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A Novel and High Speed Technique for Paddy Crops Disease Prediction in Wireless Tele-Agriculture Using Data Mining Techniques

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Abstract: Data mining is the process of selecting and exploring large amounts of data. This process has become an increasingly aggressive action in all areas of agricultural science and research. Data mining has paved way for the discovery of useful unseen patterns from considerable databases. Now-a-days many common diseases are increasing and that can be overcome by using eatable uses of paddy. Information related to paddy crops, available in the world a lot but they are scattered. This paper presents an innovative idea about diseases affected by paddy crops and give the solution to disease using high pixel camera mobile phone like android or iPhone or wireless PDA. An image taken from paddy fields, that image are involved in crop process and then the images send to stored server for identification of paddy disease and prevention. This idea provides better choice for every class of agriculture community particularly remote villages. With the help of mobile camera, mobile operating system, Compression Algorithm, Diseases Database and are used in this paper. From the mining technique, the better outcome has been deduced for medicinal plants.

Key words: Data mining Association rule · Paddy crops · Treatment · Tele-agriculture

INTRODUCTION

Data Mining: Mining process is more than the data scrutiny which in addition spans additional disciplines like Data Warehousing, Statistics, Machine learning and Artificial Intelligence [1-5]. Significantly useful patterns or meaning in raw data has earlier been called KDD (Knowledge Discovery in Databases), data mining and knowledge discovery [3]. Knowledge discovery is the "non-trivial process of identifying ultimately understandable patterns in data." Data mining "consists of applying data Analysis and discovery algorithms that produce particular patterns over the data". Data mining is typically a bottom-up knowledge engineering strategy, Knowledge discovery involves the additional steps of target data set selection, data preprocessing and data reduction, which occur prior to data mining. In the following, the performance view about data mining proposed by agarwal *et al.* and the association rules classification predicted for medical data mining given by deepika et.al, along with uniqueness of data mining is being presented. Agarwal *et al*. [2] proposed three basic classes of data mining problems. Association rules are used to spot relationships among a set of items in databases. These relationships are not based on natural properties of the data themselves, but rather depend on co-occurrence of the data items. Each and every data mining method serves a different reason depending on the modeling purpose. They are divided into two types namely classification and prediction. Classification models predict definite labels, while prediction models predict continuous-valued functions. Decision Trees and Neural Networks use classification algorithms while Regression, Association Rules and Clustering use prediction algorithms [4].

Intoduction to Paddy Crops: India is an agricultural country; wherein about 70% of the population depends on agriculture. Farmers have wide range of diversity to select suitable paddy crops. However, the cultivation of the paddy crop for optimum yield and quality produce is highly technical. It can be improved by the aid of technological support. The management of perennial paddy crops requires close monitoring especially for the management of diseases that can affect production significantly and subsequently the post-harvest life.

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Fig. 1: A Proposed web-based agricultural information system. Alert SMS/MMS will send automatically to users when a dangerous situation will occur at their fields.

The Image Processing Can Be Used in Agricultural Applications for Following Purposes:

- To detect diseased leaf and stem
- To quantify affected area by disease.
- To find shape of affected area.
- To determine color of affected area
- To determine size & shape of paddy crop. Etc.

In case of paddy the disease is defined as any impairment of normal physiological function of crops, producing characteristic symptoms. A symptom is a phenomenon accompanying something and is regarded as evidence of its existence. Disease is caused by pathogen which is any agent causing disease. In most of the cases pests or diseases are seen on the leaves or stems of the plant. Therefore identification of plants, leaves, stems and finding out the pest or diseases, percentage of the pest or disease incidence, symptoms of the pest or disease attack, plays a key role in successful cultivation of paddy crops.

The use of Mobile Phones and wireless capable Personal Digital Assistants (PDAs) have grown rapidly for various applications over the past decade. But it has some drawbacks. More recently, it is envisaged to provide tele-agriculture solutions for paddy diseases and affected plants. One of the crucial benefit of mobile phone based remote agriculture monitoring is the flexibility and mobility offered by the usage of existing wireless communication protocols for transmission of plant health information.

In a typical tele-agriculture application, as shown in Figure 1, paddy leaf image is transmitted from the farmers/agriculturists to the agriculture server as well as the doctor via different wireless protocols like SMS, MMS, HTTP and other custom socket routine. Mobile phone is utilized as an image and receiver by farmer, agriculture consultants and agriculture experts. Apart from mobile phones usage as a standard communication device, it has demonstrated its capability of being used to perform image analysis.

Objectives:

- To build an application to collect the paddy infected / uninfected image.
- To construct a database to store paddy disease image samples.
- To develop an algorithm to compare low quality images which are captured from the paddy.
- To find out the affected disease based on above comparison and conform using expert systems.
- To build the database for paddy disease syndromes and treatment possibilities.
- To build the association rule mining to find the healing possibilities from existing experiences / databases.
- Finally, to provide some android mobile to the farmers to test in fields.

Efficient transmission and Storage: The goal of the Propose work to diagnose the diseases using image processing and artificial intelligence techniques on images of infected leaves are taken with complex background taken as input. These inputs are captured through phone cameras and diagnose and assist the possible remedies.

The captured Plant images during a monitoring can grow to a massive amount of 13 GB within 24 hours. In fact, plant data alone from a single field images can easily reach up to 2.77 GB in one day. Transmission and storage of this enormous amount of data is a major hurdle for agriculture monitoring. Application of data compression can mitigate this problem to a certain extent. For wireless tele-agriculture applications using messaging protocols, any compression scheme must use the limited character sets available in MMS and SMS protocols in order to avoid any data loss. Reduced data size reduces the cost of plant images transfer via SMS/MMS which is essential for wireless tele-agriculture to be effective.

Fast Detection of Abnormalities: To ascertain the disease in the paddy leaf affected rate from the compressed paddy image, the compressed paddy leaf image requires to be decompressed first before any further computations. This decompression time on mobile devices could be significant. In the scenario as depicted in Fig. 1 both the farmer and agriculture server receive paddy crop images, which is then analysed for any possible abnormalities. In case of abnormalities, life-saving measurements are taken. Therefore, minimizing delays in disease diagnosis is a crucial and highly prioritized research area in both agriculture and pesticide domain, since time is life for the paddy crops [6-14]. The motivation of this paper are the challenges outlined above and we address them by proposing a novel SMS/MMS compatible lossless compression and lossless decompression scheme, tele-agriculture.

The study is done in this paper provides a new insight in detection of the diseases of plant. The scope in doing research in this field is as follows:

- There are two main characteristics of plant disease detection using machine-learning methods that must be achieved, they are: speed and accuracy. Hence there is a scope for working on development of innovative, efficient & fast interpreting algorithms which will help plant scientist in detecting disease.
- Work can be done for automatically estimating the severity of the detected disease.
- The main outcome of this research is an android based software tool to find and cure paddy diseases for farmers
- This work proposes two databases which contain paddy disease syndromes images and treatment experiences which can further extendable.
- In technical, to be proposed two novel algorithms for image analysis and finding the correlation between attributes of the databases.

Why I have decided to invent a New Image Compression Algorithm?

- Computationally expensive: Most of the existing compression algorithms were designed and tested on PC not in mobile phone.
- Unsuitable for MMS/SMS transmission: Mobile phone based wireless application often requires transmission of paddy crops images over existing MMS and SMS protocols.
- Requirement of decompression for further analysis on compressed paddy crop images:
- Finally, the main objective of existing paddy image compression techniques is to achieve high compressibility by having redundancy free output.

Association Rule Mining Algorithm: Association rule mining one of the most significant and well researched techniques in data mining was introduced by R. Agarwal [1]. The problem of association rule mining can be decomposed into two sub problems.

- Discovering frequent item sets
- Generating rules from frequent item sets.

Association rules are in no way different from classification rules except that does not predict only predict some other attribute. It has freedom to make a combination of attributes. Different association rules express different regularities. The association rule is the number of instances for which it predicts suitably this is often called its support.

Its exactness often called confidence is the number of instances that it predicts appropriately, expressed as proportion of all instances to which it applies. The user has to specify the minimum coverage and accuracy values and look for only those rules whose values are at least of the specified minimum value. An association rule (AR) is a pair (X, Y) of sets of attributes, denoted by $X \rightarrow Y$. X is the antecedent and Y is the consequent of the rule $X \rightarrow Y$. The simplest parameters associated to an AR are its support and confidence. The support of a rule $X \rightarrow Y$ is the number of records that contain all items of X. Clearly, the confidence of X -Y Y is an estimation of the probability that a record that contains the items of X, chosen at random, will contain the items of Y.

Association rules can be classified based on the type of vales, dimensions of data and levels of abstractions involved in the rule. If a rule concerns associations between the presence or absence of items, it is called Boolean association rule and the dataset consisting of attributes which can assume only binary (0-absent, 1-present) values is called Boolean database.

MATERIALS AND METHODS

In the below section we presented the origin of major patterns. The data warehouse consists of the information about the paddy crops and their diseases. Primarily, the data warehouse is preprocessed to make mining process more competent. In the proposed study, here it is used the association rule mining algorithm for the classification of data.

Data Set: The rice crop is subjected to more than forty diseases, which are one of the factors, for low yields of rice in the world (including India). The diseases may appear at any stage of the growth and development of plant, attacking the seed sown, root system, foliage, stalk, leaf sheath, inflorescence and even the developing grain. The fungi, bacteria, nematode and virus cause different infectious diseases. Non-infectious diseases may be caused because of low or high temperature, decrease or increase in different nutritional elements essential for the crop. Overall, present area, production and yield per acre of rice crop in India. The causes of fluctuations in production may be many more, but the diseases could not be ignored, neglected and or regretted, because they also cause variable loss time by time to the crop. These all diseases are injurious in some areas, in some years and on some plant parts. All parts of plant are subject to disease and one or more diseases can occur on virtually every plant and in every field. All draw attention because of symptoms or signs and generate great concern because of their effects on the quality and/or quantity of plants, straw or grain.

According to Kamal and Moghal (1968), Hafiz (1986), Nyvall (1979), Bhatti and Soomro (1996) and Jiskani (1999), brown spot, blast, stem rot, bunt, bacterial blight, false smut, ufra and khaira (zinc deficiency) are sometimes considered important diseases at various parts of rice growing areas of India. Therefore identification, management practices and some other relevant knowledge of the most important diseases of rice are being summarized, so that the growers may protect their crop from these diseases, research workers may decide their future strategies, extension workers may also to be alert.

Rice is one of the leading food crops of the world, an important staple food and cash crop of India. It contributes 15 percent to the foreign exchange earnings. Its area under cultivation, production and yield per hectare also indicates its importance. This crop is very suitable, where other crops are not possible to grow or where Kharif (summer) irrigation water supply is abundant. According to Cheema *et al*. (1991) rice prefers 5.0-6.5 soil pH and is moderately tolerant to exchangeable sodium percentage (ESP) in the level of 20-40%. This crop may also tolerate up to 0.40-0.60 percent of white alkali and 0.10-0.20 percent of black alkali in soil (WAPDA report, 1961). The rice is frequently grown on heavy clay soils that have an impervious, subsoil layer (hard pan) that limits drainage, because it requires a constant and plentiful supply of water. The rice production can be used to reclaim saline soils, because flooding leaches salts from the soils (Bhatti and Soomro, 1996).

Mobile Application Development: The mobile application consists of 5 basic functionalities. They are 1) Image capture, 2) Image selection, 3) Image zoom and crop, 4) Share image with expert group, 5) Receive notification from central server.

Image Capture: At the very first page of the application, for capturing image using the application. On navigation of the menu, the user gets to take image on shutter click event using the android, iPhone or wireless communicated PDA.

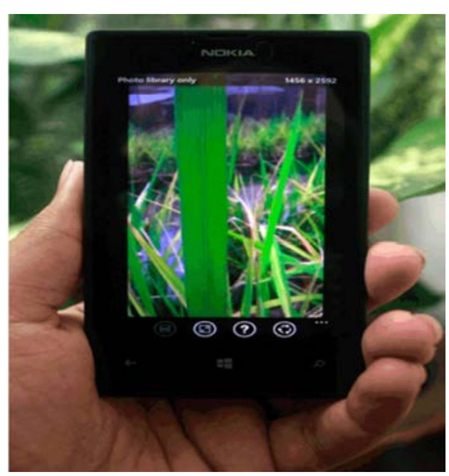


Fig. 2: Photo capture using mobile application

Fig. 3: Selecting target region of paddy leaf in mobile application

Image Selection: In case of previously taken pictures of paddy, the application navigation menu also contains the option of selecting an image from the existing photo library of the phone.

Image Zoom and Crop: The leaf of paddy is a very thin one and it is important that the targeted area of the leaf gets focus in the image. The mobile application of 'Rice Doctor' lets the farmer to zoom the affected region of paddy using pinch with two fingers. The test images were taken with a Android/iPhone o Wireless PDA which has a 5 mega pixel camera in it. The application allows to zoom 4x times the original image. In addition, once the targeted region has been selected, the crop button of the crops the image in a 170x400 pixel frame, which is the targeted resolution for processing images in the server image processing application.

Share Image with Expert Group: This functionality of the application enables the farmer to send the captured/ selected image to be uploaded in the remote server using HTTP Web Services in Windows OS phone. The client mobile application uploads two basic types of data in the server for every request, the image that the farmer selects for seeking suggestion and a unique URL created through windows live services which is created for communicating with the mobile phone from a remote application [14-20].

Receive Notification from Central Server: Once the image has been uploaded in the remote server, the expert sends feedback to the client mobile application via notification. This notification is sent through a URL generated by Windows Live Services which is unique for every device or SMS/MMS. Once the notification is received, it is displayed in the application which the user will be able to view for taking appropriate steps suggested by the experts.

Paddy Crop Symptoms, Perpetuation and Conrol

Blight or Brown Spots (Helminthosporium Oryzae):

Symptoms: This disease has been recorded all over India. Initially small dots or circular eye shaped or oval spots appear light in colour on leaves. These spots coalesce and result in linear spots brown in colour. Later on withering and yellowing of leaves occur. Seed setting also affected and causes sterility, shrivelling and show rotting and poor germination.

Perpetuation: Diseased seeds, plant debris and soils help the fungus to survive, while air and irrigation water help to the fungus for transmitting from diseased to healthy plants.

Control: 1) Use of resistant varieties or disease free seed in healthy soils, 2) Sanitation and crop rotation, 3) Hot water seed treatment at 54ºC for 10 minutes or with seed dressing fungicides, 4) Collection and destruction of stubble and spraying with copper fungicides at right time and 5) Application of suitable foliar fungicides may help to minimise further dissemination of the disease.

Bunt of Rice (Tilletia Barclayana):

Symptoms: This disease also called black or kernel smut is generally distributed wherever rice is grown. Diseased grains are filled with black powder, which can be detected by breaking them. Only a few grains may be affected wholly or partially in an ear. If not severely infected, seeds may germinate but seedlings are stunted.

Perpetuation: The disease causing organism is soil borne.

Control: 1) Cultivation of resistant varieties, 2) Use of healthy seed, 3) Sowing early maturing varieties, 4) Avoid high rates of nitrogen fertilizer, 5) Avoid winnowing and threshing of diseased crop in field, 6) Treat the seed with suitable chemicals easily available in the market and 7) Collect and burn diseased ear heads.

Rice Blast: (Pyricularia oryzae)

Symptoms: Some times this disease refers as Pyrricularia blight or rotten neck, generally distributed where ever rice is grown. Small spots appear on leaves, nodes, panicles and grains and some times on leaf sheaths. The spots begin as small, water-soaked, whitish, greyish or bluish dots. These spots rapidly increase and become grey in centre. Brown to black spots also develops on inflorescence and glumes. In later stages, diseased heads appear blasted and whitish in colour. Grain development is affected and the panicles droop.

Perpetuation: The disease perpetuates through diseased plant debris lying in the field, seed and wild grasses.

Control: 1) Burn and destroy diseased plant debris and stubble, 2) Early planting, 3) Cultivation of resistant varieties, 4) Use of healthy seed, 5) Dusting the seed with any one of the organic mercurial seed dressing fungicides, 6) Spray the crop with organo-mercurials, 7) Avoid excessive depth application of irrigation water, 8) Avoid excessive plant population and 9) Control grasses and other weeds.

Bakanae Disease: (Fusarium moniliforme)

Symptoms: This disease is also called white stalk, generally distributed where ever rice is grown. Infected seedlings are thin, chlorotic, may die before or after transplanting. In the field, infected plants have few tillers and leaves die in short time. Live plants have empty panicles. Some infected plants may be stunted instead of elongated, while the abnormal elongation of these (infected) plants in seed bed or field is most common symptom of this disease [21-30].

Perpetuation: The disease causing fungus is seed and soil borne, through which it can survive for a long period.

Control: 1) Cultivation of resistant varieties and 2) Seed treatment.

Ufra of Rice: (Ditylenchus angustus)

Symptoms: The disease has been reported from Bangladesh, Egypt, India and South Asia. The leaves become yellow and wither, seedlings die. Brown spots appear on leaves and leaf sheaths. Stems may also bear spots. These spots become darker brown along with upper inter-nodes of the stem. Ears may not emerge or may show swellings and become twisted and distorted. Grains are not formed usually.

Perpetuation: Diseased plant debris carrying disease causing nematodes.

Control: 1) Burn the stubble, 2) Grow early maturing varieties, 3) Use healthy seed and 4) Plough the field thoroughly after harvest so as to expose the soil to sun-heat.

Bacterial Blight: (Xanthomonas oryzae)

Symptoms: Water soaked stripes appear along the margin of leaf blades, which later on enlarge and turn yellow. These lesions may cover the entire blade, may extend to the lower end of leaf sheath. Similar symptoms may occur on glumes of green grains.

Perpetuation: Survive in rhizophere of weed hosts, infected straw and root stubble. Disseminate by wind and water.

Control: Cultivation of resistant varieties is alone easy and safe way to prevent the crop against diseases including this disease also.

Stem Rot: (Sclerotium Oryzae)

Symptoms: Two to three months old plants begin to wither and ultimately dry up; the sheaths soon turn somewhat dark and start rotting. Black dots (fruiting bodies of sclerotia) occur at the base of dried leaves and leaf sheaths. Stem begins to rot and become soft, plant falls down.

Perpetuation: Infested soil helps the organism for its survival.

Control: 1) Use of resistant varieties, 2) Burning of diseased rice stubble, 3) Crop rotation and 4) Antagonistic organisms.

Sheath Blight: Sheath blight is a fungal disease caused by Rhizoctonia solani. Symptoms are usually observed from tillering to milk stage in a rice crop. It occurs throughout the rice-growing areas in temperate, subtropical and tropical countries. Rice sheath blight is found in all rice production areas and is decreasing rice production especially in intensified production systems. Studies at IRRI showed that sheath blight causes a yield loss of 6% across lowland rice fields in tropical Asia.

Fig. 4: Bacterial blight is affected in the paddy crops.

Fig. 5: Rice blast is affected in the paddy crops.

Bacterial Blight - Bacterial blight is caused by Xanthomonas oryzae pv. oryzae (Xoo) and affects the rice plant at the seedling stage where infected leaves turn grayish green and roll up. As the disease progresses, leaves turn yellow to straw-colored and wilt, leading whole seedlings to dry up and die. The disease occurs in both tropical and temperate environments, particularly in irrigated and rainfed lowland areas. It is commonly observed when strong winds and continuous heavy rains occur. The disease is severe in susceptible rice varieties that are treated with high nitrogen fertilizer.

Bacterial Blight: Bacterial blight is one of the most destructive rice diseases in Asia and has historically been associated with major epidemics. It occurs in China, Korea, India, Indonesia, the Philippines, Sri Lanka, Myanmar, Laos, Taiwan, Thailand and Vietnam. The disease also occurs in Northern Australia and Africa. In the late 70s, epidemics due to bacterial blight were reported in India. The advent of rice varieties bearing genes with resistance to the disease has changed the perception about the disease: the incorporation of host-plant resistance genes in rice varieties, their adoption and deployment in the world's main rice-producing environments is probably one of the most significant evidences of the role of plant pathology in agricultural development. Bacterial blight nevertheless remains an important concern and many countries will not endorse the release of new rice varieties unless they carry resistance to the disease. Whenever susceptible rice varieties are grown in environments that favor bacterial blight, very high yield losses, as much as over 70%, may be caused by bacterial blight. It is particularly serious in hybrid rice and therefore, active breeding in national and commercial breeding programs have developed and released some hyrbids that have resistance to the disease [31-40].

Rice Blast: Rice blast (Pyricularia grisea) is a fungus that feeds on the rice plant, causing severe damage usually during the seedling stage. It attacks different parts of the plant: the collar, which can ultimately kill the entire leaf blade; the stem, which turns blackish and breaks easily (node blast); the neck of the panicle, where the infected part is girdled by a grayish brown lesion, or when severe, causes the panicles to fall over; or on the branches of the panicles which exhibit brown lesions when infected.

Blast is highly destructive in lowland rice in temperate and subtropical Asia, as well as in upland rice in tropical Asia, Latin America and Africa. Blast is found in approximately 85 countries throughout the world. Its first known occurrence was as early as 1637 in China where the disease was known as rice fever disease. Blast is considered a major disease of rice because of its wide distribution and extent of destruction under favorable conditions. Although blast is capable of causing very severe losses of up to 100%, little information exists on the extent and intensity of actual losses in farmers' fields. Losses of 5-10%, 8%,and 14% were recorded in India (1960-1961), Korea (mid-1970s) and in China (1980-1981), respectively. In the Philippines, yield losses ranging from 50-85% were reported.

Rice Yellow Mottle Virus: Rice yellow mottle virus (RYMV) is a plant virus disease. The most important symptom on a rice plant is that leaves turn yellow, with alternate yellow and green stripes that give its typical mottled appearance to the plant. The other symptoms are: stunting, reduced tillering, leaf mottle with yellow stripes, incomplete panicle exsertion, the panicle sometimes being badly formed and spikelet sterility. In natural conditions, RYMV is transmitted from an infested plant to a healthy plant by insect vectors of the beetle group, or be lesions caused by tillage practices (transplanting, weeding, etc.). The disease can be transmitted mechanically; touching an infested plant and later a healthy plant can transmit the disease. In a infested field, yellow patched indicate the infestation [41].

Sheath Rot: This disease is usually associated with a virus disease infection and is identified by rotted growing panicle being incompletely exerted with numerous empty

Fig. 6: Sheath Rot disease affected in the paddy crops.

Fig. 7: Narrow Brown Spot disease affected in the paddy crops.

grains. Infected plants may be infested with stem boreres. Management options for this disease include using resistant varieties, To eradicate seed-borne pathogens causing the disease, use Mancozeb and benomyl for seed treatments. And finally, systemic fungicide can be applied when typical symptoms are observed on emerging panicle.

Bakanae: This disease is commonly found throughout the whole growth stages of the rice plant. Infected seedlings elongates abnormally, becomes slender and the leaves turn pale yellow green. Infested plants develop roots at the upper nodes and the whole plant turns yellow. At booting stage, some infected plants die.

Brown Spot: Typical spots on the leaves are oval, about the size and shape of sesame seeds. The spots are relatively uniform and fairly evenly distributed over the leaf surface. Young spots are small, circular (0.05 to 0.10mm in diameter) and usually dark brown. Most spots have a light-yellow halo around their margins.Since the disease is known to be associated with soil deficient in nutrients, proper fertilization, good water management and soil amendment are suggested as management option.

Narrow Brown Spot: The characteristic symptoms of the disease are usually observed during the late growth stages and are characterized by the presence of short, linear, brown lesions mainly on the leaves (although it may also occur on leaf sheaths, pedicels and glumes).Foliar fungicides such as mancozeb, benomyl, propiconazole and iprodione effectively suppress this disease and may be economical if other diseases are also controlled along with narrow brown spot.

Bacterial Leaf Streak: Symptoms begin with fine translucent streak between veins. As the disease progresses, the streaks becomes yellowish-gray, the lesion coalesce, then eventually turn to brown to grayish white causing the leaves to die. Management options include the use of resistant varieties is the most effective method of controlling the disease. Application of balanced levels of plant nutrients, especially nitrogen and draining the field when symptoms start to appear can also help minimize the spread of the disease.

Grassy Stunt: Grassy stunt-infected rice plants show pronounced stunting and proliferation of short, erect and narrow leaves that are pale green or pale yellow.

Management options include the use of resistant varieties for ragged stunt management is probably the most important control measure. However, BPH-resistant cultivars, which formerly had little or no ragged stunt, often showed infestations when populations of BPH became adapted to the resistant cultivars.

Software Solution for the Problem Statement: “M-Archive” It is a free file manager for cell phone series. It is capable and compatible to compress and decompress archives. The system is ideal for professional corporatists, hobbyist users, students or all other users of a mobile phone. Using M-Archive puts you ahead of the crowd when it comes to compression by consistently making smaller archives, this can be achieved very fast, saving disc space, transmission costs AND valuable working time. It makes it easy for you send files, compressed, via Bluetooth or GPRS. The technology used J2ME (ie. Java 2 Mobile Edition) is the first and only tool that combines the power of a large programming and the portability of a mobile phone to create a small and easy to use source code editor.

Deciding the Technology: AppForge MobileVB enables developers to use Microsoft Visual Basic and Visual Studio to write applications for Pocket PC 2003 devices like the Hp iPaq and Dell Axim models. AppForge products and technology enable software developers to write mobile and wireless applications using the knowledge and resources they already have. AppForge’s flagship product, MobileVB, provides Visual Studio developers the ability to write applications for more than 90% of the world's leading mobile and wireless devices including Palm OS, Pocket PC and Symbian devices.

Deciding the Platform (OS): Windows Mobile is a compact operating system combined with a suite of basic applications for mobile devices based on the Microsoft Win32 API. Devices that run Windows Mobile include Pocket PCs, Smartphones, Portable Media Centers and on-board computers for certain automobiles. It is designed to be somewhat similar to desktop versions of Windows, featurewise and aesthetically. Additionally, third-party software development is available for Windows Mobile. Windows Mobile runs on multiple hardware platforms including Pocket PCs, smartphones, Portable Media Center and automobiles. These hardware platforms did not always exist from the inception of Windows Mobile. Windows Mobile 6 is meant to be similar in design to Windows Vista.

RESULTS AND DISCUSSION

Results: We have considered very common paddy disease of the different areas over the world as experimental images. We have taken the images from the Lousiana State University Auricular Center (www.lsuagcenter.com), International Rice Research Institute (IRRI) and Bangladesh Rice Research Institute (BRRI). We have considered paddy disease images with the environmental parts. It has been observed that the proposed system output accuracy varies respect to paddy diseases.

Table 1: Comparative Accuracy analysis of paddy disease recognition

Disease Name	True Recognition	False Recognition	Accuracy in %
Brown Spot	27	2	93.10
Bacterial Leaf Blight	82	2	97.62
Leaf Scald	18	2	90.00
Leaf Blast	10	3	76.92
Cold Damage	3	0	100.00
Bronzing	6	1	90.91
Crown rot	5	1	88.89
Narrow Brown Leaf Spot	4	0	100.00
Sheath Blight	41	3	93.18
Leaf smut	4	0	100.00
Stackburn	8	2	80.00
White tip	4	0	100.00
Head Blight	14	3	84.21
Downy Mildew	3	0	100.00
Healthy Paddy Crop	19	19	100

To measure the performance of a paddy disease test, the concepts sensitivity and specificity are often used. Say we test some people for the presence of a disease. Say some of the test leaves have disease and we call it true recognition (TR) if the system recognizes the disease properly. In addition, if the system provides misleading results then it is called false recognition (FR). Thus, the number of true recognition and false recognition add up to 100% of the set. Finally we have calculated accuracy of the system using the following equation.

$$accuracy = \frac{TR}{TR+FR}$$

The above table depicts the data of accuracy for the targeted four paddy diseases analyzed by the system. Furthermore, training a disease using the system takes 575.0324 milliseconds.

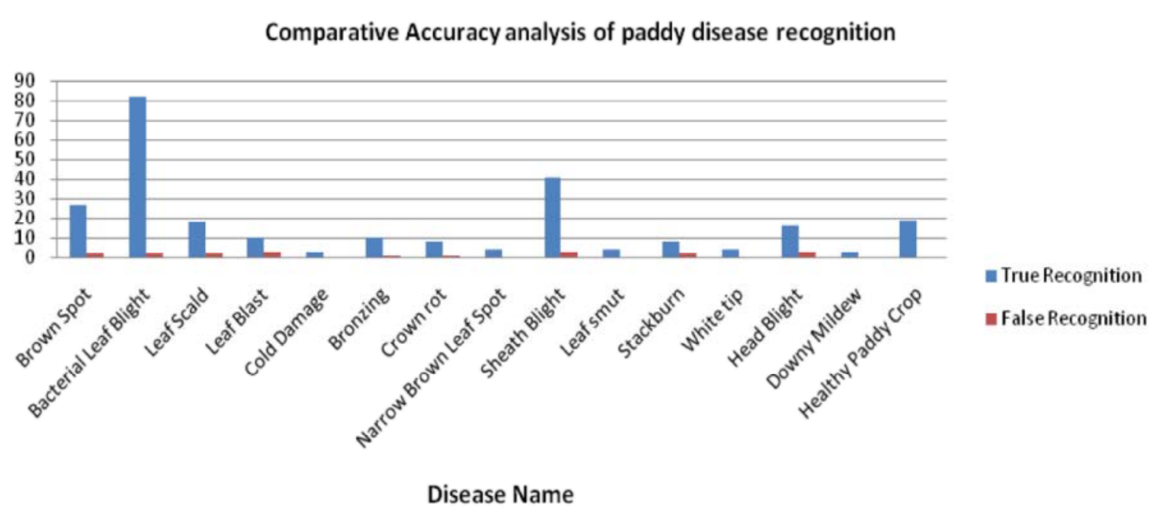
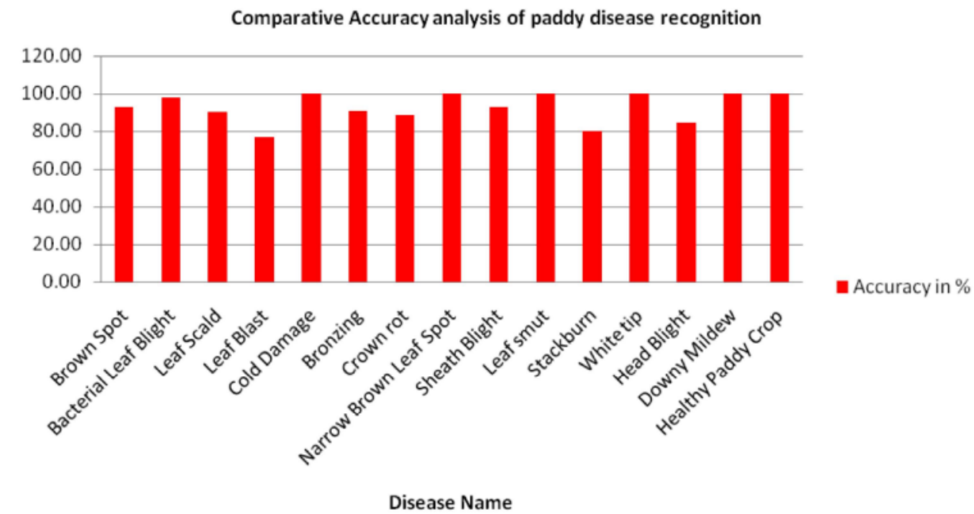


Fig. 8: Comparative Accuracy analysis of paddy disease recognition

Table 2.1: Comparison between LZW and Huffman

File Name	Input File Size	M-Archive	7 Zip	LZW	Hoffmann Coding	Filzip



On the other hand, analysis of an image for disease detection takes 458.5252 milliseconds, which is an improvement from analysis time of 987.741 milliseconds for exhaustive comparison of features [42].

CONCLUSION

There is a growing number of applications of data mining techniques in agriculture and a growing amount of data that are currently available from many resources. This is relatively a novel research field and it is expected to grow in the future. There is a lot of work to be done on this emerging and interesting research field. The multidisciplinary approach of integrating computer science with agriculture will help in forecasting/ managing agricultural crops effectively by using of Mobile phones. M-Archive software allows you to Compress and decompress files allowing you to store and retrieve data as and when required. It supports in saving memory space, better file transfer rate, user friendly and cost-Effectiveness. It supports compression in the following file format.

REFERENCES

1. Di Cui, Oin Zhang, Minzan Li, Youfu Zhao and Glen L. Hartman, 2009. Detection of soybean rust using a multispectral image sensor, SpringerLink -Journal article.
2. Zulhaidi Helmi, Mohd Shafri and Nasrulhapiza Hamdan, 2009. Hyperspectral Imagery for Mapping Disease Infection in Oil Palm Plantation Using Vegetation Indices and Red Edge Techniques, American Journal of Applied Sciences, 6(6): 1031-1035.
3. Ha, S. and S. Joo, 2010. A Hybrid Data Mining Method for the Medical Classification of Chest Pain, World Academy of Science Engineering and Technology.
4. Abdullah, U., 2008. J. Ahmad and A. Ahmed, Analysis of effectiveness of apriori algorithm in medical billing data mining, Emerging Technologies, Islamabad.
5. Ullah, I., 2010. Data Mining Algorithms And Medical Sciences, International Journal of Computer Science and Information Technology (IJCSIT), 2: 6.
6. Rajnijain, Sonajharia Minz1 and V Ramasubramanian, 2009. Machine Learning for Forewarning Crop Diseases. J. Ind. Soc. Agril. Statist, 63(1): 97- 107.
7. Nithya, A. and V. Sundaram, 2011. Classification Rules For Indian Rice Diseases, IJCSI International Journal Of Computer Science Issues, ,ISSN (Online): 1694-0814, 8(1): 444-448.
8. Prasad Babu and M.S. Sridhar, 2010. Implementation Of Web-Based Chili Expert Advisory System Using ABC Optimization Algorithm, (IJCSE) International Journal On Computer Science And Engineering, 02(06): 2141-2144.

9. Zhangjian, Zhangwei, 2010. Inst. Of Intel. Machines, Chinese Acad. Of Sci., Hefei, China, Support Vector Machine For Recognition Of Cucumber Leaf Diseases, Advanced, pp: 264-266.
10. Prasad Babu and M.S. Sridhar, 2010. International Journal of Engineering Science and Technology, A Web Based Sweet Orange Crop Expert System Using Rule Based System And Artificial Bee Colony Optimization Algorithm, 2(6): 2408-2417.
11. Lili, N.A, 2011. International Journal on Computer Science and Engineering, Classification Of Herbs Plant Diseases Via Hierarchical Dynamic Artificial Neural Network After Image Removal Using Kernel Regression Framework, ISSN: 0975-3397, 3(1): 15-20.
12. Phadikar, S. and J. Sil, 2008. Dept. Of CSE, West Bengal Univ. Of Techno, Kolkata. Computer and Information Technology, ICCIT 2008. 11th International Conference, Rice Disease Identification Using Pattern Recognition Techniques, 24-27: 420 - 423.
13. Ghaffari, R., Fu Zhang, D. Iliescu, E. Hines, E. Leeson, M. Napier and R. Clarkson, 2010. Univ. Of Warwick, Coventry, UK. Neural Networks (IJCNN), the 2010 International Joint Conference, Early detection of Diseases in Tomato Crops: An Electronic Nose And Intelligent Systems Approach, 18-23: 1-6.
14. Attonaty, J.M., M.H. Chatelin, F. Garcia and S. Ndiaye, Using Extended Machine Learning and Simulation Technics to Design Crop Management Strategies.
15. Juhua Luo, Wenjiang Huang, Jihua Wang and Chaoling Wei, 2009. The Crop Disease And Pest Warning And Prediction System, Computer And Computing Technologies In Agriculture II, Volume 2 IFIP Advances In Information and Communication Technology, 294: 937-945.
16. Rumpf, T., A.K. Mahlein, U. Steiner, E.C. Oerke, H.W. Dehne and L. Plümer, 2010. Early Detection And Classification of Plant Diseases With Support Vector Machines Based On Hyper spectral Reflectance, 74(1): 91-99.
17. Jason A Smith, Kathleen M. Baker and Robert Trenary, 2009. 7th World Congress On Computers In Agriculture Conference Proceedings, Mining Derived Weather Forecast Variables For Crop Disease Risk Prediction, American Society Of Agricultural And Biological Engineers, St. Joseph, Michigan Www.Asabe.Orgjune, 200: 22-24.
18. Zhangjian, Zhangwei, 2010. Inst. Of Intel. Machines, Chinese Acad. Of Sci. Hefei, China, Support Vector Machine For Recognition Of Cucumber Leaf Diseases, Advanced, 27-29: 264-266.
19. Prasad Babu, 2010. International Journal of Engineering Science and Technology, A Web Based Sweet Orange Crop Expert System Using Rule Based System And Artificial Bee Colony Optimization algorithm, 2(6): 2408-2417.
20. Lili, N.A.,, 2011. International Journal on Computer Science and Engineering, Classification Of Herbs Plant Diseases Via Hierarchical Dynamic Artificial Neural Network After Image Removal Using Kernel Regression Framework, ISSN: 0975-3397, 3(1): 15-20.
21. Phadikar, S. and J. Sil, 2008. Dept. Of CSE, West Bengal Univ. Of Techno, Kolkata. Computer and Information Technology, ICCIT 2008, 11th International Conference, Rice Disease Identification Using Pattern Recognition Techniques, 24-27: 420 - 423.
22. Ghaffari, R., Fu Zhang, D. Iliescu, E. Hines, M. Leeson, R. Napier and J. Clarkson, 2010. Univ. Of Warwick, Coventry, UK. Neural Networks (IJCNN), the 2010 International Joint Conference, Early detection of Diseases in Tomato Crops: An Electronic Nose And Intelligent Systems Approach, ISSN: 1098-7576, 18-23: 1 - 6.
23. Luo Juhua, Wenjiang Huang, Jihua Wang and Chaoling Wei, 2009. The Crop Disease And Pest Warning And Prediction System, Computer And Computing Technologies In Agriculture II, Volume 2 IFIP Advances In Information And Communication Technology, 294: 937-945.
24. Rumpf, T., A.K. Mahlein, U. Steiner, E.C. Oerke, H.W. Dehne and L. Plümer, 2010.Early Detection And Classification of Plant Diseases With Support Vector Machines Based On Hyper spectral Reflectance, 74(1): 91-99.
25 . Jason A. Smith, Kathleen M. Baker and Robert Trenary, 2009.7th World Congress On Computers In Agriculture Conference Proceedings, Mining Derived Weather Forecast Variables For Crop Disease Risk Prediction, American Society Of Agricultural and Biological Engineers, St. Joseph, Michigan Www.Asabe.Orgjune, pp: 22-24.
26. Beagle Ristaino Jean, 2006. The Evolutionary History of The Potato Late Blight Pathogen With Historical Collections, Outlooks on Pest Management.

27. Traunfeld Jon, 2009.Late Blight of Potato and Tomato, home & garden information center.
28. Renato B. Bassanezi, José Belasque Junior and Cícero A. Massari, Current Situation, Management And Economic Impact Of Citrus Canker In São Paulo and Minas Gerais, Brazil.
29. Brendon J. Woodford, Nikola K. Kasabov and C. Howard Wearing,1999. Fruit Image Analysis using Wavelets , Proceedings of the ICONIP/ ANZIIS/ ANNES.
30. Mix, C., F.X. Pico and N.J. Ouborg, 2003. A Comparison of Stereomicroscope And Image Analysis For Quantifying Fruit Traits, SEED Technology, 25(1).
31. Abdullah Ahsan and Muhammad Umer, 2004. Application of Remote Sensing in Pest Scouting: Evaluating Options and Exploring Possibilities, Proceedings of the 7th International Conference on Precision Agriculture and Other Precision Resources Management, Hyatt Regency, Minneapolis,MN,USA.
32. Ei -Helly Mohammad, Ahmed Rafea, Salwa Ei -Gamal And Reda Abd Ei Whab, 2004. Integrating Diagnostic Expert System With Image Processing Via Loosely Coupled Technique, Central Laboratory for Agricultural Expert System (CLAES).
33. Weizheng S., W. Yachun, C. Zhanliang and W. Hongda, 2008. Grading Method Of Leaf Spot Disease Based On Image Processing, Proceedings Of 2008 International Conference On Computer Science And Software Engineering, pp: 06.
34. Meunkaewjinda, A., P. Kumsawat, K. Attakitmongcol and A. Srikaew, 2008. Grape leaf disease detection from color imagery system using hybrid intelligent system, proceedings of ECTICON, 2008, IEEE, pp: 513-516.
35. Ying Geng, Li Miao, Yuan Yuan and Hu Zelin, 2008. A Study on the Method of Image Pre-Processing for Recognition of Crop Diseases, International Conference on Advanced Computer Control, 2008 IEEE.
36. Cui Di, Oin Zhang, Li Minzan, Youfu Zhao and Glen L. Hartman, 2009. Detection of soybean rust using a multispectral image sensor, SpringerLink - Journal article.
37. Helmi Zulhaidi, Mohd Shafri and Nasrulhapiza Hamdan, 2009. Hyperspectral Imagery for Mapping Disease Infection in Oil Palm Plantation Using Vegetation Indices and Red Edge Techniques, American Journal of Applied Sciences, 6(6): 1031- 1035.
38. Ha, S. and S. Joo, 2010. A Hybrid Data Mining Method for the Medical Classification of Chest Pain, World Academy of Science Engineering and Technology.
39. Abdullah, U., J. Ahmad and A. Ahmed, 2008. Analysis of effectiveness of apriori algorithm in medical billing data mining, Emerging Technologies, Islamabad.
40. Ullah, I., 2010. Data Mining Algorithms And Medical Sciences, International Journal of Computer Science and Information Technology (IJCSIT), 2(6).
41. Rajnijain, Sonajharia Minz1 and V. Ramasubramanian, 2009. Machine Learning for Forewarning Crop Diseases. J. Ind. Soc. Agril. Statist, 63(1): 97- 107.
42. Nithya, A. and Dr. V. Sundaram, 2011. Classification Rules For Indian Rice Diseases, IJCSI International Journal Of Computer Science Issues, January,ISSN (Online): 1694-0814, 8(1): 444-448.