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Smart Soil Testing

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ABSTRACT: Agriculture is the backbone of our country. However, in spite of all the development, the agriculture methods that Indians use are still old. The primitive method is collecting the soil sample and it has been tested in the laboratories. The tested result will be given only after few days. The problem faced in the agriculture field is that the farmers are suffering much to get the farm lands survey reports quickly. Lack of facility to suggest fertilizers for the chosen crop. Lab testing method will not able to visualize the soil parameters for the live monitoring. This project is intended to provide the soil testing services at the farmers' doorstep by determining all the soil parameters such as pH, EC, moisture, nitrogen, potassium, phosphorus contents and recommending fertilizer nutrients for the soil. Live updating in a website helps the farmers to get to know the current status of soil. We are suggesting the crops to the farmers based on the soil fertility and climatic conditions. The project is implemented using new technology called Thing Speak Cloud by processing the data from MySQL database. As a result, the project will produce the survey report which contains NPK values and related crops and fertilizers for the soil. The project can be improved further by suggesting the fertilizers long with the amount to be applied for per acre.

I. INTRODUCTION

The Internet of things (IOT) is the most efficient and important techniques for development of solutions to the problems. IOT evolve from different building blocks which includes lots of sensors, software, network components and other electronic devices. Also it makes data more effective. IOT allows to exchange the data over the network without human involvement. In Internet of things, representing things with natural way just like normal human being, like sensor, LCD, etc.. The IOT technology is more efficient due to following reasons:

1. Global Connectivity through any devices.
2. Minimum human efforts
3. Faster Access
4. Time Efficiency
5. Efficient Communication

The problems faced in the agriculture field are testing all the soil samples in time by the laboratories. Lack of facility of suggesting fertilizers for the chosen crop. There is no help facility are provided for the farmers to test the soil. Lab testing method will not able to visualize the soil parameters for the live monitoring. Lab testing method will not provide a detail summary of the fertilizers and crops for the soil. And so these problems will be solved in this system.

II. EXISTING SYSTEM

At present soil ingredients are being tested only at Soil Analysis Centre, where they use primitive method. In the existing system the soil can be tested just to check out the fertility and the moisture level. It has to be given to the lab for testing the soil. It will take some days to fetch the results. Farmers are suffering much to get the farm lands survey reports quickly. Farmers get scared of rain every year for their desired yield. In primitive method, various soil nutrients can be suggested with the help of pH value. As per the availability of nutrients, recommendations of cultivating the particular crop will be given with the help of ph electrode. The copper electrodes are used as sensor which measures the ionic particles present in the soil and converts it in to electrical signal.

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Methods and Test Cases

This project is intended to provide the soil testing services at the farmers doorstep by determining all the soil parameters such as pH, EC, nitrogen, potassium, phosphorus contents by using respective sensors. The LCD display is used to display the measured value which helps the farmers to get the crop and fertilizer recommendation in a website. Live updating helps the farmers to get to know about their land at every moment. All the data in the database are processed effectively to fetch the results. The smart soil testing system will have a database that can support storing and retrieving of user details, crop details and fertilizer details which will later be accessed by users who log into the system. The smart soil testing system will have a client interface that allows privileged users such as administrators to carry out tasks such as adding/editing crop details, adding/editing fertilizer details and creating/editing user details. This system will provide a viewing functionality in order to allow normal and privileged users to visualize the soil parameters value. It will be fully integrated to the World Wide Web and hence allow access from any internet networked terminal and web browser around the world.

III. IMPLEMENTATION

The goal of this project is to provide the soil analysis service at farmer's doorstep. For better yielding, soil fertility is the measure factor. Farmers are suffering much to get the farm lands survey reports quickly from the soil analysis center. Knowing the nitrogen, potassium, phosphorus contents in the soil is important before cultivation. But this proposed project aiming to automate the system completely for detecting the N,P,K level and providing recommendations. (i.e) No human intervention is required. Live update is also available in a website for better understanding of farmers. The various components used here are Arduino, GSM, pH sensor, Moisture sensor, EC sensor, LCD display. The intention of this project is to help the farmers for taking better decision to increase the yield and avoiding them to use unbalanced fertilizers. Refer (Figure No 1.1)

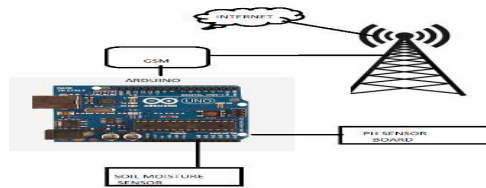


Figure No 1.1 Flow of Smart Soil Testing

This system uses Fibonacci Algorithm to search data in the database. The Fibonacci search algorithm is a strange algorithm was invented by D.E.Ferguson and derived from Golden section search, an algorithm to search for the maximum or minimum of a unit-modal function in an interval. The Fibonacci numbers consist of the sequence of integers. Refer (Figure No 1.2) $F_0=0, F_1=1, F_2=1, F_3=2, F_4=3, F_5=5, F_6=8, F_7=13, F_8=21, F_9=34, F_{10}=55, \dots$

These are defined recursively by the following formula:

$$F_0=0$$

$$F_1=1$$

$$F_n=F_{n-1}+F_{n-2}, n>1$$

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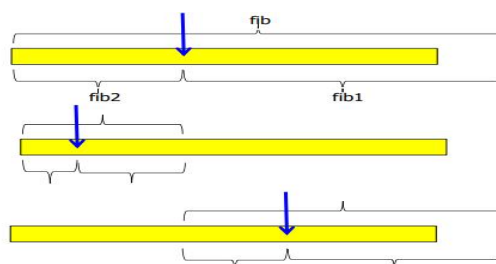


Figure No 1.2 Fibonacci Algorithm for Smart Soil Testing

IV. RESULTS AND DISCUSSIONS

The major outcome of this project is providing soil specific crop recommendation and crop specific fertilizer recommendation along with soil analysis report. It is very difficult to test all the soil samples in time by the laboratories. By the time test reports are generated, harvesting is on the verge of completion. Hence there is a need for soil analysis to be made available to the farmer. The SMS message which contains the link of website is sent to the farmer's mobile phone which is already pre-stored in the GSM module, once the designed kit which contains Arduino, GSM, pH module is fixed on the land. The pH module (4 in 1 sensor) can able to measure the four parameters of soil such as pH, moisture, temperature, light. The live data of these four parameters are analyzed using Thing Speak. The fertilizer recommendations are provided to the user in a website based on the crop chosen by the farmer. Based on the current nutrient level of the soil and required nutrient level of the chosen crop, this fertilizer recommendation is done. At last the survey report will be given to the user along with crops and fertilizer recommendations.

FUTURE REFERENCES:

The future work of this project will be suggesting the fertilizers along with the amount to be applied for per hectare or acre. The project can be improved further by connecting the farmers with traders in a website. This will help the farmers to sell their products at reasonable price. The advantage of this project is it skips lab-testing process and determines soil fertility in real time.

V. CONCLUSION

The outcome of this project is providing crop and fertilizer recommendation based on the processing of different parameters of soil. The farmers can get the soil testing services at doorstep. This project replaces the primitive method of soil testing and so, the farmers get to know about their soil quickly. The result provided by this project helps the farmers to take up the decision and prevent them to use unbalanced fertilizers. This project is greatly useful to the second level farmers.

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