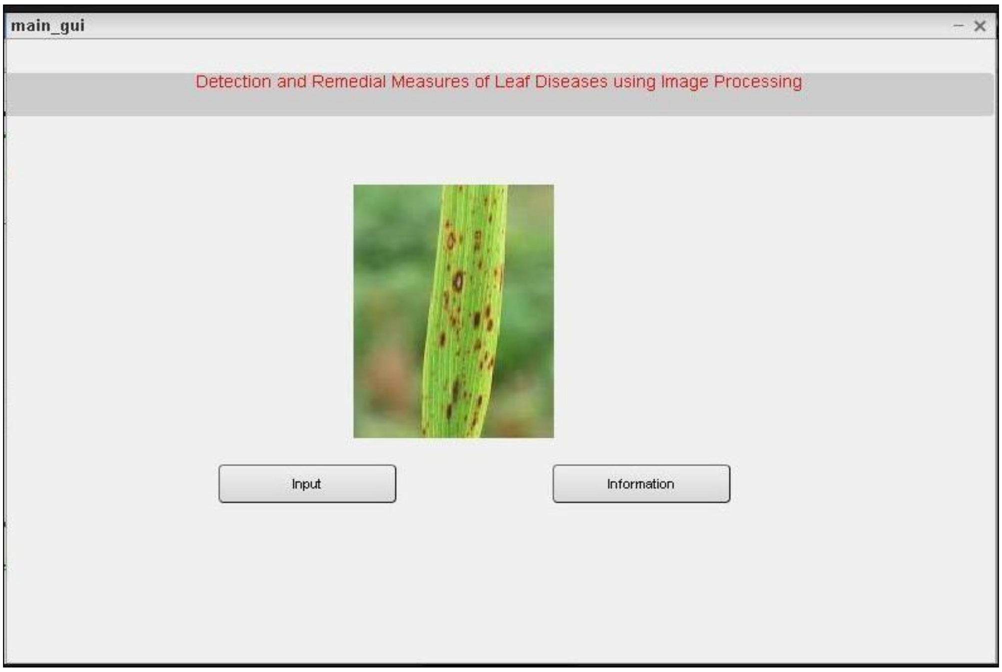


Fig.5.3: Selected input leaf

When the input button is clicked it is asked to take leaf as input so here we considered one input leaf.

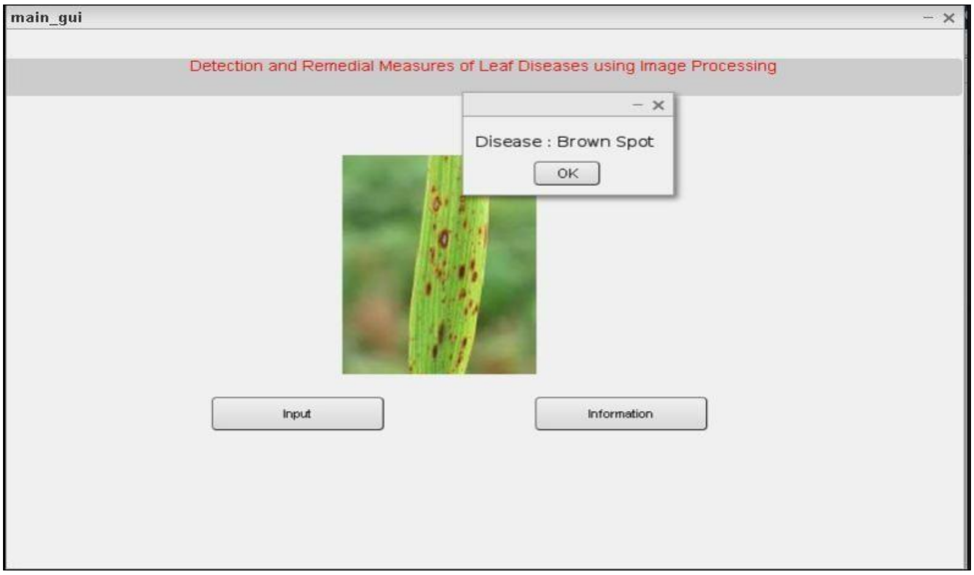


Figure 5..4:Disease

When the information button get clicked it gives the name of the disease that has for our selected input leaf.

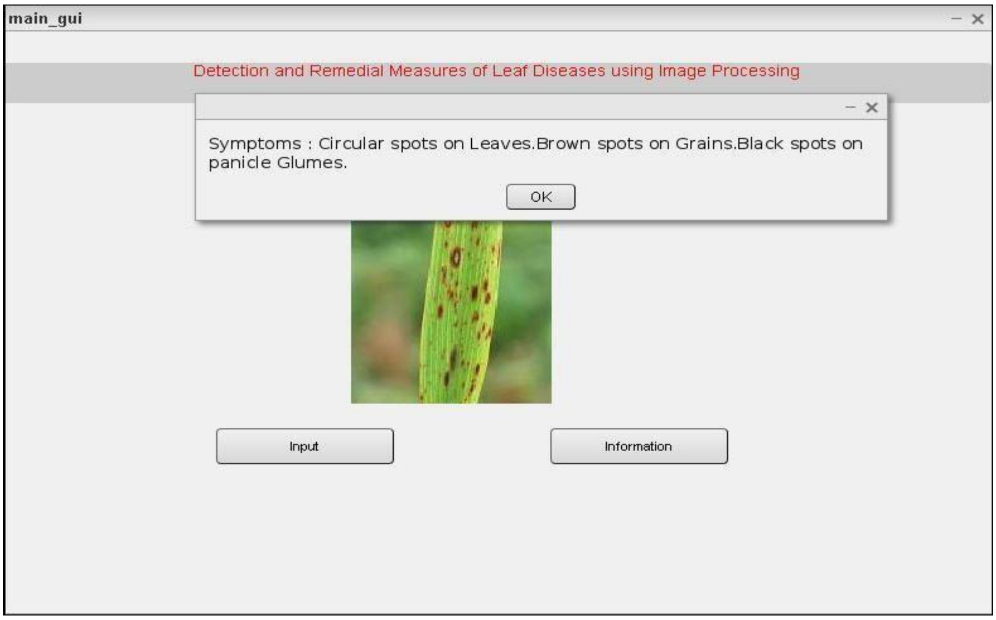


Figure 5.5:Symptoms

It is observed in the figure that it results in symptoms of the selected input leaf. It clearly mentions the symptoms that a particular disease have. Here our selected leaf is brown spot so it gave all the symptoms of it.

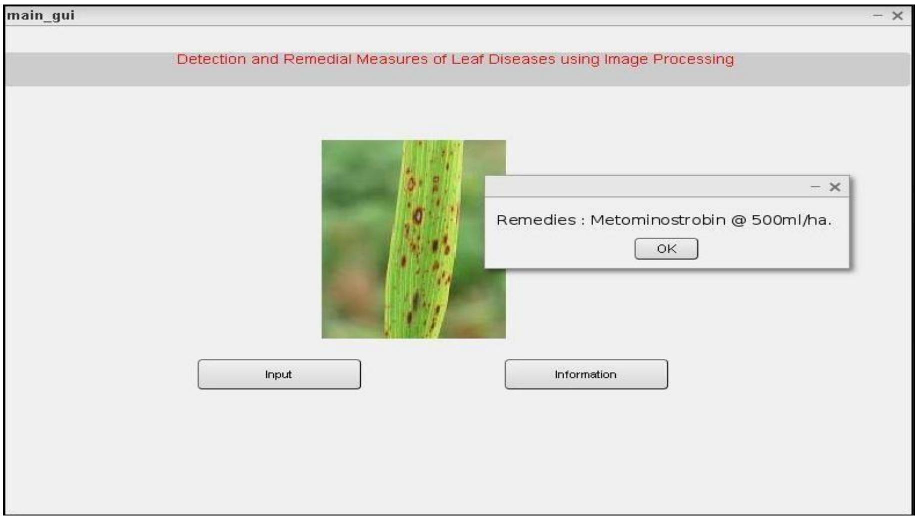
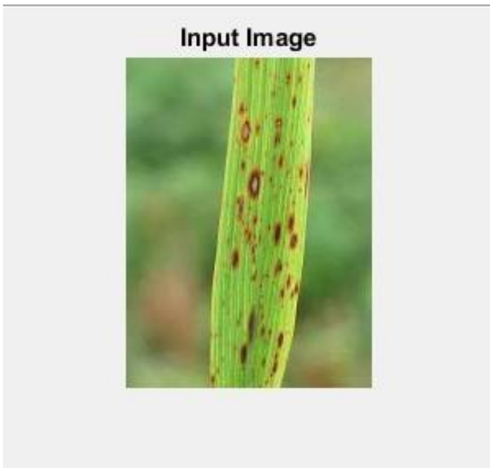


Figure 5.6: Remedies

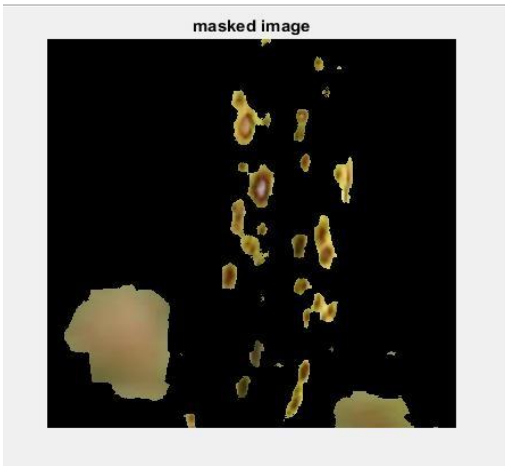
Here it gives the remedies to cure that particular disease.

In order to know the inner process of how an image get processed and segmented inorder to detect any disease can be understood if we run the code named main.m.The results of this code are

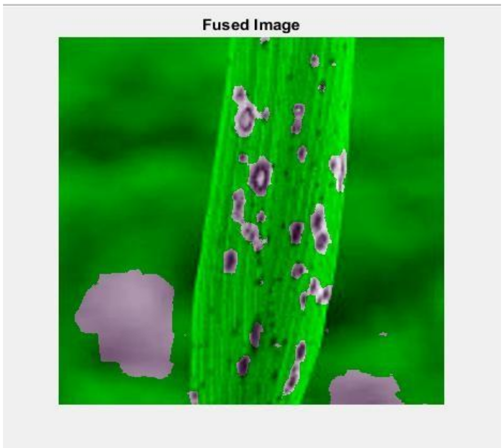
Brown Spot



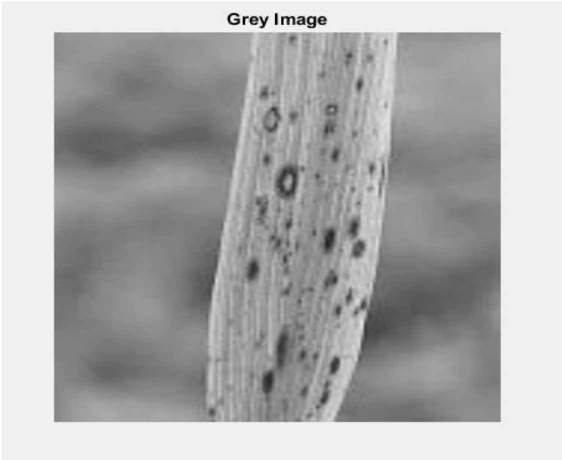
(a)



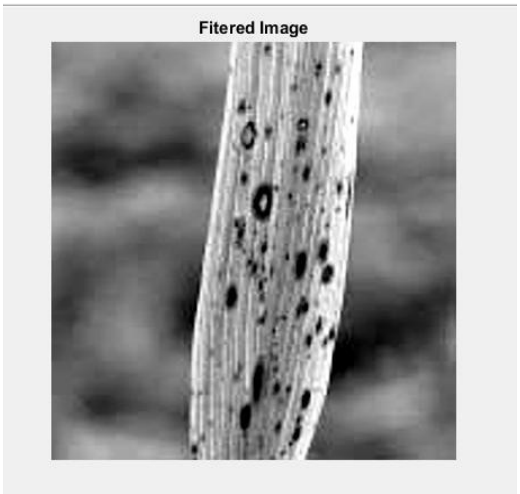
(b)


Fused Image

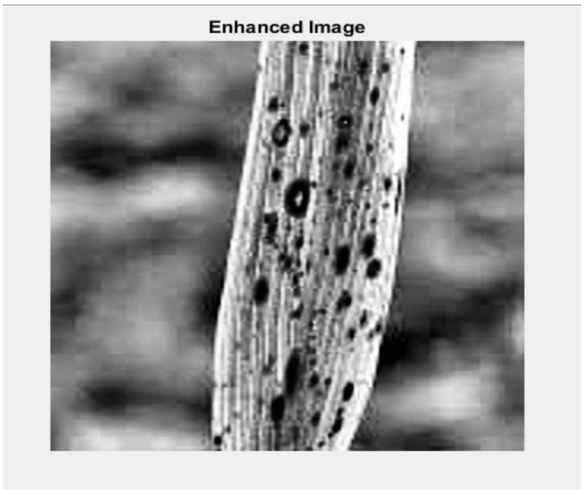
(c)


Grey Image

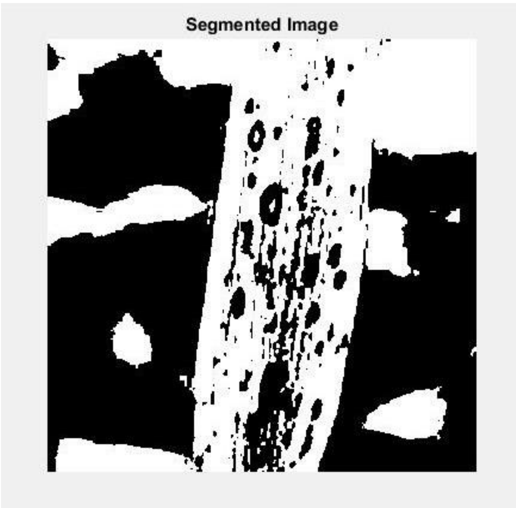
(d)


Fitered Image

(e)


Enhanced Image

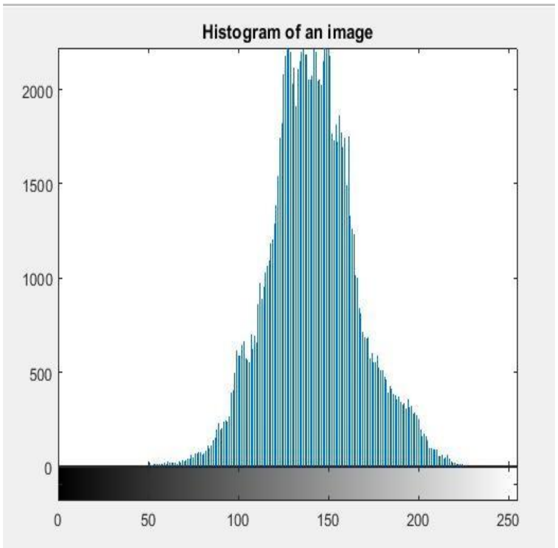
(f)


Segmented Image

(g)


Fused Image

(h)



(i)

CONCLUSION AND FUTURE WORK

In this project we have proposed a new histogram-based concept of detecting damaged leaf. From histogram we extract the difference between the intensity among the original leaf and the diseases affected leaf. A system for identifying the diseases like Blast, Brown spot and Narrow brown spot are detected. It is mainly based on the mat lab application using k-means algorithm This project evaluates the techniques in digital image processing for detecting, diagnosing, recognizing of crop leaf diseases k-means clustering algorithm is used for automatically the disease for more accuracy. As more no. of image samples are produced accordingly, three is more scope of identifying the various errors during the simulation. The primary result of the proposed methodology indicates a strong and systematic way of assessing disease intensity by plant pathology more precisely. The result of the preliminary test shows the better result of disease extraction. The classification techniques like SVM, Fuzzy, ANN are performed and SVM is proved to be the best. The method is tested for detection of diseases in plant leaves. Future work is to be carried out for classification of diseases in different leaves and species of plants and to improve the classification accuracy.

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PROJECT OUTCOMES MAPPED WITH PROGRAMME SPECIFIC OUTCOMES (PSOs) AND PROGRAMME OUTCOMES (POs)

Classification of Project	Application	Product	Research	Review
	✓		✓	

PROJECT OUTCOMES

The main objective of this research is to develop a data mining system to detect the paddy disease,symptoms and remedies.

PROGRAMME OUTCOMES (POs)

The ECE Graduates will be able to

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project Management and Finance: Demonstrate knowledge and understanding the engineering and management principals and apply these to one's own work as a member and leader in the team, to manage project and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Designing electronics and communication systems in the domain of VLSI, embedded systems, signal processing and RF communications and applying modern tools.

PSO2: Applying the conceptual knowledge of Electronics and Communication Engineering to design, develop, analyze and test systems containing hardware and software components taking into societal, environmental, health, safety, legal, cultural, ethical and economical considerations.

Mapping Table

Project Outcomes	Program Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	2	3	2	3	1	1	1	3	3	1	1	3	3

1- Slightly (Low) mapped

2- Moderately (Medium) mapped

3-Substantially (High) mapped

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To,
B.Naga Mani
Published in : Volume 8 | Issue 3 | March-2023

Subject: Publication of paper at International Journal of Novel Research and Development (IJNRD).

Dear Author,

With Greetings we are informing you that your paper has been successfully published in the International Journal of Novel Research and Development (ISSN: 2456-4184). Following are the details regarding the published paper.

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Thank you very much for publishing your article in IJNRD. We would appreciate if you continue your support and keep sharing your knowledge by writing for our journal IJNRD.

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