

Survey of Disease Prediction on Plants with the Helps of IOT

Mr. P. S. Chopade
Computer Engineering Department
Y.B.Patil Polytechnic, Akurdi.
Pune, India.
pratik.chopade87@gmail.com

Mr. S. A. Korde
Computer Engineering Department
Y.B.Patil Polytechnic, Akurdi.
Pune, India.
korde.santosh@gmail.com

Abstract—overall climate change is a diversity in the long-term weather patterns that indicates the regions of the world. The term "weather" refers to the short-term (daily) changes in temperature, wind, and precipitation of a region. With the up-gradation in data mining and its applications, data mining is extensively used to make smarter decisions in farming. Agricultural forecasting is the science that employ knowledge in weather data relating to atmospheric environment observed by instruments on the ground and by remote sensing. Most of the data need to be processed for generating various decisions such as cropping and scheduling of irrigation. Various meteorological data like- temperature, humidity, leaf wetness duration (LWD) plays the vital roles in the growth of microorganism responsible for disease. Effective forecasting of such diseases on the basis of climate data can help the farmers to take timely actions to restrain the diseases. This can also justify the use of pesticides, which are one of the source behind land pollution. This paper illustrate the study which is useful for farmers in order to make decision if there is change occur in environment. In this study we are going to implement application which give the notification to farmers, if there is change in environment so based on that changes which disease should be affected to plant such type of notification will be generated on farmers mobile. Weather based forecasting system can be treated as a part of the Agricultural Decision Support System (ADSS) which is Knowledge Based System (KBS). IoT device that collects data regarding physical parameters, using a sophisticated microcontroller platform, from various types of sensors, through different modes of communication and then uploads the data to the Internet.

Keywords-Agricultural Decision Support System (ADSS), Meteorological Data, Internet of Things, Arduino Microcontroller. Sensors.

I. INTRODUCTION

Agriculture is the backbone of our economic system. Agriculture provides maximum employment in the country. Unfortunately, crops production heavily affected by the pests and diseases. Pest damages huge amount of the agricultural Production. It is essential to switch from traditional agricultural methods to precision agriculture mainly to increase agricultural productivity. Internet of Things (IoT) has the potential to make the world more friendly for present and future generations of mankind. IoT devices can be deployed in numerous ways for sustainable development. An IoT device can be used to measure physical criterion pertaining to a physical object and upload them real-time to an online archive i.e. to a cloud storage where they can even be analyzed in real-time.

Discrete knowledge in weather and climate data leads to quantitative and qualitative improvement in agricultural production. The observations of atmospheric environment data relating to organism response to varying environment includes agricultural crops, stages of their growth, development as well as pathogenic elements affecting them. After green revolution concept in India, uses of chemical pesticides and fertilizers were increased. Irrational use of pesticides creates a problem with the crop quality, land quality and the human health. Uncontrolled use of pesticides creates an economic loss to farmers as well as crop quality. Temperature, precipitation and solar radiation are the main drivers of the crop production. Forecast based on temperature and precipitation are important to agriculture. Extreme climate conditions also

negatively blow agriculture production, pest and diseases. Weather based forecast provides the early cautioning to the farmers. This guide to take the timely action against the diseases.

We are going to develop an application which is very useful to farmers for obtaining the environmental variation data. If there is change in climate condition then application prompt a message on mobile. Depend on that environmental condition which disease can attack or affect the crop which is planted in farm. So it will useful for farmers, once message prompt on mobile so farmers can be able to treat as per requirement. Various types of sensors are used for obtaining the environmental data such as humidity sensor, temperature sensor, leaf wetness sensor etc. Precision farming is an emerging methodology in today's context of agriculture and it definitely holds the key in the future.

II. LITERATURE SURVEY

Many researchers have tried to use data mining technologies in areas related to meteorology and weather prediction. Data mining is the process of automatically discovering useful information in large data repositories [1]. Data mining techniques are used in different fields like medical diagnosis, gene engineering, weather data and agricultural field. Climate change can also be referred to as the variation in the earth's global climate or in regional climates overtime. It describes changes in variability or average state of the atmosphere overtime scale ranging from a decade to millions of years. Climate change is seen as the variation in climate over time.

Climate change is also seen as the drastic alteration in the natural components of the atmospheric environment with the resultant adverse responses. It is the shift in weather variations or patterns involving overall and unprecedented changes in weather patterns, which may include unusual challenges in rain yield or precipitation, temperature, density or cloud look.

A method of finding chemical composition on rice samples, using data mining techniques such as classification, support vector machine, random forests and neural network models are proposed by (Camila Maione et al.) [3].The rice samples obtained from Midwest region and south region of brazil. Random forest methodology is used for variable selection purpose and finding missing values in the data set by computing proximities. Most important mineral components (Na, Sn, P, F, S) and least important mineral components (Zn, Cr, Be) were found in an organic and conventional grape juice using classification models. To determine most influential weather parameter on evaporation from soil and vegetative surface and transpiration from plants using adaptive neuro fuzzy inference system (ANFIS) by (Dalibor Petkovic et al.) [4]. Weather data sets for seven meteorological parameters such as maximum and minimum air temperature, maximum and minimum relative humidity's, actual vapor pressure, wind speed and sunshine hours were taken from 12 weather stations in Serbia for the period 1980-2010 is used as input data.

III. FORECASTING A DISEASE BASED ON WEATHER

Weather plays an important role in the development of a disease. The importance of weather in the formation and spread of the diseases is well explained with the disease triangle concept.

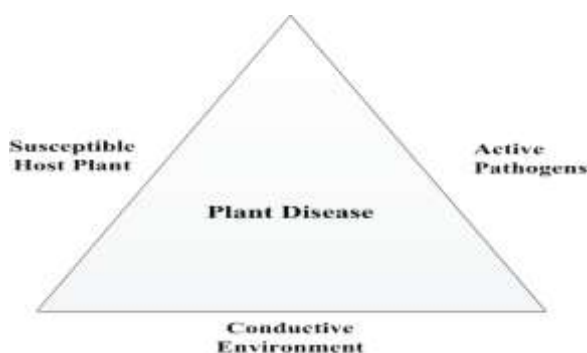


Figure 1: Disease Triangle

Disease triangle concept graphically presented in fig.1. In order for disease to occur, three conditions must be happening simultaneously. First it is necessary to have a susceptible host plant. Each type of plant can be infected by only some pathogens. The plant must also be in a stage of development susceptible to infection by the disease agent. The second requirement is the presence of an active pathogen. If there is no pathogen present there can be no disease. Also, the pathogen must be in a phase of development favorable to infecting the host plant. The third condition is an environment suitable for the pathogen to cause disease of the plant. If early warning of weather changes which are favorable for disease is available then prevention of occurrence of the disease can be done. This is the foremost principle of weather based disease

forecasting. Weather forecasting is the application of science and technology to envisage the state of the atmosphere for a given location. A Weather detection, monitoring and early warning system can provide reliable and timely information to the farmers to deal with weather and climate variability and changes.

IV. USE OF FUZZY LOGIC FOR DISEASE FORECASTING

We are going to propose an expert system for disease forecasting using fuzzy logic. Model of fuzzy set theory and fuzzy logic is given by Zadeh [5]. An expert system can be implemented using fuzzy logic, neural network, knowledge base system etc. Fuzzy logic is used in many applications like data mining, control applications, decision support system and other practical applications where the system is partially known. In many literature uses of fuzzy logic are demonstrated for the partially known systems. The agricultural system is a partial known and complex system. Fuzzy logic theory is very useful to develop a decision support system for an agricultural system [6]. Accurate data of temperature and humidity are always available with meteorological station. Disease formation happens in the specific range of temperature and humidity. In the literature, maximum and minimum values as favorable environment are defined as crisp values. Disease spreading also possible with the nearby crisp value of climate conditions.

A leaf is an important part of the plant. The majorities of the pathogens are developed and grow on the surface of the leaf. Leaf wetness duration plays an important role in the growth of a disease. Leaf wetness duration is given as a degree of moisture associated with the vegetation [7]. LWD can measure by two approaches. The first and the foremost is use of various sensors. The second method is estimation of LWD by means of mathematical models. Measurement and accuracy of the LWD using sensor depends upon the number of sensors placed as well the location of the sensors. Evaluation of LWD using mathematical approach associate with a measurement of various variables like soil moisture, wind speed, heat reflux rate etc. Temperature and relative humidity parameter is primarily important for the estimation of Leaf wetness duration.

V. PROPOSED SYSTEM

Crops production heavily affected by the pests and diseases. Pest damages huge amount of the agricultural production. To increase agricultural productivity farmers have to switch from traditional agricultural methods to precision agriculture. Extreme climate conditions also negatively blow agriculture production, pest and diseases. Weather based forecast gives the early warning to the farmers. This helps to take the timely action against the diseases. Leaf wetness duration (LWD) plays an important role in the growth of a disease. Leaf wetness duration is given as a degree of moisture associated with the plant. Temperature and relative humidity parameter is essential crucial for the estimation of Leaf wetness duration.

As shown in fig-2 we develop an application which is useful for farmers for obtaining environment variation data. In our proposed system user able to access application, from that

application user can give input. After specifying, input data is processed in data storage system. There are two important factors in our system first one is Weather data acquisition

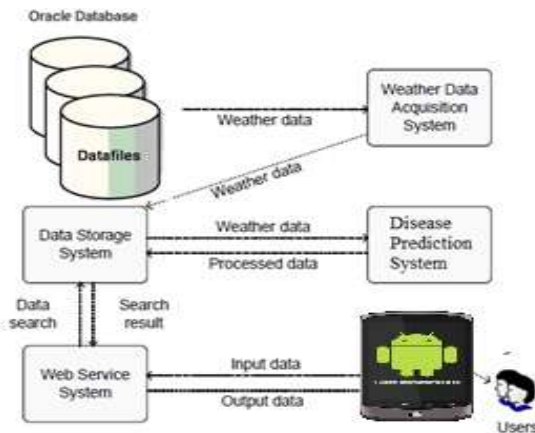


Figure 2: Disease Prediction System for plants.

System and second is Disease prediction system. Weather data acquisition get the weather information or data from data files and passed that data to data storage system. Disease prediction system then acquire that data form storage data and after processing that data it returns to data storage system.

VI. METHODOLOGY

A. Wireless Sensor Network

A sensor is a device that recognize and responds to some type of input from the physical environment. The specific input could be light, heat, motion, moisture, pressure, or any one of a great number of other environmental phenomena. The output is generally a signal that is transform to human-readable display at the sensor position or broadcast electronically through a network for reading or further processing. A WSN is a distributed sensor network to monitor physical or environmental conditions, such as temperature, humidity and moisture to cooperatively pass their data through the network to a main location.

B. Meterlogocal Dataset

For dataset we have to gather data which includes agricultural meteorological data for minimum 30 days. We have to obtain these data from meteorological center. Data includes parameters such as air temperature dry, relative humidity, air temperature wet, cloud, pan evaporation. These are the input parameters for application based on these data we are able to generate a result.

C. Data Mining Methods

Main Objective of the data mining is to discover hidden patterns in a data set. Different types of data mining task includes classification, association analysis and cluster analysis. In this study, we used K Means and Hierarchical clustering techniques to predict patterns in the data set.

D. Cluster Analysis

Clustering is unsupervised learning. Cluster analysis is association of data objects established on information initiate in the data that describes the objects and their relationships. Instances in a data set are characterized by the values of features or attributes that measure different aspects of the instance. Algorithm forms cluster by considering attribute values such as air temperature, relative humidity, rainfall and pan evaporation etc.

E. K- Mean Clustring

K Means clustering algorithm takes the input parameter k and partitions a set of n objects into k clusters. By clustering data according to an attribute hierarchy makes better prediction about minimum temperature, maximum temperature, relative humidity during morning and noon hours and rainfall. Cluster similarity is measured with respect to the mean value of the attributes in a cluster.

F. Hierarchical Clustering

Hierarchical clustering methods partition the data set intosubsets represented by a hierarchical data structuredendrogram. Clusters are procured by combining the subsetsat various levels using the maximum distance criteria.

VII. CONCLUSION

This paper presents a disease prediction system based on wireless sensor network. Implementation of such a system in the field of agriculture can definitely help to improve the yield of the crops and overall production. Using this approach we able to control. Diseases with the optimum use of pesticides. Weather baseddisease forecasting is one of the methods of IPM. Variousmeteorological data like temperature, relative humidity, and leafwetness duration and wind speed are used for the earlydetection for probability of disease in crops. We are going to use clustering techniques to predict minimum and maximum air temperature, relative humidity, rainfall and pan evaporation and effect of these weather parameters on the crops. Knowledge interpretation obtained after analyzing these patterns help farmers to undertake any measures to prevent disease, fertilizer usage, to obtain good yield and information can also be shared between the farmers through messages.

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