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Development of IOT System for Prediction Nutrient Deficiency in Plants Leaf

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Abstract: Plants require adequate nutrient content for a total as well as natural life cycle. Six macronutrients, such as nitrogen, calcium, phosphorus, potassium, sulfur and magnesium are essential for the natural and healthy rise of plants. Regular activities with a lack of nutrients in plants lead to transportation difficulties and ultimately affect crop. Plants show the definite lack of nutrient on their leaves with notable differences in pattern. Our research suggested is to provide an automated and economically viable method for detecting defects nutritional conditions. Our system uses helpful information to forecast performance of crops using IOT. The dataset for deficient leaves and healthy leaves is developed with the help of the RGB Color Extraction Analysis Technique, Disclosure of texture in real time, Identification of bottom edge, etc. This dataset will allow supervised machine learning to predict and identify accurate shortages of vitamins and healthy plants to prohibit growth rates.

Keywords: Nutrient deficiency, segmentation, Feature Extraction, Image Processing, Clustering, IOT.

1 INTRODUCTION

Plants required a proper mix of nutrients to reside, growth, and reproduction. It represents symptoms of being unhealthy when plants are malnourished. Two sources and micronutrients of plant resources fall into macronutrients. In relatively higher quantities, macronutrients are the elements needed. These include nitrogen, sodium, arsenic, Calcium, magnesium and phosphorus; Plants require the micronutrients in small amounts such as carbon, boron, manganese, zinc, copper, chlorine and molybdenum. Macronutrients as well as microelements typically separate roots from the earth to get additional requirements plant roots need to obtain nutrients from the soils. Third, the soil must be proper enough to permit the roots to absorb nutrients and to sustain it. Correcting ineffective methods of irrigation also reduce the symptoms of deficient nutrients. Fixing ineffective irrigation methods also eliminates symptoms of nutrient deficiencies. The temperature of the soil must decrease with a given range to ensure the absorption of nutrients. The best combination of temperature, pH and humidity varies for various species of plants. These nutrients are naturally exist in the soil but may not be accessible to plants. Information of soil pH, composition, and past can be very. Effective in determining which nutrients may be decreased. Phosphorus and copper are the only elements usually absent in soils in Arizona. Most of the others may be ignored in some situations but the drawbacks are quite unusual.

2 LITERATURE REVIEW

This section explains the Literature review. For learning the present system, different papers have studied.

Susanto B. et al [1] This paper found out nutrient content in wheat leaves by defining color types of leaves pictures taken on field with several lighting

circumstances. They proposed the advancement of DSELM fusion and genetic algorithm (GA) to regularize plant images and to decrease color disparity produced due to sunlight intensity. In the picture segmentation, they applied the DSELM to distinguish wheat leaves from a dynamic background. Mean, variance, skewness and kurtosis the 4 moments are takeout and used as forecasters in the nutrient approximation. The results have shown superior quality and processing speed.

Shichao Jin, et. al [2] Precise and high-performance extraction of phenotypic crop characteristics, as a key phase in molecular breeding, is of great significance in that production. Automatic stem-leaf segmentation, though, remains a major challenge as a requirement for certain correct extractions of phenotypic traits. Current research focuses on the analysis of 2-D image-based separation that is adaptive to illumination. With lively laser scanning and strong penetrating capabilities that pass through 2-D to 3-D phenotyping, precise 3-D information can be obtained through Light Detection and Ranging (LiDAR).
Pavit Noinongyao et.al [3] This paper suggested an image analysis approach to identify unusual regions that are induced by nutritional shortages on plant leaves. The suggested solution analyzes a histogram of normal leaf colors for the detection of irregularities on trees. This is divisible into three main acts. Firstly, the color characteristics of the leaf area are computed in an input image.

Mahadi S. Hosseini, et al [4] presented design of picture deblurring in the appearance of one-shot convolution filtering. Used Gaussian LPF to distinguish the image noise removal difficulty for image edge deblurring. Proposed an unsighted method to find the PSF statistics for 2 Gaussian and Laplacian model, planned for testing and authenticate the competency in given technique using 2054 originally blurred pictures across 6 imaging applications & 7 state-of-the-art de-convolution technique

Mustafa merchant et. al [5] Discussed as Indian national fruit, its leaves are enormance affected by a number of nutrient deficiencies such as nitrogen, phosphorus, potassium and copper. Mango leaves nutrients alter color. These leaves are considered defective. This research has found the numerous nutrient deficiencies in mango leaves. At the beginning a data set is created by obtain the various mango leave features.

Fumiaki Mitsugi, et.al [6] suggested the consumption of plasma to eliminate soil-borne pathogens & worms as a method in least chemicals in farming. Ozone dispersion handling method used & real farming place for soil disinfection. By calculating the soil acidity and nitrogen nutrients, the ozone presence in soil measured. After that a part of the field infected with the Streptomyces, taken along the ozone dispersion method. And then, radish seeds planted in the ozone area & control area. The result was radishes showed improved growth compared to the control & were not contaminated from outside.

P. Krithika et al.[7] The aim was to find diseases of the salad cucumber leaf at the first stage. The natural diseases existing in salad cucumber are Alternaria leaf blight, Bacterial wilt, Cucumber green mottle montage, Leaf Miner, Leaf spot, Cucumber Mosaic Virus (CMV) disease etc. In this work, the use of K-means clustering, an unsupervised algorithm with Support Vector Machine (SVM) used to provide this problem.

Itamar F Salazar et.al [8], this article provided an automatic system for understanding the root condition of avocado. This method uses k-means to divide leaves from identical backgrounds from pictures taken in ground under semicontrolled circumstances in s-v space at the super pixel level & a light neural network for classifying collected histograms from segmented plants into following parts: Healthy, Fe insufficiency, Mg insufficiency and red spider plague. The presented strategy divides the leaf from literature with an typical F-score of 0.98 and categorized the leaf state with a total correctness of 96.8 percent

Siddharth Singh et. al [9] The plant is essential for any living organism. Plants suffer from different kinds of diseases alike a human or other living thing. Such diseases are detrimental to crops, as they can influence the development of trees, seeds, fruits and leaves, etc. which can even cause the plant to die. BRBFNN method was designed to find and grouping of plant leaf diseases. The findings shown higher performance in diagnosing leaf.
Aaditi shaha et. al [10] intended that plants require sufficient nutritional content for a full and balanced lifecycle. Adequate amounts of six macronutrients such as Nitrogen, Calcium, Phosphorous, Potassium, Sulphur, Magnesium are more essential for natural and balanced plant development. The lack of nutrients causes problems in plants 'everyday operations and reduces the yield.

3. Scope of Research

Nitrogen, phosphorus and potassium are the important and essential plant nutrients. Using the nutrient present in the herb, the machine can predict future crop output and give suggestions on how to enhance crop quality. Crop production is growing and has a direct impact on the farmer's economic life. Our system makes appropriate decisions on the quantity of pesticide depending on the deficiency of the element. This system works as a real-time framework to help farmers improve their crop production without any Collins. This approach is not restricted to any single weed, it also measure nutrients on any herb or fruit and it will be recommended accordingly. The various nutrient like magnesium, nitrogen, phosphorus, potassium, copper etc. present in the crops, if any one falls down it will badly effect on crops, so system helps to maintain the all nutrient according to crops. It predicts the future market rate based on the previous record and estimate the future product risk.

3.1 Objectives

Following are the objective of the system

- Identify the Nutrient in Leaf with Intensity and to suggest the how much amount of fertilizer required to the crops.
- With the help of nutrient present in the leaf, system predicts the quality of future crops and gives suggestion on how to improve quality of crops.
- System provides the yield of crops using previous records and quality of crops. If crops production increases that directly effect on farmer economical life.
- Make appropriate suggestion for quantity of pesticide, based on nutrient intensity.
- System work as real time application to help the farmer to increase their production of crops without any Collins.
- This system is not limited to any specific leaf only, it detects the nutrient on any plant or fruits leaf and give suggestion accordingly.
- System forecast the market rate of crops based on previous record with the help of machine learning approach.
- System predicts the future demanding product that has been demanding in future.

4. Proposed system

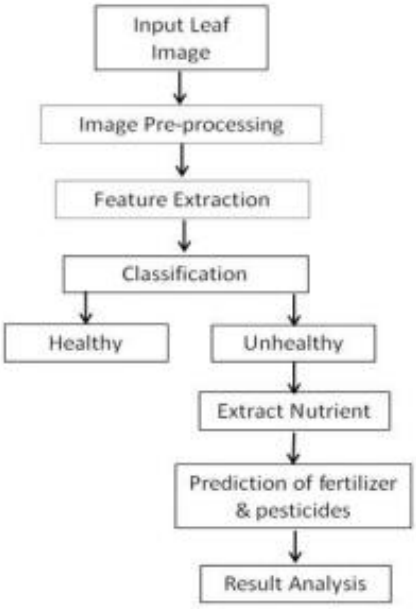

Fig 1 .Deficiency identification using Machine learning

The Figure 1 shows the Deficiency identification using Machine-learning approach and it is explained below:

Image Acquisition

- First, we have to shape the Supervised Machine Learning dataset. Violently 700 photos are needed for the healthy plant and six nutrient absences, around 100 for each.
- For every defective and stable leaf to take an image of the white background in usual brilliance, digital camera is used.

Image Pre-processing

The image taken can contain some unnecessary noise or detail. Subtracting the context brings on the role of meaning. Noise is also taken out, if present, & the value portion, i.e. leaf, is improved for additional isolation & examination of deficiencies. By using Mean filtration to reduce noise and to provide a smooth picture. Mean filter eliminates abrupt pixel value shifts by substituting each pixel

value with the nearest usual pixel value. This is centered on the kernel that specifies the size and shape of the region to be verified. Amplitude is measured for Image Improvement using histogram equalization.

Feature Extraction

Then the already processed image is taken to retrieve the fir feat = extraction. The characteristics are red (12), green (G), blue (B), G / R and GB band ratios. As contrast is firstly dominant on good leaf green is color. It also tests the average color spectrum of R,G, B from 0 to 255

Edge Detection

If the value of the green color in the given input image is not dominant, a nutrient deficiency is likely in such cases, the area for error detection shall be the edge detection. Different edge detectors as laplacian of caussian, Roberts, Piewitt, Sobel, Zero crossing, canny etc. Roberts, Piewitt & Sobel used to discover derivative and Zero crossing, canny & LoG used to discover 2nd order derivatives. The gradient is the derivative of the 1st scale used to calculate changes in the amplitude of the signal gradient.

Classification

In ML, classification is supervised learning procedure where the input is already known and the output depends on the output data. Classification is supervised learning procedure in ML in that data is already known and success is based on feedback from study, i.e. output is analyzed. We are using decision tree here for deficiency grouping. Picture will be piped and the extraction method will be used. Such parameters will now be compared to the input dataset by judgment bee, where the real parameters will fit the data set.

5. Expected Outcome

We will find all types of nutrient deficiencies in any type of plant or fruit leaf and provides the pesticides and fertilizers suggestion accordingly to have better crop production and to get good quality of crops. We will also provide the forecasting of market rate of crop, yield of crop and future demanding product with the help of availability of previous records. Along with this system also provides the soil enrichment so that farmer can produce any crop in any region, which directly effect on economical life of the farmer.

6. Conclusion

It is high time to focus on the highest yield to satisfy the increasing needs of the population. This can only happen if plants have enough space to grow. Plant nutrient quality is often overlooked although the value should be added. This paper emphasizes macro-nutrient recognition through image processing as well as machine learning methods. This will reduces farmers work and give time to think on crop production. This will also useful in vertical farms, where plants are given nutrient supplements.

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