Early Crop Disease Detection Using Agricultural Robot

Ms.Anjali Rajendra Patil[1], Mr.Sachin Abhang[2]
[1, 2] Dept of E&TC
[1, 2] RSSOE JSPM College of Engineering Narhe, Pune, India

Abstract- *It is basically ground based agricultural robot. This robot automatically survey farmland to detect disease and spray the pesticides. Cost and pollution both reduces due to optimize use of chemical and fertilizer as well as enable better management. In this project we do management of crops. Management of crops involves identification and monitoring of plant diseases, controlled irrigation and controlled use of pesticides and fertilizers, nutrient deficiency. Farmer can take informed decision locally by using this robot or for expert opinion allows connection with other existing services. Image processing is used for disease detection. To handle issues such as sunlight and dimlight effect some image processing algorithms have been designed. Agricultural robot that works at microlevel and provide users with real time detection of diseases along with controlled spraying of pesticides*

Keywords- image processing, agricultural robot.

I. INTRODUCTION

Precision Crop Management (PCM) is agricultural management system. With the use of information technology it can identify and manage site-soil, spatial and temporal variability within fields for profitability and sustainability and protection of the environment. Remote sensing technology provide spatially distributed information about crop and soil condition needs of PCM[1]. SIBWA and Quickbird are satellite based imaging solution. SIBWA uses VHRI(very high imagery solution) of land. And then enhances that image to estimate variations of soil fertility, land size and shape. Quickbird chooses high resolution satellite image to produce the results for the multispectral part of the study. In quickbird there are two sensors: 0.7m in PAN mode, 2.5m in multispectral mode. Image classification were produced to indicate the difference between healthy and unhealthy plants[2][3]. Low altitude stationary surveillance instrumental equipment (LASSIE) is used as a tool for the management of variable agricultural resources. LASSIE is an innovative concept for the continuous recording of real time images of crop and soil surface. Advantages of this technique are low maintenance cost, temporal constraints, being independent of weather conditions. LASSIE is a stationary scanner system on elevated position in the landscape. Depending on the height of the pylon the camera is mounted to the area covered by LASSIE is calculated [4]. To find out pesticides in agriculture is a boon or curse we do case study. In case study it is observed that chemical used is found to be much than higher recommended level. The user should be aware about the pesticide toxicity level, health impact. In kerala during January 2006 32% poisoning cases 70% due to pesticides [5].

There are total 94 varieties of pesticides among that 12 were banned by European union and only one pesticide is banned in India. Due to improper use of pesticides kill crabs and earthworm. In 43% cases farmer use an overdose of pesticides. Farmer use overdose to upto 20 times the prescribed dose. Due to overdose it will totally damage the plant and reduce both quality and quantity[6].

Agricultural robot is used to detect disease early. Robot capture the images of plant then all images are converted into standard resolution and pre-processed. Then pre-processed images are stored in database. And then edge detection algorithms are applied to pre-processed image. Then features like color, shape, texture are extracted using segmentation technique like k-means. And then finally to identify diseases comparing with trained database SVM support vector machine classifier is used [7].

Leaf disease recognized using neural network. To analyze and classify whether it is healthy or unhealthy Phyllanthus Elegance Wall is used. Software model is developed to suggest preventive measures for disease management in agricultural crops. User can scan an infected leaf to identify the types of leaf ,pest or disease incidence on it and can obtain solution for its control using this software[8].

First image is captured then pre-processing is done on that image. The objective of pre-processing is to adjust the intensities of the image in order to highlight targets. Then after pre-processing image enhancement is done on that image. To improve the quality of image by different means is the objective of image enhancement. In image enhancement guassian filter is applied to the image, this filter suppress high frequency and its effect is to blur the image. Then image

segmentation is done, in image segmentation diseased and background regions were separated[9].

II.OBJECTIVES

- To protect plant from overdose.
- Optimize use of pesticides and fetilizer.
- Early disease detection by observing plant continuously by robot.
- Optimize use of chemical and fertilizer reduce cost and pollution as well as enable better management
- Detect disease early so that it can prevent plant from damage hence improving both quality and quantity

III. CHALLENGES FACED BY FARMERS

For detection and identification of plant diseases visual inspection is the main approach adopted in practice . However, this requires continuous monitoring by experts which might be expensive. Further, in some cases, to contact expert farmers may have to travel long distance , due to which consulting experts too expensive and time consuming . farmer use an overdose of pesticides in 40% cases due to which cause reduction in both quality and quantity . once in a three years due to new diseases and delay in getting critical information about controlling the sprade farmers faces extensive crop damage.

IV. CURRENT PRACTICES

Among the farmer a survey conducted by authors growing groundnut at Salem, TamilNadu, India, during the survey it is found that, they conduct routine visual inspection of their farmland; they are aware of the more common diseases and if in case of doubt seek help of nearby knowledgeable farmers or approach dealers with a sample of infected crop. For groundnut farms,during different stages of crop lifecycle different pesticides with chemicals such as carbendazim, chlorothalonil, mancozeb are used .Due novel diseases and delay in getting critical information about controlling the spread once in a three years some farmer faces extensive crop damage. If the sprade is limited to 1 acre the satellite based solutions can indicate the presence of disease, On the other hand agriculture departments under Government of India plan to take corrective action when a considerable mass of land (5 to 8 acres) is found infected. In contrast, when less than 1/3rd of an acre is infected. small-holder farmers use pesticides

V. SYSTEM SPECIFICATION

A) Microcontroller LPC2138:

1. 8/16/32 kB of on-chip static RAM and 32/64/128/256/512 kB of on-chip ash program memory,
2. 128 bit wide interface/accelerator enables high-speed 60 MHz operation.
3. Single ash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.
4. 8-channel 10-bit ADCs provide a total of up to 16 analog inputs, with conver-sion times as low as 2.44 ms per channel.
5. Single 10-bit DAC provides variable analog output.
6. Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
7. Low power Real-time clock with independent power and dedicated 32 kHz clock input.
8. On-chip integrated oscillator operates with external crystal in range of 1 MHz to 30 MHz and with external oscillator up to 50 MHz.
9. Power saving modes include Idle and Power-down.
10. CPU operating voltage range of 3.0 V to 3.6 V (3.3 V 10%) with 5 V tolerant I/O pads.

B) Liquid Crystal Display:

In a project to visualize the output of the application LCD is used. In 16x2 LCD their are 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. In a project to check the output of different modules interfaced with the microcontroller LCD can be used. In a project LCD plays important role to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

C) Soil moisture sensor:

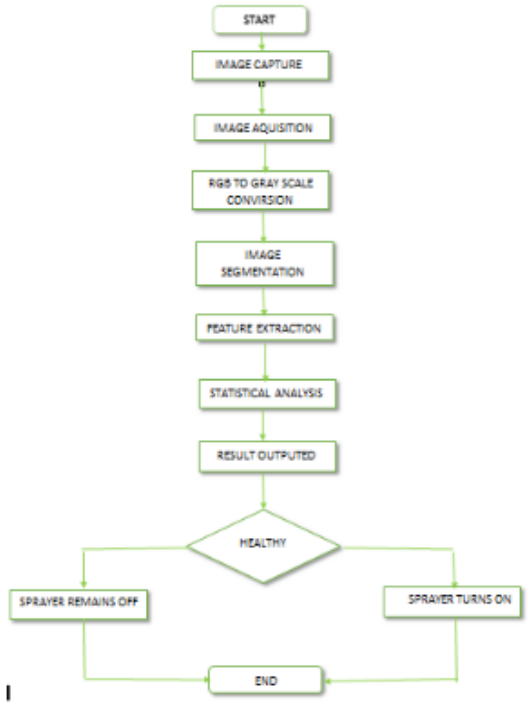
Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. Since analytical measurement of free soil moisture requires removing a sample and drying it to extract moisture, soil mois-ture sensors measure some other property, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for moisture content. The rela-tion between the measured property and soil moisture must be calibrated and may vary depending on soil type.

D) DC motors:

DC motors are used to physically drive the application as per the requirement pro-vided in software. The dc motor works on 12v. To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of

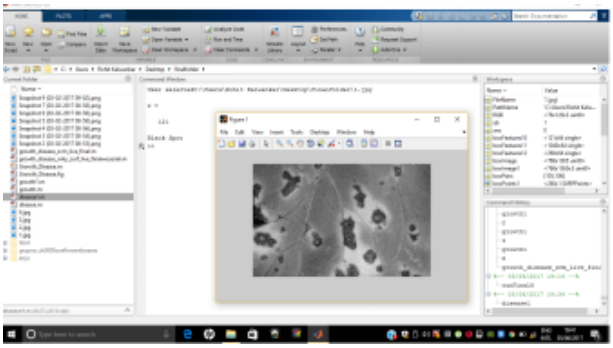
driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode con gurations across each dc motor

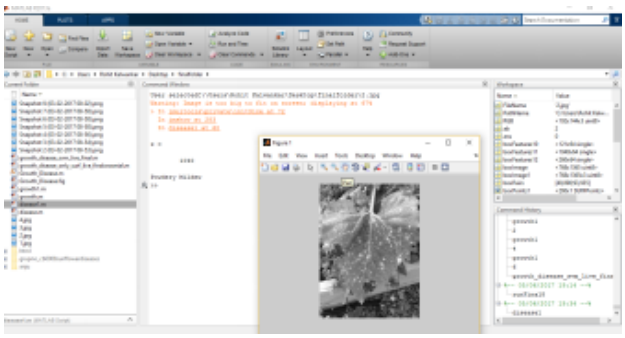
VI. FLOW CHART



VII. RESULT

Image is captured though webcam. Then image processing is done on that image, in image processing RGB image is converted into grayscale image,then after that next step is image segmentation to peak area of interest and finally statistical analysis is done to detect the presence of the disease. LCD displays whether the plant is healthy or unhealthy,then dc motor turn on the sprayer to spray the pesticide if the plant is unhealthy.





VIII. CONCLUSION

Workload of farmers are decreased and health problems also. Increase quality and productivity to a greater extend. There are many advantages of robotics as well as controlling the high cost of labor. In agriculture the opportunities for robot enhance productivity are immense and robots are appearing on farms in various guises and in increasing number. It may mean rethinking of how crop production is done. crop production may be done better and cheaper with a swarm of small machines than with a few large ones. By using agricultural robot farmer can detect the disease early so protect plant from disease and hence increases both quality and quantity. Farmer use an overdose of pesticides wich will totally damage the plant but by using agricultural robot pesticides spray in proportion so save the plant from overdose. In some cases farmer needs to travel long distance for consulting expert but by using agricultural robot farmer can upload the pic of the plant to take expert advise due to which money and time of the farmer get saved.

REFERENCES

[1] “Image-Based Remote Sensing for Agricultural Management–Perspectives of Image Providers, Research Scientists, and Users.”

[2] “Mobile Applications in Agriculture”, Syngenta Foundation, Basel, Switzerland, 2011

[3] Laudien, R., Bareth, G. & Doluschitz, R., 2004b: “Comparison of remote sensing based analysis of crop diseases by using high resolution multispectral and hyperspectral data – case study: Rhizoctonia solani in sugar beet” in Proceedings of the 12th International Conference on Geoinformatics, June 7th -9th, Gävle, p.670-676

[4] Lilienthal H, Ponomarev M, Schnug E 2004 Application of LASSIE to improve agricultural field experimentation. Landbauforsch Völkenrode 54(1):21-26 Online. Available:

[5] Indira Devi P, "Pesticides in agriculture A boon or a curse; A case study of Kerala", in Economic and Political Weekly, Vol: 45, Issue: 26, pp: 199, June 2010

[6] Sayantan Bera, "Toxic punch: heavy use of pesticides reducing local fish and bird populations", Nov 3, 2012.

[7] Weizheng, S., Yachun, W., Zhanliang, C., and Hongda, W. (2008). "Grading Method of Leaf Spot Disease Based on Image Processing" Proceedings of the 2008 international Conference on Computer Science and Software Engineering Volume 06 (December 12 - 14, 2008). CSSE. IEEE Computer Society, Washington, DC, 491-494.

[8] Prasad Babu, M. S. and Srinivasa Rao , B. "Leaves recognition using back-propagation neural network - advice for pest and disease control on crops", Technical report, Department of Computer Science & Systems Engineering, Andhra University, India.

[9] Camargo, A. and Smith, J. S., "An imageprocessing based algorithm to automatically identify plant disease visual symptoms, Biosystems Engineering", Volume 102, Issue 1, January 2009, Pages 9-21, ISSN 1537-