PEST DETECTION AND CROP PREDICTION

Mr. Basavaraj Muragod[1], Miss. Megha Pashupatihal[2], Miss. Shilpa Hulgurmath[3], Miss. Soumya Alagodi[4], Miss. Varsha Teekappanavar[5]

[1] *Asst. prof., Dept. ofComputer Science and Engineering SKSVMACET, Laxmeshwar, Karnataka, India*
[2] *Final Year Student Dept. of Computer Science and Engineering SKSVMACET, Laxmeshwar, Karnataka, India*
[3] *Final Year Student Dept. of Computer Science and Engineering SKSVMACET, Laxmeshwar, Karnataka, India*
[4] *Final Year Student Dept. of Computer Science and engineering SKSVMACET, Laxmeshwar, Karnataka, India*
[5] *Final Year Student Dept. of Computer Science and engineering SKSVMACET, Laxmeshwar, Karnataka, India*

ABSTRACT

Determining which crop is to be grown; when the soil needs more water and if the crop is infected by pests are well understood with the help of IoT sensors and the use of Machine Learning models. The proposed system aims to collect the current soil conditions to determine the water quantity needed by the soil. The IoT camera sensor module will help to determine if the crop is infected by pests so that the farmer will be able to take suitable actions. Soil conditions and weather conditions will be used to determine the suitable crop and will lead to maximum yield and profit. The system provides alert notifications to the farmer and other relevant information related to the crops and the soil through mobile application. It helps the farmer to take suitable actions in order to minimize the loss and maximize the crop yield. This project proposes a new technique which can predict soil type and gives correct information to the farmers in audio format for improvised cultivation. It collects different soil parameters such as temperature, soil moisture and Humidity, and soil type using by taking the help of different sensors and predict the soil type using color sensor and Linear Regression Algorithms. Using Google API technique, the predicted soil type information which is given in text format is converted to audio format which is easily understand by the farmers. A serverless application has been utilized to convey the information about the soil type to the farmers for better cultivation.

1. INTRODUCTION

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play. Projections for the impact of IoT on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IoT devices. The Internet of Things engages a broad set of ideas that are complex and intertwined from different perspectives. Key concepts that serve as a foundation for exploring the opportunities. the Internet of Things raises significant challenges that could stand in the way of realizing its potential benefits. Attention-grabbing headlines about the hacking of Internet-connected devices, surveillance concerns, and privacy fears already have captured public attention. Technical challenges remain and new policy, legal and development challenges are emerging.

India's economy mainly relies on the export of agricultural products. The species of mealybugs, Coccidae, and Diaspididae, which are the primary pests of the scale insect in India, can not only lead to serious damage to the plants but also severely affect agricultural production. Hence, to recognize the scale pests is an important task in

India's agricultural field. In this Project, we propose an AI-based pest detection system for solving the specific issue of detection of scale pests based on pictures. Our system detects pests earlier so that the farmer does not incur losses. Deep-learning-based object detection models, such as faster region-based convolutional networks (Faster R-CNNs) is employed to detect and localize scale pests in the picture. As we know the fact that, India is the second largest population country in the world and majority of people in India have agriculture as their occupation. Farmers are growing same crops repeatedly without trying new verity of crops and they are applying fertilizers in random quantity without knowing the deficient content and quantity. So, this is directly affecting on crop yield and also causes the soil acidification and damages the top layer. So, we have designed the system using machine learning algorithms for betterment of farmers. Our system will suggest the best suitable crop for particular land based on content and weather parameters. And also, the system provides information about the required content and quantity of fertilizers, required seeds for cultivation. Hence by utilizing our system farmers can cultivate a new variety of crop, may increase in profit margin and can avoid soil pollution.

1.1 PROBLEM STATEMENT

The Pest can be a big threat to the agriculture. If suspicion of a pest is found on the plant leaf then the whole batch of crops is destroyed, resulting in extreme crop losses. Farmers are growing same crops repeatedly without trying new verity of crops and they are applying fertilizers in random quantity without knowing the deficient content and quantity. Since major percentage of farmers are not literate they can find difficulty in reading the text which is the output of soil prediction.

1.2 OBJECTIVES

- To determine whether the leaf is infected by pest or not.
- This pest detection can be applied on any image video or live web camera feed.
- Based on the captured image of the leaf the trained CNN model will recommend whether the pest is present or not.
- Testing the type of the soil based on its colour.
- Also predicting the Moisture level of the soil, Temperature and Humidity in the environment.
- Using all these data sets crop will be predicted for a particular crop type.

1.3 REQUIREMENT SPECIFICATIONS

A Requirement Specification is a collection of the set of all requirements that are to be imposed on the design and verification of the product. The requirement specification is classified into two types. Those are Hardware And Software Requirements. Requirement specification is a description of a software and hardware system to be developed. It lays out functional and non-functional requirements, and may include a set of use cases that describe user interactions that the software must provide. The requirements of the device on which the application will be running. The application runs on both the Android and IOS devices.

Software Requirement

- TensorFlow
- OpenCV
- Python 3.6 and Above
- Anaconda

Hardware Requirement

- 15 and above Processor
- 8 GB RAM and above
- DHT11 Sensor
- Soil Moisture
- Color Sensor
- Arduino Uno
- Wifi
- 12V Adaptor

2. METHODOLOGY

Our project mainly contains two parts. First one is fully hardware part and another one is software part. By using hardware materials we will predict the crop type for a particular soil type and by using software we will detect whether the leaf is affected by the pest or not.

2.1 PEST DETECTION METHODOLOGY

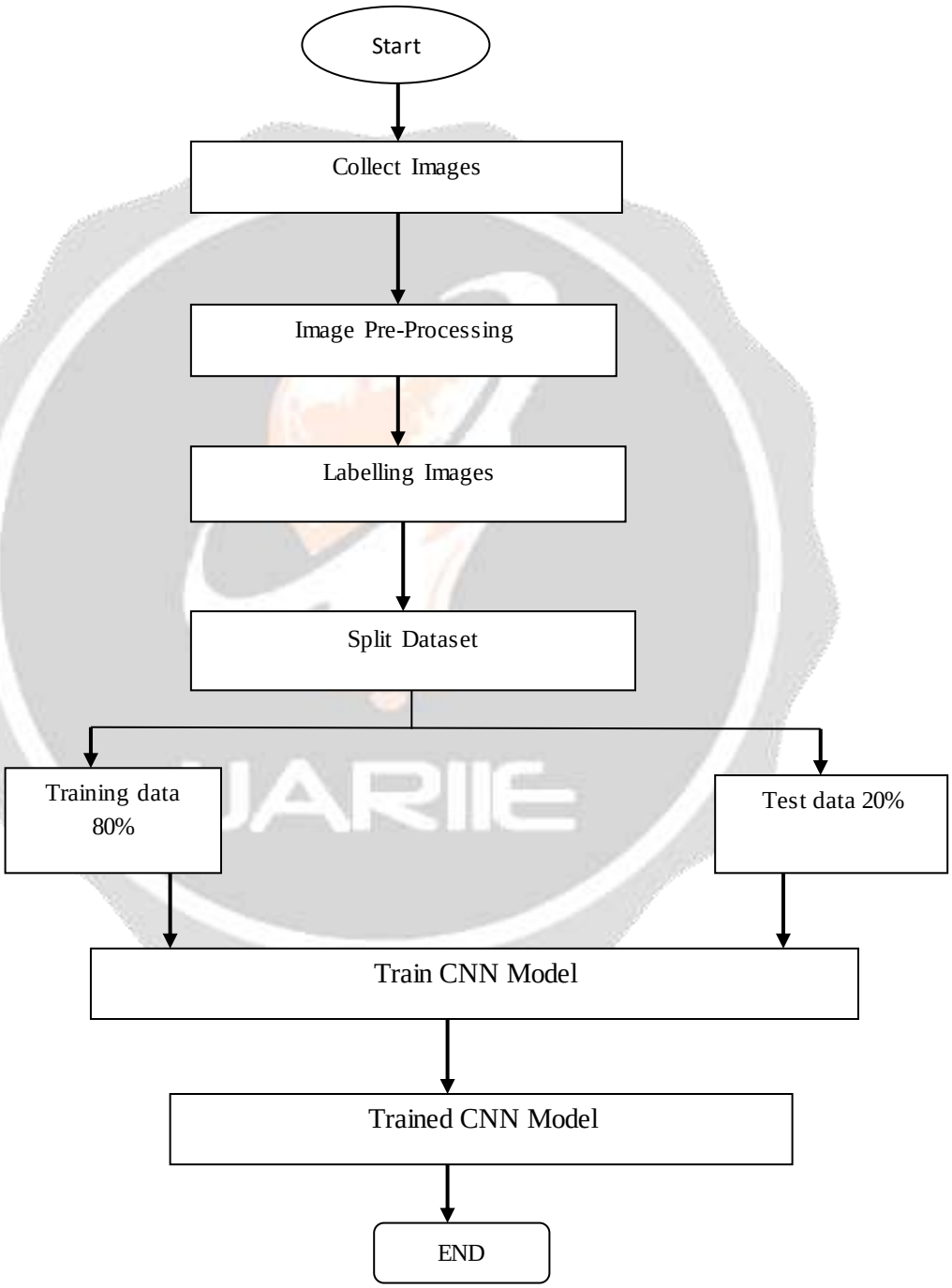

Fig-1 : Block Diagram for Pest Detection

Data Collection Process:
In this process we will collect images of Insects and pest on The leaf this images should be collected in different environment and different lighting conditions. The images which we collect should be more than 200-300 images.

Image Pre-Processing:
This image pre-processing step the images which ever we have collected will be to reduce to same resolution. And noisy images will be cleared or deleted.

Image Labeling:
Image labelling process is a process we will annotate each and every image with their respective classes example pest. This process will be done by using a tool called as label me tool.

Training Fast R-CNN Model:

Faster R-CNN is an architecture for object detection achieving great results on most benchmark data sets. It builds directly on the work on the R-CNN and Fast R-CNN architectures but is more accurate as it uses a deep network for region proposal unlike the other two.

The breakthrough of Faster R-CNN is that it does the region proposals and classification predictions on the same feature map instead of using a sliding window approach and then splitting the tasks like its predecessors.

This module will be initialized and the model will be trained by using the data set. This training time will be dependent on CPU GPU power available. This can take anywhere around 4 hours to 12 hours of time depending on dataset CPU GPU power available

Save And Live Pest Detection:
The model which has been trained will be saved. This saved model will be used for further pest detection. This pest detection can be applied on any image video or live web camera feed

2.2 CROP PREDICTION METHODOLOGY

- The crop methodology gives a clear pictorial representation of how the soil data are collected using different sensors such as temperature sensor, soil moisture sensor and color sensor. Along these lines, the collected data are being sent for prediction of soil type using color sensor.

- The working principle behind this system is in connecting the soil moisture sensor and DHT11 sensor and color sensor, which was previously embedded into the plant, to the Arduino microcontroller.

- Measurement of soil moisture is done by the sensor which forwards the information and parameters regarding the soil moisture to the micro controller.

- DHT11 sensor interface with the Arduino controller to get field temperature and humidity value and color sensor provide the information regarding which type of soil color reflecting.

- Once all data get from the sensor Arduino controller send the data to the wifi module using UART communication for cloud interface.

ARDUINO:
Arduino board acts as the heart of the required system. Entire functionality and processes of the system depend on this board. Arduino reacts in response to the 5V supply given by the Opto -coupler and keeps on counting the supply and then calculates the cost and also the power consumed. This data, it continuously stores on the webpage, so that users can visit anytime and can also check their consumption. It even reacts accordingly as per programmed, to the situations like message passing/sending during threshold values etc.

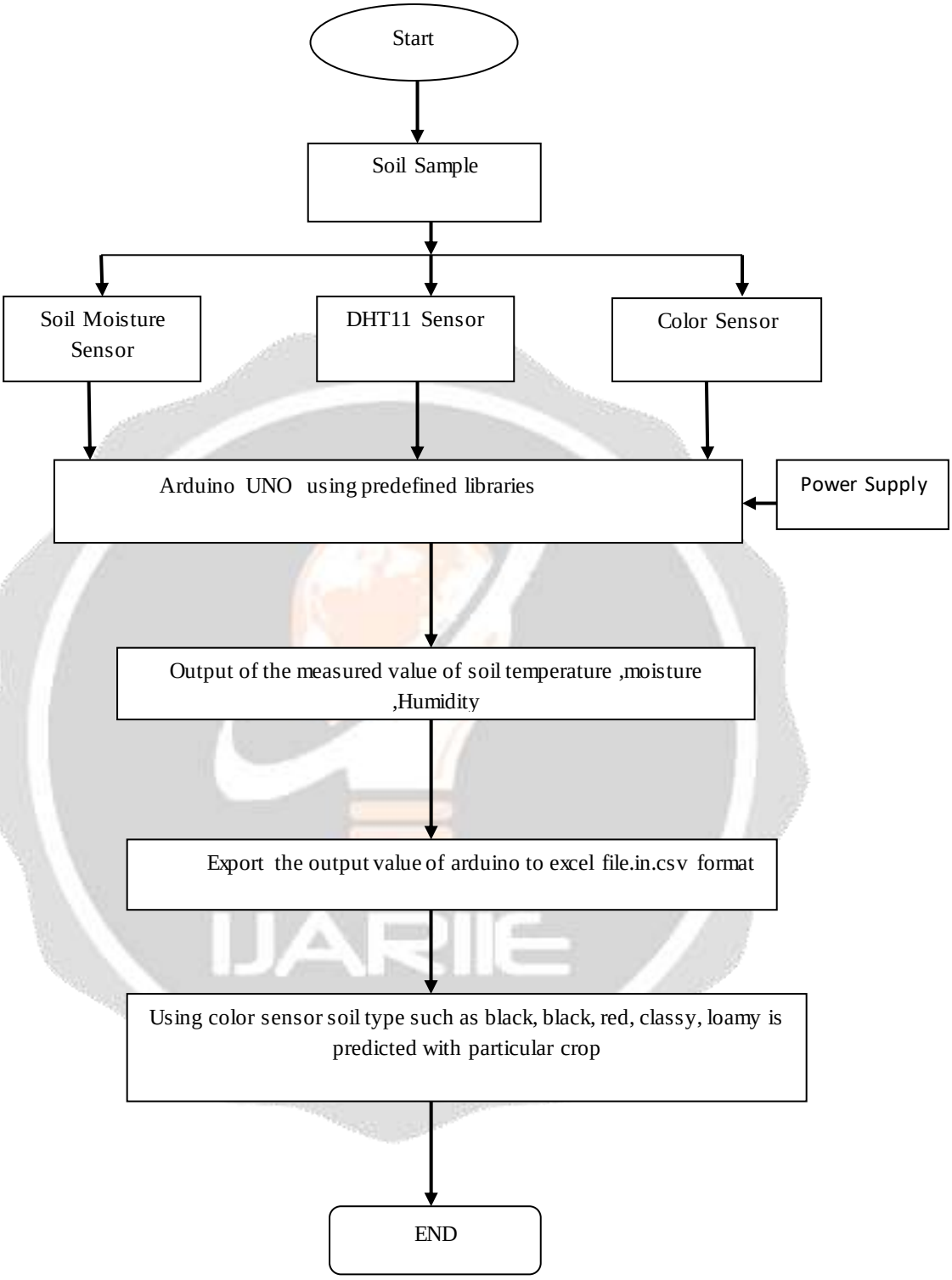

Fig-2 : Block diagram for Crop Prediction

- **Covertion of text to speech output**

  Speech synthesis is one of the challenges for technology. In traditional approach for speech generation a sample voice for respective text is stored in the database and according to text encountered, the voice is retrieved from the database. However current applications uses deep learning to enhance the search. In this project Google API has been used. which gives ”text to speech” application service.

3. RESULTS

- This System is used to measure accurate value of temperature, humidity, and soil moisture.
- By using mobile application we will see the present values of the environmental conditions to grow the particular crop.
- By using Thing Speak web application we will get the graphical representation of the previously measured temperature, humidity, and soil moisture values.
- With the software model we will detect weather the pest is present on the leaf.
- It will give speech enabled output.

Fig-3 : Mobile application setup

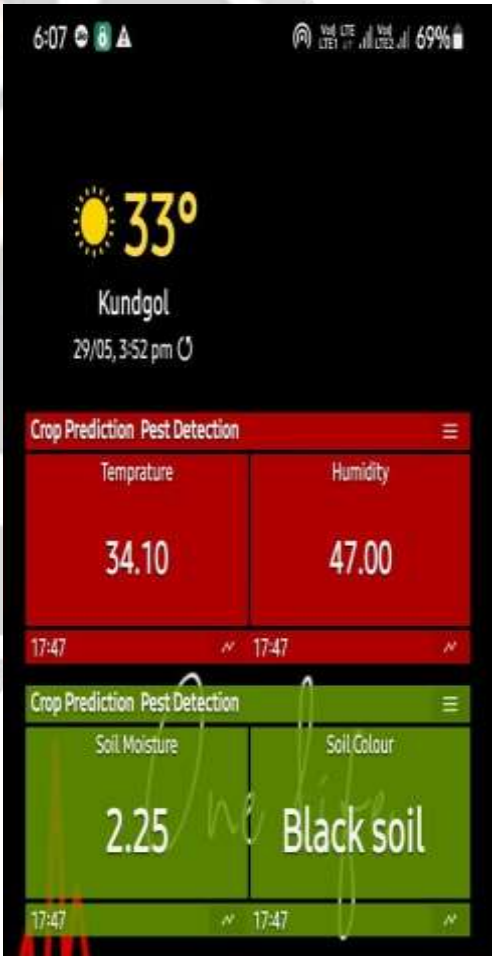

Fig-4 : Mobile application display

Fig-5: Data set used for training

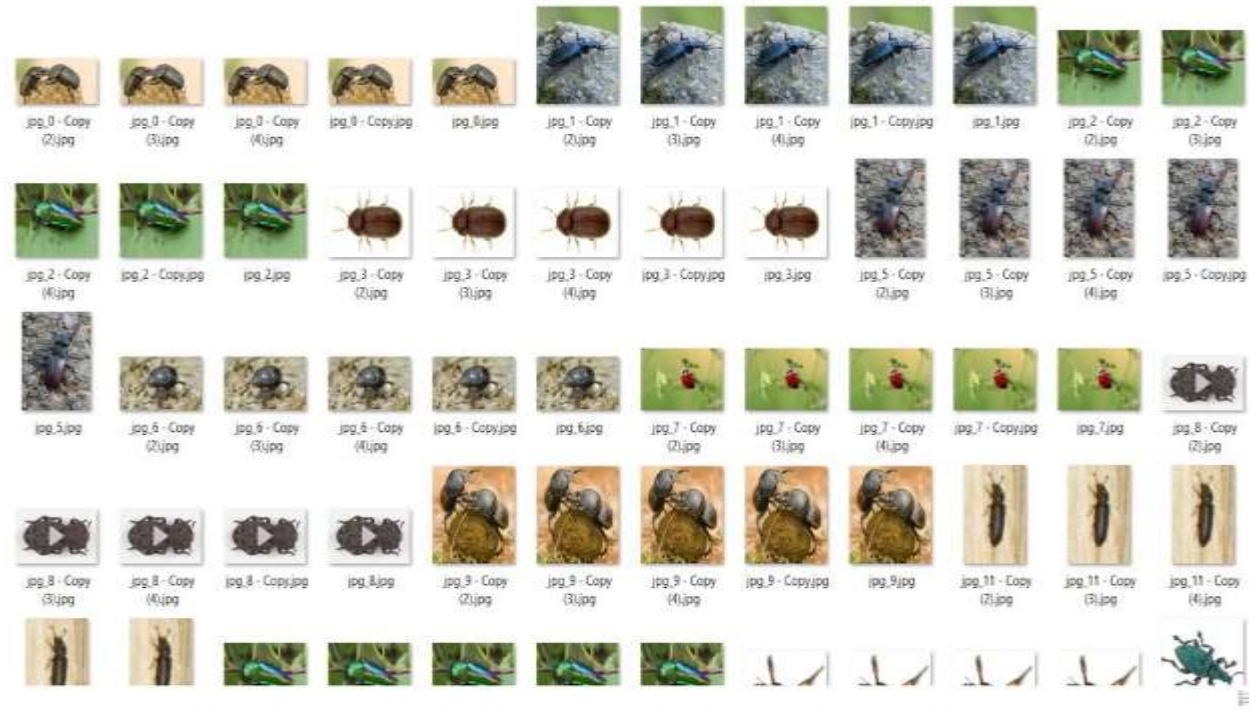

Fig-6: Data set used for training

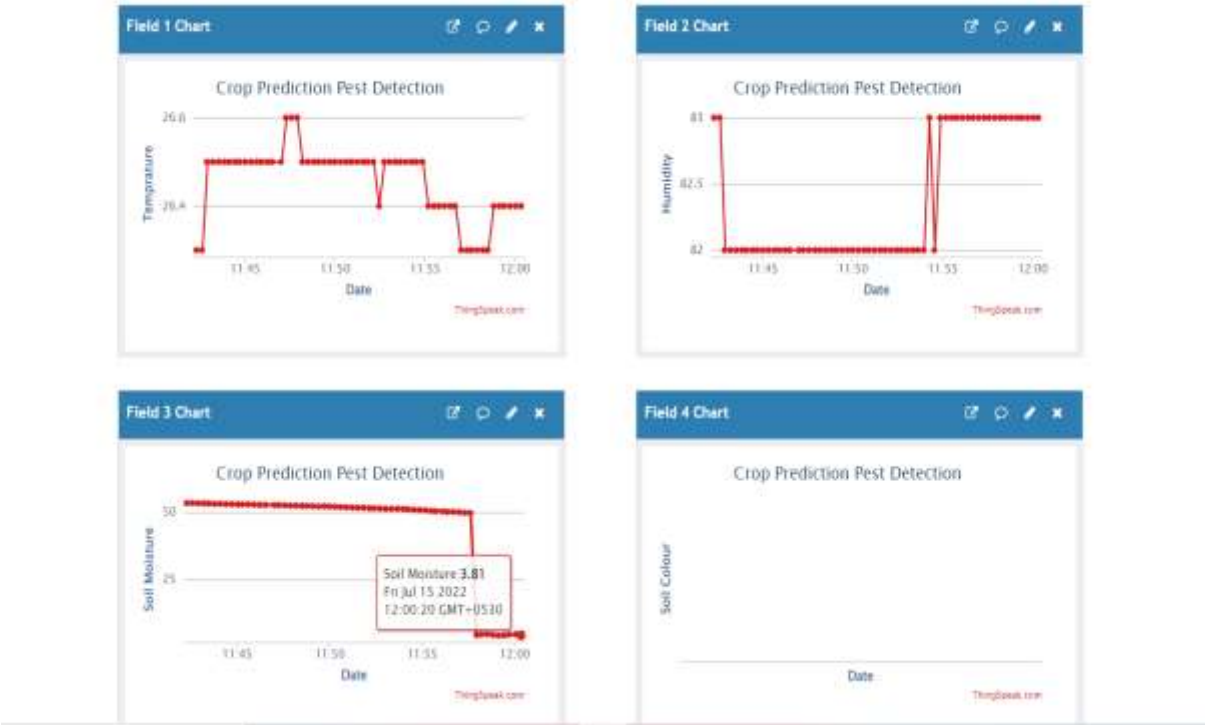

Fig-7 : Graphical representation of previously stored values.

4. REFERENCES

[1] W. Liu, D. Anguelov, D. Erhan, C. Szegedy et. al., "SSD : Single Shot MultiBox Detector"
[2] Ashwani kumar Kushwaha, Swetabhattachrya "crop yield prediction using agro algorithm in hatoop".
[3] Girish L, Gangadhar S, Bharath T R, Balaji K S, Abhishek K T "Crop Yield and Rainfall Prediction in Tumakuru District using Machine Learning".
[4] Rahul Katarya, Ashutosh Raturi, Abhinav Mehndiratta, Abhinav Thapper "Impact of Machine Learning Techniques in Precision Agriculture".
[5] S. Ren, K. He, R. Girshick, J. Sun, "Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks", IEEE Transactions on Pattern Analysis and Machine Intelligence 39(6) , June 2015.
[6] J. Sun, J. Wang, T. Yeh,"Video Understanding: From Video Classification to Captioning", Stanford university,2016.
[7] Liu, C. Hu, "Video event description in scene context", Journal of neuro computing, Elsevier, 2013.
[8] H. Belhani, L.Guezouli, "Automatic detection of moving objects in video surveillance", 2016 Global Summit on Computer & Information Technology, 2016.
[9] Soundrapandiyan, R. ,Mouli, P.V.S.S.R.C., "Adaptive Pedestrian Detection in Infrared Images Using Background Subtraction and Local Thresholding". Procedia Computer Sci.58, 2015.