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Crop Yield Prediction and Disease Detection Using IOT Approach

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Abstract **-** Today energy resources are becoming inadequate and therefore more worthwhile. In association with the population advance over last century, the need for finding new, more decisive, and continual methods of agricultural farming and food production has become more biting. To simplify this process, we are designing, building, and classifing a system for rigor agriculture which afford farmers with useful data about the disease prevention, the water stockpile, and the general information of the diseases in a good enough, easily available manner. Our system aims to make farming and sprinkling more worthwhile as the farmer is able to make better informed decisions and thus save time and resources. The diversity of location and climatic effects upon agricultural farming, along with other environmental parameters over time makes the farmer's decision-making process more difficult and requires additional factual grasp. Implementing wireless sensor networks for observing weather parameters and bringing together this information with a user-personalized service may enable farmers to deed their knowledge in an dynamic way in order to get the best results from their agricultural farming. The system can scale based on each farmer's claims and the resulting imposition of collected information may express a beneficial resource for forthcoming use, in addition to its use for real-time decision making. The design of the precision agriculture system consist of a prototype solution about the sensor platform and a personalized service that can be used in diverse ways and by several articles.

Keywords:
Graphical passwords, Social engineering, Distortion

I. Introduction

As the world is contributing towards advanced technologies and fulfillment it is a paramount goal to trend up in agriculture also. Many researches are completed in the field of agriculture. Most projects proclaim the use of wireless sensor network collect data from different sensors use at various nodes and send it over the wireless obligation. The collected data grant the information about the assorted environmental factors. Observing the environmental factors is not the outright result to raise the yield of crops. There are number of other factors that reduce the yield to a greater quantity.

In India around 80% of people depend upon farming. Smart Agriculture is one of the clarification to this problem. To representing appearance of this project concludes water

Management, weather forecasting, canal controlling in both automatic and manual modes and all these data are saved and visible in a mobile application. The alert SMS and notification is sending to the user based on the fixed benchmark. By regulating all these operations by a mobile which is connected to internet and it will supply better performed by interfacing sensors, Wireless Fidelity etc.

II. Literature Survey

There are many existing strategies and approaches are used for prediction and detection of disease, for that different types of algorithms are implemented.

[6]It is systems which can predict the more accuracy using meteorological data. Nowadays, there are a lot of yield prediction models, that more of them have been generally classified in two group: a) Statistical Models, b) Crop Simulation Models of Artificial Intelligence (AI), [8]This Recently, application research aimed to assess these new data mining techniques and apply them to the various variables consisting in the database to establish if meaningful relationships can be found.

[14]The results of this study indicate that the ARMA model is preferable over other time series models considered in this paper. The implication of the finding in this study is significant for insurance underwriters responsible for constructing area-based yield insurance that can benefit the Micro insurance market of smallholder farmers and for institutions that rely on those forecasts in providing capital.

III. Proposed Methodology

This project is implemented using Rasberry Pi as a controller. Here we are using Hardware like moisture sensor and Motor On and off switch.

In this work the experiments are executed significant and well admitted grade algorithm KNN are enforced to the dataset. There veracity is obtained by assess the datasets.
In recommended system the farmer will enter his crop name in the system and when system detect the climate or weather change ,then System will automatically predict and advise the farmer that which disease will taint to your crop as well as the system will also gives a distinct methods to prevention.

This project support us to conduct the moisturize level and where we can use in the Society easily. The percentage of moisturize is preserve by sensor which is present inside the soil and the data will store in the database using mobile application. Confer to that motor will be work automatic and manual. If the moisturizer level is low automatically motor gets switched on if it's up to fill ,Then it will shut down the motor. Apart of this the farmer will also get disease information by only putting the disease name in the system. This information include the prevention methods ,how to cure the disease, which plants can be affected by this disease and on which weather it can be happen or have the chances to come etc. along with their images.

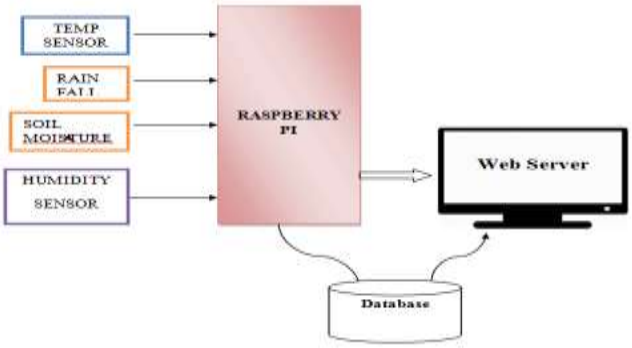

Fig. (1) Architectural Diagram of system

1. Soil Moisture Sensor:

The volumetric water present in soil is measured by moisture sensors.In consideration of the explicit geometric assessment of free moisture which build upon removing, drying, and weighting of a sample, moisture sensors sense the volumetric water circumlocutorily with the help of some other property of the soil, like as electrical resistance, dielectric constant, or synergy with neutrons, as a proxy for the moisture content. The affiliation among the sensed property and soil moisture must be graded and may differ depending on substancial factors such as soil type, temperature, or electric conductivity. Reverse transfered microwave radiation is afflicted by the soil moisture and is used for remote sensing in hydrology and agriculture. lightweight probe equipments can be pre-owned by farmers or gardeners.

Soil moisture sensors have general attribute to sense volumetric water . Another class of sensors sense other property of moisture in soils known as water potential. These sensors are commonly referred as soil water potential sensors and incorporate densitometers and gypsum blocks.

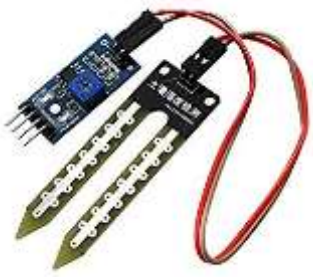

Fig. (2) Soil moisture sensor

2.Rasberry PI:

Raspberry Pi is a basic computer that was originally intended to help spur interest in computing. Raspberry Pi is single circuit board which provide ability to mix and match software according to the work they wish to do. There are some sensors for the Raspberry Pi that can measure humidity, temperature and other values. The value received from sensor is processed by rasberry pi and the conditioned signal pass to the data base for further acquisition.

Fig. (3) Rasberry Pi

3. Data Base:

MySQL: MySQL, is the most famous Open Source SQL database management system, is advanced, dispersed, and backed by Oracle Corporation. The MySQL Web site (http:www.mysql.com) administer the immediate prior information regarding MySQL software.

MySQL is a database management system.
A database is a efficient batch of data. It may be any thing at all from a simple shopping bill to a picture gallery or the broad amounts of information in a collective network. To reckon, approch, and process data stored in a computer database, you need a database management system such as MySQL Server. Since computers are excellent at handling huge amounts of data, database management systems play a fundamental role in computing, as stand alone service, or as parts of other applications.

4. Android application:

An Android app is a software application fuctioning on the Android podium. Because the Android podium is built for mobile like devices, a typical Android app is invented for a smartphone or a tablet PC functioning on the Android OS.

5. KNN Algorithm:

A simple way of accomplish this is to use K-nearest Neighbor.

K-nearest neighbor algorithm (KNN) is element of administered research that has been used in many applications like field of data mining, statistical pattern understanding and many others.

KNN is a approach for allocating objects based on closest training examples in the feature space.

An object is allocated by a mass vote of its neighbors. K is always a positive integer. The neighbors are taken from a set of objects for which the proper allocation is recognized.

It is normal to use the Euclidean distance, though other distance measures such as the Manhattean distance could in principle be used instead.

Points given to compute algorithm on K-nearest neighbors are as follows:

1. Calculate the parameter K = number of nearest neighbors ahead. This value is eliptic or acceptable.
2. Calculate the distance between the query-instance and all the training samples. You can use any distance algorithm.
3. Sort the distances for all the training samples and determine the nearest neighbor based on the K-th minimum distance.
4. Since this is supervised learning, get all the Categories of your training data for the sorted value which fall under K.
5. Use the majority of nearest neighbors as the prediction value.

Advantages:

Robust to noisy training data (especially if we use inverse square of weighted distance as the “distance”)Effective if the training data is large.

K-nearest neighbor (Knn) algorithm pseudocode:

Let (X_i, C_i) where i = 1, 2……., n be data points. X_i denotes feature values & C_i denotes labels for $X_i$for each i.
Assuming the number of classes as ‘c’
$C_i \in \{1, 2, 3, ……, c\}$ for all values of i

Consider x is a point for which label is uknown, and we would like to determine the label class using k-nearest neighbor algorithms.

Knn Algorithm Pseudocode:

1. Calculate “$d(x, x_i)$” i =1, 2, ….., **n**; where **d** denotes the Euclidean distance between the points.
2. Arrange the calculated **n** Euclidean distances in non-decreasing order.

3. Let **k** be a +ve integer, take the first **k** distances from this sorted list.
4. Find those **k**-points corresponding to these **k**-distances.
5. Let $\mathbf{k}_i$ denotes the number of points belonging to the i^{th} class among **k** points i.e. $k \geq 0$
6. If $k_i > k_j \; \forall \; i \neq j$ then put x in class i.

6. MATHEMATICAL MODEL:

Let W be the whole system which consists

Input = {U, M, dp, D}.

1. Let u is the set of number of users or Farmer.

   U= {U1, U2….Un}.

2. M is the moisturize level of soil

3. Dp is a crop name .

4. D is a disease name

Procedure:

Step 1: The farmer will enter his crop name in the system and when system detect the climate or weather change ,then System will automatically predict and notify the farmer that which disease will infect to your crop as well as the system will also gives a different methods to prevention.

Step 2: When sensor sense the moisture in the soil, according to that motor will be work automatic and manual. If the moisturizer level is low automatically motor gets switched on if it's up to fill ,then it will shut down the motor.

Step 3: The farmer will enter the disease name and system will return all the information related to that disease (including their prevention methods, cure methods and images)

Output: Predict the weather and provide disease prevention methods, turn motor on/off by sensing the moisturize level, disease information.

A. Registration

- ✓ The Farmer will register to the system with normal information.
- ✓ At the time of registration Farmer will enter valid Email-ID and Password

B. Login

- ✓ For login to the system, Farmer will enter the Email and password, if entered details are correct then the system will redirect him to home page otherwise it will shows an error message.

After Login:

1. Disease prevention: Farmer will enter the his crop name.

On climate change the system will predict which disease will affect the crop and notify the farmer what prevention methods he has to take.

2. Moisturizer

The Sensor sense the moisturize level of the soil and turn the motor on and off accordingly.

3. Disease information

The farmer will enter the disease name as input and system will return all the information related to that disease as an output. This information includes disease prevention methods, cure methods their brief information along with the images.

C. Logout

Farmer Logout from system.

Hardware Requirements:

- ➢ System : Pentium IV 2.4 GHz.
- ➢ Hard Disk : 40 GB.
- ➢ Ram : 512 Mb.

Software Requirements:

- ➢ Operating system : Windows XP/7.
- ➢ Coding Language : JAVA/J2EE, Hibernate.
- ➢ IDE : Java eclipse, Android.
- ➢ Web server : Apache Tomcat 7.
- ➢ Front End : JSP, CSS etc.

- Back End : MySQL as database server.

IV. Prototype model:

Fig. (4) Prototype model

Initially, the soil moisture sensor detect the certain parameters which include moisture, phosphorus,and nitrogen present in the soil.we get required ratios as in form of input values which will help us for prediction.

The prototype model has 3 buttons on it , when we put sensor in soil that time it shows the NPQ ratio on mobile application. That NPQ ratio will setup by using these 3 buttons on model as per requirement.

Secondly, motor get started and there water level is calculated.And simultaneously the wheather will detected through the mobile application,by the detection of wheather the approximate prediction is done about which type of disease will affect the crops .This will provide proper guidelines and accordingly farmers will give proper prevention and cure to save the crops.

Lastly , the predicted disease will found out and required solution will given form data base.

Conclusion

In the advance, a Novel System Facilitate: IoT Based Agriculture Stick for Live adherence Soil Moisture has been recommended using Arduino or Rasberry pi 3. The sensors has high efficiency and accuracy in fascinating the live data of soil moisture. The system enables effective soil, water, moisture, parameters has been observing and updating using IOT. This implement adequate soil maintenance and Disease prevention mechanism. This conquered the manual operations required to observe and maintain the agricultural farms in both automatic and manual. The system enables the farmer to search about the various diseases.

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