CROP PREDICTION USING MACHINE LEARNING TECHNIQUE

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Abstract : Agriculture helps to meet the basic needs of human and their civilization by providing food, clothing, shelters, medicine and recreation. Hence, farming occupation is the most important enterprise in the world. Agriculture provides different raw materials and provides a free fare and fresh environment, abundant food for driving out famine; favours friendship by eliminating fights. One of the reasons for the shortage of food across the country can be selection of unsuitable crop for cultivation. The proposed project will contain information of different crops and will suggest the farmers crop which is suitable for cultivation based on the geographic area and climatic conditions such as temperature, humidity and moisture which is calculated by using sensors.

IndexTerms - sensors, Arduino kit, K-means algorithm, Arduino IDE, machine learning, prediction, climatic conditions.

I. INTRODUCTION

Farming is one of the most significant economic activities. It is not just a source of livelihood in India but it is the way of life. Agriculture plays a significant part in the development of human civilization as a whole. India is such a country, which is largely dependent on agricultural sector. The recent development in the science and technology sector is leading to use modern technologies in agriculture. Due to the technologically advanced equipment has improved irrigation facilities and with specialized knowledge about the field, this sector started began improving. The traditional way of farming, farmers used to decide the crop to be cultivated based on their previous experience without knowing the factors soil capacity, water drain level, temperature, moisture, humidity, PH level of soil, soil properties, etc., that plays an important role in choosing the crop. Due to this farmers were facing problems like low production, reduced market rates, reduction in soil nutrients, sterilized soil. Our proposed system will help farmers in overcoming some of these obstacles by suggesting the crop that is to be planted in the farm based on important parameters such as temperature, moisture, humidity. In the proposed system we are going to develop an android application that will accept temperature, moisture, humidity values with the assistance of various sensors and by analyzing this information the system can recommend the list of crops. Then the farmer can choose the crop from suggested list for plantation. Then application will provide information about lifecycle and water requirement of crop, pesticide, fertilizers for that particular crop.

II. METHODS AND MATERIAL

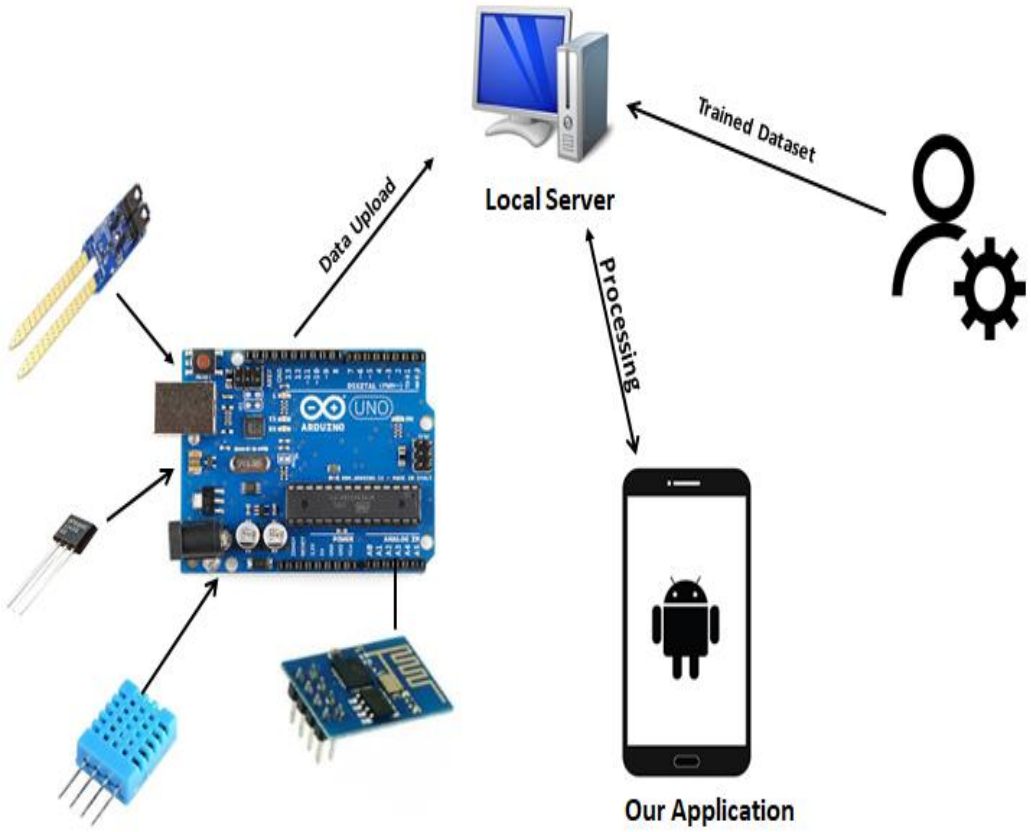

Fig 1. System Architecture

system architecture has three parts, hardware part, user who is using android application and local server.

The software modules in project are as follows:
Registration: This module helps the new users to get registered with the application by entering details such as name, address, mobile number, email id, password etc. Each and every field is provided with validations so that application will accept correct data only.

Login: Only registered user is allowed to log in to the application. This module ensures the security of the application by allowing only authorized users to access the application.

Dataset: The trained dataset having parameters such as id, crop name, required temperature range, required humidity and moisture range , type of soil, amount of water cycles, fertilizers to be given , pesticides , crop life cycles etc. is stored on the local server for analysis purpose.

Wi-Fi Interfacing: The data fetched from sensors will be sent on local server by using Wi-Fi interfacing. For this purpose ESP8266 chip is employed. Also the trained dataset will be stored on the local server using Wi-Fi interfacing.
Fetch Values from H/W: For taking real time values from the field, three sensors are used which senses the data and through Wi-Fi chip it is passed to local server for further analysis.

Analysis of H/W values: The actual working of algorithm starts from this module. Here we are using K-Means clustering algorithm to cluster the data. The sensed data stored on local server is passed to algorithm for predicting the most suitable crop to be cultivated in the given field by analyzing different parameter range.

Result display: After the completion of analysis, the list of crops suitable to be cultivated in the given parameter range is displayed on the application screen. Then user will have

The hardware module consists of three sensors temperature , moisture and humidity .

Temperature Sensor:

A temperature sensor a device, that provides for temperature measurement through an electrical signal. The LM35 is temperature sensor that can be used to measure temperature which gives electrical o/p comparative to the temperature(in °C). This sensor generates a high output voltage and may not need that the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.

Humidity Sensor :
Humidity sensor is working voltage 3.3 V-5 V Humidity measurement range 20 precent -95 percent, humidity measurement error +-5 percent. Temperature measurement range 0 -50, measurement error +-2 degrees.DHT11 digital temperature and humidity sensor module is a composite Sensor contains a calibrated digital signal output of the temperature and humidity.

ESP8266 :
The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP and microcontroller capability produced by Shanghai-based Chinese manufacturer. With the ESP-01 module, made by a manufacturer. This small module the helps microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections.

Arduino:
Arduino is an open-source platform which uses hardware and software. Arduino boards are able to read inputs - light on a sensor and turn it into an output - activating a motor, turning on an LED, publishing something online.

K-Means Algorithm
There are two types of clusters-
1. Central – Central cluster will group the dataset into different clusters with respect to centroidl value.
2. Hierarchy Cluster- It will form tree with sub-nodes having sub-data-points.

Steps-
1. Take two random mean values from data points for forming two clusters.
2. Find the data points nearest to the mean value.
3. We can calculate these by using Euclidean distance or by Manhattan distance.
4. It will again form two clusters with data points nearest to two mean values.
5. Then find the new mean of the two new clusters formed.
6. Repeat these steps until we get same mean value again.
7. Therefore we tend to get the ultimate clusters.

III. DATASET

Trained Dataset:
It consist of parameters like- crop, temperature, moisture, humidity, and crop link for further information of crop.

id	crop	temperature	humidity	moisture	croplink
1	sugarcane	30	42	40	https://en.wikipedia.org/wiki/Sugarcane
2	rice	31	43	38	https://en.wikipedia.org/wiki/Rice
3	potato	21	40	31	https://en.wikipedia.org/wiki/Potato
4	bajara	28	44	38	https://en.wikipedia.org/wiki/Pearl_millet
5	groundnut	24	41	32	https://en.wikipedia.org/wiki/Peanut
6	maize	26	46	34	https://en.wikipedia.org/wiki/Maize
7	sorgagun	29	49	36	https://en.wikipedia.org/wiki/Vegetable

Fig 2. Trained Dataset

Fetched Dataset from sensors:
Fetched values of temperature, moisture and humidity from sensors will be stored in these dataset.

int	temperature	humidity	moisture
1	21	22	31
2	23	24	29
3	18	24	33
11	33	32	42
12	39	32	41
13	33	32	43
14	28	32	43
15	58	32	45
16	42	32	44
32	54	32	35
33	23	32	35

Fig 3.Fetched Dataset

IV. RESULTS AND DISCUSSION

This section explains the result from the proposed model. The trained data is taken from different sites like Wikipedia, different agriculture related government sites as well as different android application like shetkarimitra, phule krushi darshani, etc. The trained dataset particularly includes the major crops in Maharashtra. After formation of clusters from testing data which is fetched from the sensors , we will get average temperature, average moisture and average humidity values. These values will be mapped to suitable clusters of temperature, moisture and humidity of trained data and result will display one or more suitable crops to be cultivated in that particular environment. After logged in user has different options like select crop find soil laboratory etc. After pressing fetch button user will get the list of crops. Then click on the crop to get more information regarding the crop. The result will be more accurate if the trained data samples are more in numbers. For correct prediction of the crop the accuracy of the sensors is also important to be considered.

1. Security to the system is provided through IP address which user needs to enter. The IP address is known only to the individual farmers.
2. Only registered users are allowed to login and use the application.
3. Farmer should first register to the system by giving his details like mail-id, mobile number and password.
4. User can click on the Fetch Data button to get the list of crops.
5. After clicking on the particular crop we can get the further information related to that crop.

V. CONCLUSION

Since the yield of farm highly depend on the crop selected for cultivation and environmental parameters therefore proper selection of crop before cultivation is important in farming. Our proposed system will be a great help to the farmers for selection of desired crop as per the given agro-climatic conditions. This will help to maximize yield rate and thereby increasing the profit.

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