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Android Application for Crop Yield Prediction and Crop Disease Detection

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Abstract:- As we know, India's economy primarily depends on agriculture. For successful production of crops we must ensure whether a particular crop will yield in particular soil and weather condition. And also if crop is not yielding properly, that means it must have some disease. So our project primarily focuses on two modules. One module will take Input factors such as weather condition, soil chemical content proportions, etc. and will use previous data in that condition and will give output as crop name which will be suitable in that particular condition. In second module application will take diseased crop image as an input and with the help of image mining we will predict which might be the possible disease caused to the crop. The proposed system represents a digital tool in the form of a mobile application, which will help farmers intelligently. It would include crop disease detection, crop yield prediction and recommendation of best crop as the prime focus. The prime focus is on improving the usability of agricultural services by providing a better tool.

Keywords:- data mining; crop yield; usability; crop disease detection; recommendation of best crop

I. INTRODUCTION

India is an agricultural country with second highest land area of more than 1.6 million square-kilometre under cultivation. Agriculture has been backbone of our country. It is very much essential for the growth of our country. India possesses a power potential to be a superpower in the field of agriculture Indian agriculture sector accounts for 18 percent of India's gross domestic product (GDP) and provides employment to 50% of the countries workforce. Various important industries in India find their raw material from agriculture sector -cotton and jute textile industries, sugar, vanaspati, etc. are directly dependent on agriculture. There is no such universal system to assist farmers in agriculture. India is an agriculture based developing country. In spite of having lot of digital data, they are not able to access real time to the factual information such as the crop yield data in particular soil and crop disease detection techniques, pesticides to be used, weather conditions, pest management etc. So as a solution to improvement in usability tool, this paper explores to develop solution that aims to be scalable, easy to access, community oriented design, efficient that aims to reduce digital gap among rural farmers towards technology. This paper highlights two major crop related parts:

A. Crop Yield Prediction

From very long time agriculture has been main culture practiced in India. Many people don't have awareness about the cultivation of crops in a right time and at right place. By analyzing the parameters such as weather, temperature and several soil related parameters such as soil ph value, water availability in the region, etc., this paper proposes an idea to identify the suitability of crops for a particular soil which is based on the parameters mentioned above. Due to this, quality and yield of the crop will enhance. For Prediction there are many algorithms available such as K-means, Support vector machines, Random forests, Bayesian, ID3, etc. In this paper, we will use Naïve Bayes/Bayesian algorithm, in which accuracy can be maintained. For analyzing and predicting the suitable crop for a particular soil the data sets are being collected based on weather, season, soil PH and water level. By Bayesian Algorithm, the probabilistic conditions are calculated and the prediction is done.

B. Crop Disease Detection

Crop disease detection is one of two parts of our android application after Crop yield prediction. This part will be useful in detecting from which disease crop is suffering from. In early days, monitoring and analysis were done manually, thus it used to take lot of time and work. Detection of disease can be done effectively with the help of image processing techniques and algorithms. So it reduces the lot of work from farmer side. Detection of disease in the early stage is very much essential, because if disease persists then it might destroy whole agricultural field. Detection and hence cure or prevention will be done for the better yield of crop.

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II. LITERATURE SURVEY

S.Nagini, Dr.T.V.Rajini Kanth, B.V.Kiranmayee [1], the author has discussed about various parameters which are responsible for crop yield prediction. In this paper, lot of exploration data analysis is done and various regression models like linear, multiple linear, non linear and non-linear models are tested for effective prediction. Aishwarya B.R. [2], the author has presented application of data mining techniques to extract knowledge from the agricultural data to estimate crop yield for major cereal growth. In this paper, sensor networks are used for monitoring Rice plants. Kalavathi K, Nimitha Safar P.V. [3],the author has compared three classification algorithms which are naïve bayes, Decision tree and k-Nearest Neighbor using Neural network Toolbox. Suraksha, Sushmita, Sushma, Sushmita Keshav [5], in this paper author implemented identification of disease affected in paddy crops and provides mobile phone like android or iOS. These images are then fed to application for identifying paddy disease and suggest remedies. K. Jagan Mohan, M. Balasubramanian, S. Palanivel [7], the author developed computer vision system which can identify and various paddy plant diseases. Diseases affecting the cultivation of paddy are brown spot, bacterial blight and leaf blast diseases. Using Haar-like features and Ada Boost classifier disease is affected is detected. The detection accuracy rate is found to be 83.33%. For disease recognition, using Scale Invariant Feature Transform (SIFT) feature provides paddy plant disease type. Various classifiers such as k-Nearest Neighbour (k-NN) and Support Vector Machine (SVM) are used. Dhanashri Nemishte, Rupali Patil, Supriya More, Sayali Udgave, Monika Kasture [8], author presents survey on various classification techniques for leaf disease classification. The classification method is to classify each pattern in one of the distinct classes. It is done using different morphological features. Different classification techniques are k-mean clustering, Support Vector Machine, etc. Ms. P.R. Patil, Prof. N.B. Bhawarkar [9],in this paper, various techniques of crop detection method using image processing are discussed. The basic steps of image pre-processing, image enhancement and feature extraction methods are same. For recognition of leaf pattern various neural networks are available. KNN, Decision tree, Naive Bayes, RNN, SVM are available. Sakshi Kasat, Dhawnit Thadani, Manali Kolekar, Shreya Gudsurkar[10], the author discussed about various IT solutions in agriculture sector. The interface provided focuses on connection farmers, bank, government bodies, etc. The interface is built in Marathi Language. It provides expertise service related to cultivation of crops, pricing and predicting the production rate of particular crop with specific soil and weather conditions for farmers.

III. EXISTING AND PROPOSED SYSTEM

A. *Existing System*:

In Existing system farmers not connected with any technology and analysis. In traditional system farmer uses "trial and error" method. Farmer experiments on land with different crops, water availability, etc. and after many such "tries", farmer probably gets the best crop suitable in particular land.

Disadvantages of existing system**:**

- High chance of money and time loss
- Particularly when growing new crops, farmers may face the risks of either market failure or production problems or sometimes both.
- Increased risk
- Unsuitable technology and crop incompatibility
- Prediction is not so accurate with regression models.

B. *Proposed System:*

In our proposed system we are building a system which can help farmers to get best crops. System give output after analyzing all necessary attribute like rain, soil condition, temperature, cost, market value, etc. proposes the use of data mining techniques to provide result to farmers for recommendation of best crops. We are developing a system that will improve the usability by providing services for crop disease detection as well along with its information, providing crop yield prediction, selecting the best crop for a region. The recommendations here will be based primarily on user location and on multiple factors like humidity, water availability, weather status, soil condition, acidity of soil, etc.

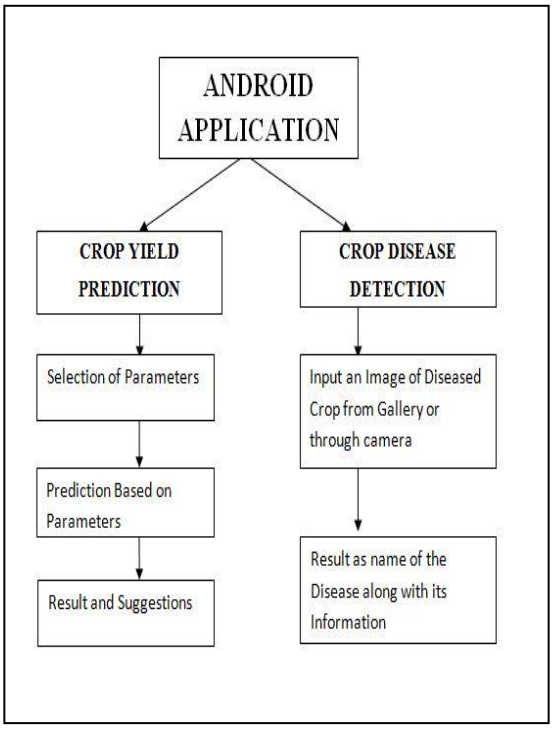

Fig. 1:- Proposed System

It also focuses on farmers should be able to identify crop diagnosis by sending image through app. Also the farmer by using our project will get information easily even though he is an amateur at using technology.

Thus the farmer gets maximum profit and knowledge which in turn reduces digital divide.

IV. ALGORITHMS USED IN PROPOSED SYSTEM

A. Naive Bayes Algorithm

The Naive Bayes Classifier technique is based on Bayesian theorem. Despite its simplicity, Naive Bayes can often outperform more sophisticated classification methods. In Naive Bayes, you make the assumption that the variables are independent (even if they are actually not).The attributes related to agriculture and weather condition are taken into consideration for prediction of crop yield in the particular soil and atmosphere.

Steps in Bayesian algorithm

- Identify the tuples with attributes in the datasets.
- Calculate the probabilities of decisive attribute along with other attributes and make predictions.
- The classifier will predict the particular attributes needed with the Bayesian theorem.
- In result, success and failure rates of all crops will be displayed. More the success rate, more the crop would be suitable in particular region.

B. SIFT Algorithm

Scale-invariant feature transform (or SIFT) is an algorithm in computer vision. It is used to detect and also describe local features in images. These features include various distinctive, scale invariant image feature points, which can be matched between query image and the image in database to perform tasks. It is used for detecting features in crop images. Input image's features will be compared with the features of images from dataset, and with the maximum numbers of features that matches with the dataset image that image's disease will be shown in result along with its information.

C. Steps in SIFT algorithm

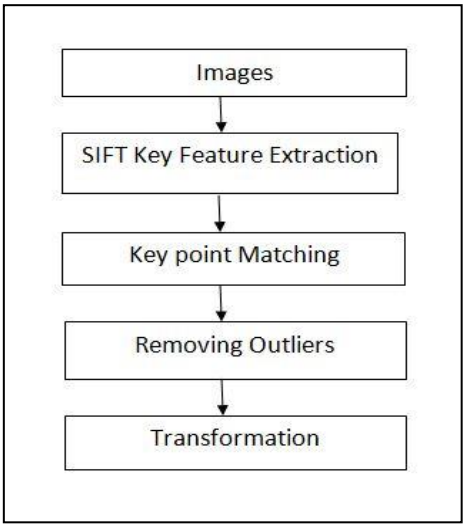

Fig. 2 SIFT steps

D. Pseudo Code for SIFT

```
for all octaves
{
   List keypoint_list;
   for all scales
   {
      ConvolveImageGaussParallel( );
      BuildDoGParallel( );
      //Detect Keypoint
      #pragma omp parallel for
       for all pixels p in Image
      {
        if( IsKeypoint(p) )
           #pragma omp critical
           keypoint_list.add(p);
      }
   }
   #pragma omp parallel for
   for all pixels kp in keypoint_list
   {
      ExtractFeature(kp);
   }
   DownSampleImageParallel( );
}
```

E. Advantages of SIFT

- Locality: features are local, so no prior segmentation is needed
- Quantity: many features can be generated even for small objects
- Efficiency: Close to real time performance
- Distinctiveness: individual features can be matched to the large database of objects.

V. CONCLUSION

In current system farmers not connected with any technology and analysis. So there are many chances of loss. Sometime wrong selection of crop will effect on their income. To reduce these we are developing an android application. We are developing an application which will predict which would be the suitable crop in particular region and this application will also detect disease from image of the crop, if crop is suffering from any with the help of image processing technique.

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