Crop Monitoring System

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Abstract— Farmers in agricultural nations like India, still rely on their intuition and use techniques that are over a century old for cultivating crops. It is also a fact that income of farmers are not increasing to survive in current scenario and it is not possible for them to afford technologies that are not cheap. That is why we require an application that helps them in real world, to inform them about which crop is suitable to grow on what type of land by using algorithms to predict the crop based on parameters like moisture, temperature, etc. This can be determined either by collecting details of land which is asked during the registration done by the farmer or by getting more precise results with the help of IOT based method along with detection of weeds using Convolutional neural network in specific site of crops. Both methods can be used together for achieving efficient results.

Keywords: IoT, Weeds, Application

I. INTRODUCTION

Agriculture is critical area for people living Work has been done toward achieving optimality as far as creation and quality. [1]A major part of farming activities are based on the predictions, which may fail. Agriculture is critical area for people living. Farmers need to hold up under tremendous misfortunes and on occasion they wind up ending it all Since we know about the advantages of legitimate soil dampness and its quality in the development of harvests, such parameters can't be disregarded. So we have, come up with a concept of crop monitoring. We believe that our concept will be a benchmark in the agribusiness due to it being reliable [4]. The aim of research in the field of agriculture is to detect techniques so that production and quality can be enhanced with least expenditure .Our idea tries to digitalize agricultural activities so that the farmers can keep an eye on the requirements of the crops and accurately predict their growth.

This idea will definitely quicken their business to arrive at new heights and furthermore be progressively productive. Work has been done toward accomplishing optimality in terms of production and quality. The aim of this project is to introduce new technology into the agriculture business and to yield better crop production by collecting real-time status of crop. This concept not only tries to reduce the traditional techniques related to agriculture but also able to adapt new technology for better yield.

We have organized our paper as follows: Section II highlights related work done in the field of crop monitoring system. Section III describes in depth the details of the paper. Section IV gives the result. Section V gives the conclusion.

II. LITERATURE REVIEW

The following research related work are selected keeping in mind the traditional approach for the paper. The author Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S [1] in this system explains about water accessibility to trim is observed through sensors and according to require watering is done through the controlled water system. The practically endless abilities of capacity and preparing, the fast versatility makes distributed computing an appealing answer for the enormous measure of information created. The authors Wei-Che-Liang, You-Jei-Yang, Chih-Min Chaou [2] right now explains an ease Weed Identification System (WIS) utilizing RGB pictures taken by rambles as preparing information and applying Convolutional Neural Networks (CNN) to manufacture the recognizable proof model. The aftereffect of the WIS can be utilized as a source of perspective for agribusiness specialists and can likewise be utilized to educate farmers to take vital responses. The author Kawaljit kaur, Chetan Marwaha [3] clarifies Plant and organic product infections are extraordinarily influencing quality and amount related with creation. The pesticides and other unsafe compost is greatest deterrent right now. Image procesing procedures are utilized so as to break down debasement of natural product crop. The authors Petcharat Suriyachai, Jakkapong Pansit[4clarifies about the harvest checking and computerization structure right now an IoT cloud-based stage and open APIs to utilize various organizations available through the Internet. Identified data are showed up through a web application for both continuous and credible data appears. The authors A. J. Irías Tejeda, R. Castro Castro [5] explains the utilization of accuracy agribusiness apparatuses for the administration of weeds in crops. It has concentrated on the making of a picture handling calculation to distinguish the presence of weeds in a particular site of harvests. The authors Muhammad Hameed Siddiqi, Irshad Ahmad, Suziah Bt Sulaiman [6] explains the objective of this paper is to fabricate a continuous, machine vision weed control framework that can distinguish weed areas. The calculation is formed to arrange pictures into expansive and limited class for constant specific herbicide application

III. PROPOSED SYSTEM

Use of technology by farmers seems to be difficult due to financial issues faced by them .The barrier of entry into farming technology has dropped, as cloud computing, computing systems, and other tools have become progressively reasonable and accessible. So further.

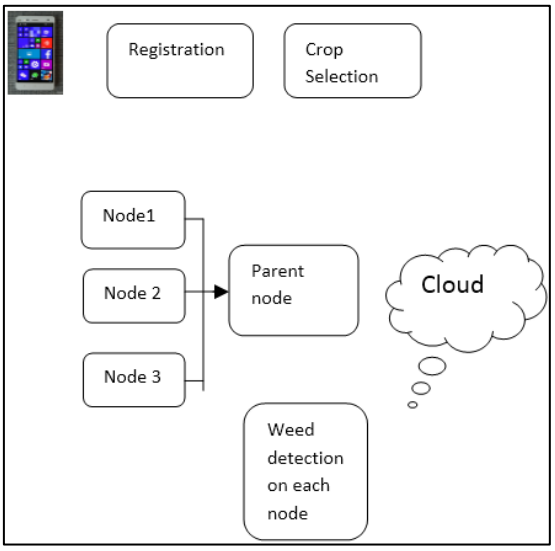

Fig. 1: System Architecture

We have introduced a system which is easy for farmers to take appropriate decisions based on what kind of crops should be grown suitable for the land and also distinguishing between weeds and crops. The system architecture is shown in the above Fig.1 .The selection of the crop based on prediction is free for farmers so that they can get an insight on what is suitable to grow but for getting more precise results one can use the IOT based method along with it which generates various parameters like moisture, temperature, etc. but also surcharges applied to it This method is optional but if both methods are used together it will be better for getting efficient results. Below given are the modules present in the system:

A. Login and Registration

Farmers first need to get themselves login/create an account into the application. During creating a new account, farmer needs to register their personal details and land details for example state, type of soil and the area of the land, etc. that belongs to farmer.

B. Crop Selection & Report

For selecting the right crop for given conditions, land details are taken so that the model gives accurate predictions. For predictions of what is suitable to the land random forest algorithm and decision tree is used. The Module is made remembering the insignificant soil supplements prerequisites and soil type that are important for growing a specific harvest and helping farmers to boost their yield and great use of the rural field. This section also gives an update to the farmers about every week's market price of the crops so that the farmer remains up to date with the price of the crops.

C. IoT Based Method

The general architecture of the system is shown in the fig.2 where there are three main components: first to generate parameters/data from the sensors, then to upload onto the cloud and lastly for the farmers to know about the status and application/UI is needed to display the result. The main aim of our project is to reduce the complexity of supervision and to avoid the continuous monitoring. Continuous checking of temperature and moistness assumes an indispensable job in numerous fields of agriculture. A Wireless Sensor Unit (WSU) is incorporated with a nRF24L01 transceiver, ESP8266, different sensors, and power sources. In this wireless sensor unit collects the sensor data from different sensors like Soil moisture, temperature, humidity and stores it in the cloud. The data is displayed on Android phones.

In this system there is a node which has sensors, that senses the temperature, humidity & moisture content present in the soil. We can use multiple number of nodes depending upon the number of crops and size of the field. Since we require large number of data for multiple crops, we use n number of nodes. Also Arduino NRF24L01 is used for wireless communication between multiple nodes to a single central node. This module has the capacity to communicate with up to 6 channels. Here the central node also consists of NRF24L01 so that other nodes can communicate with it. ESP8266 is a low cost WIFI microchip /microcontroller which help to transfer the data onto the cloud. The farmer can obtain these data from the cloud via android phones. Data here in our project that is Temperature, Humidity and moisture of soil is received and this data is put on to the cloud where one can easily view it by logging in to the account on the cloud or by using applications.

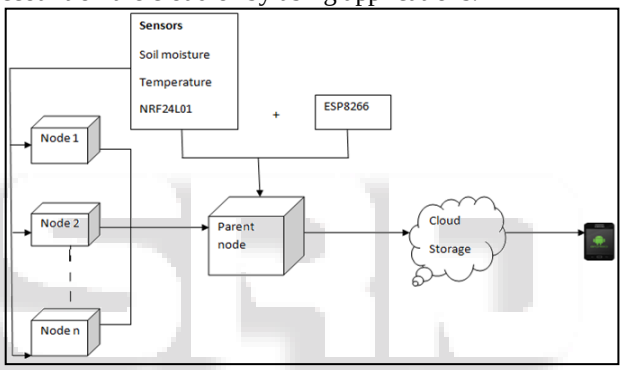

Fig. 2: IoT

D. Weed Detection on Every Node

Further by applying Convolutional neural network (CNN), we have implemented image processing on every node of the farm. The area of nodes is decided based on number of crops to be included .And within the node containing crops, the presence of weeds is detected by using image processing technique. Dataset of various kinds of weeds are collected. Approximately a 1000 images are taken so that the model gives accurate predictions. All the training images are immediately center normalized and the CNN layers are made of layers of the filters respectively. The model consists of the pooling layers and the fully connected layers (FC). Max Pooling layers are used for reducing the spatial features. After finishing the previous step, we're supposed to have a pooled feature map by now which leads flattening and generates fully connected layers and passes on to the neural network.

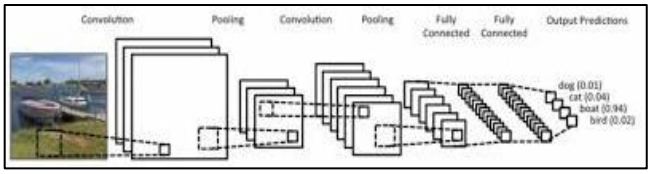

Fig. 3: Weed Detection

IV. RESULTS

The results leads to values of parameters obtained such as temperature in the environment and the amount of moisture present in the soil.

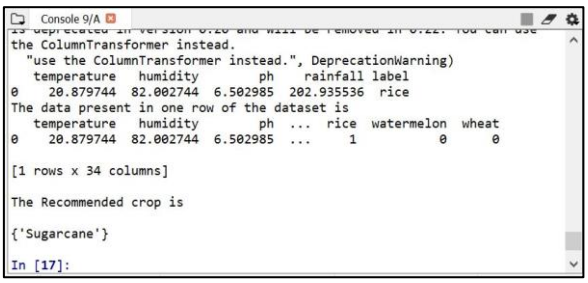

Fig. 4: Output

Based on the above parameters, the model predicts which crops can be grown on the land.

Fig. 5: Output of Crop Selection

Every node has a prediction of whether the weed is present or not.

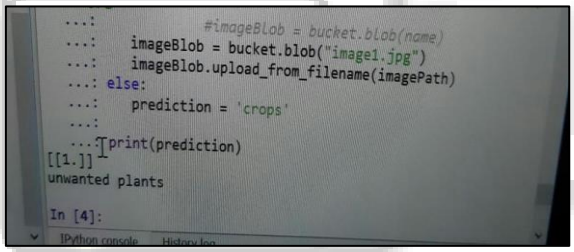

Fig. 6: Output of Weed Detection

The algorithm gives a reliable accuracy to detect the presence or absence of weed cover. Following table shows how CNN is able to predict maximum of the weeds present in the particular area.

	Weed (600 images)	No weed (300 images)
Weed found	540	40
No weed found	60	260
% Accuracy	90	86

Table 1: Results on Weed Detection

The above table shows the percentage of accuracy for the prediction of weeds present in the farm. The images containing weed gives the accuracy of 90 % i.e. the algorithm is able to predict the 90% of the images has weed present in it. Same goes for the images which doesn't have weed. The algorithm is able to predict that 86% of the prediction is present.

V. CONCLUSION & FUTURE SCOPE

Agricultural monitoring is very much needed to reduce much of human labour and at the same time minimize on water usage. Lot of systems are been developed employing Wireless Sensor in monitoring and predicting the soil condition for irrigating the field. These days with growing population we need the efficiency of agriculture to be increased to meet the demands. Increase in demand leads to increase in use of herbicides which leds to harm to the nature. This project ultimately aims at reducing the amount of manual labour required to be done by the farmer. It also aims at helping the farmer be more at ease about his crops by giving him real time updates and complete control over his field from anywhere in the world.

Further in future, images of crops can be taken to detect whether there is any disease on the crop. Detection of disease by using some technique is useful as it reduces a huge amount of work to monitor each and every crop on the field and at very early stage itself.

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