Third International Conference on "Materials, Computing and Communication Technologies"
International Journal of Scientific Research in Computer Science, Engineering and Information Technology | ISSN : 2456-3307 (www.ijsrcseit.com)

Whitefly Detection Algorithm Using Image Segmentation and Feature Analysis

Kavithamani V.1, Nandhini M.2, Surya R3, Gowsika C4

Assistant professor[1], Student[2]

Department of Electrical and Electronics Engineering, Jai Shriram Engineering College, Tirupur, Tamil Nadu, India

Article Info
Volume 8, Issue 7
Page Number: 169-174

Publication Issue :
May-June-2022

Article History
Accepted: 01June2022
Published: 20June2022

ABSTRACT

Pest detection in plants and crops is essential for production of good quality food, improved quality of life and a stable agricultural economy. Digital image processing along with computer vision techniques can be applied for early detection of pests and it can minimize amount of pesticides used in the plants. Generally, leaves are the most affected part of the plants. So, the study of interest is the leaf, rather than whole plant. Among many pests, the white fly is one of the most hazardous pests that affect the leaves. This paper presents an automated approach for detection of white fly pest from leaf images of coconut. And if any whitefly is detected then a pesticide spray motor connected with this system will spray a min amount of pesticide to that leaf.

I. INTRODUCTION

Agriculture is the foundation of Indian economy as over 75% of its population is directly or indirectly engaged in this profession. Beyond the traditional agriculture, new trends in cropping pattern have been recognized for changing the status of rural community. Due to the increase in demand in the agricultural industry, the need to effectively grow a plant and increase its yield is very important. In order to do so, it is important to monitor the plant during its growth period, as well as the time of harvest. The main source for the disease is the leaf. About 80% to 90% of disease on the plant is on its leaves. So, our study of interest is the leaf of the tree rather than whole plant. There are so many things that can cause different diseases to the plants among which pests are of utmost importance. A pest is any living organism which is harmful to plants. Pests can damage large crop fields. This results in decreased productivity of crops and ultimately the economy of the country is severely affected. If harmful pests are detected on the early basis and prevented accordingly, then big losses can be avoided. Pesticides can be used to control pests but they can be harmful to plants and humans if used uncontrollably and in excessive amount. To save time, efforts, labors and use of heavy pesticides there is a need of fast and accurate

pest detection. Among many pests, white fly is a very common which affects mainly leaves of cotton, bamboo, avocado, citrus etc. Whiteflies are softbodied, winged insects closely related to aphids. They can be found in any region, but they are so tiny that they are usually camouflaged. They can be as small as 1/12 of an inch, and are often found in clusters on the undersides of leaves. In this paper, digital image processing and computer vision techniques are used as a tool to automatically detect the white fly pest on various leaves. The goal of the system is to separate white fly infested images from a set of leaf images given as input to the system. Image pre-processing techniques such as noise removal and contrast enhancement are used for improving the quality of image such that subsequent tasks like segmentation, feature extraction and classification can produce good results. K-means segmentation algorithm is used to detect the infected cluster. Statistical feature extraction methods such as Gray Level Cooccurrence Matrix (GLCM) and Gray Level Run Length Matrix (GLRLM) are used for extracting texture features from segmented images. Infected leaves are separated from healthy leaves by using various classification methods like Support Vector machine (SVM), Artificial Neural Network (ANN), Bayesian classifier, Binary decision tree classifier and k-Nearest Neighbors (k-NN). The performance evaluation of these trained classifiers are also tested on a test set of leaf.

II. EXISTING SYSTEM

The Coconut leaf image from the database collected is subjected to pre-processing where two important pre-processing techniques are performed:

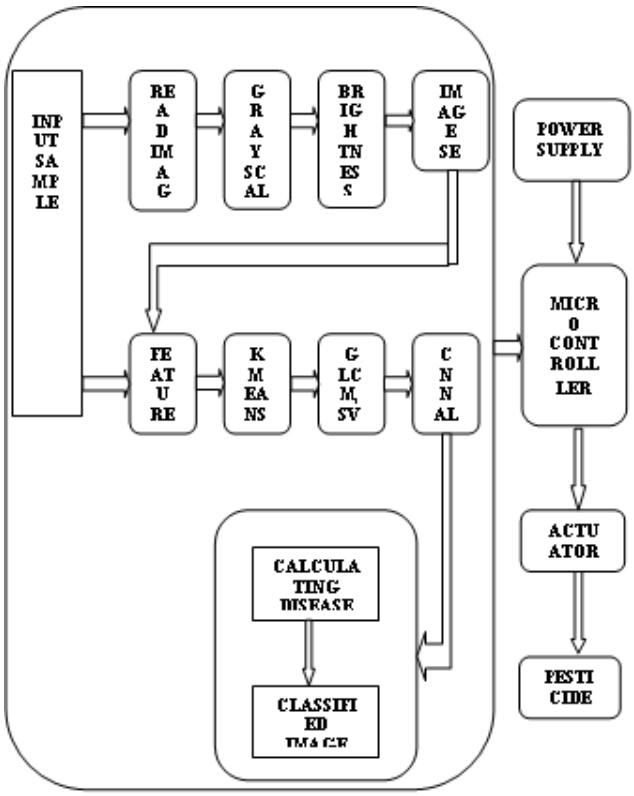
- Contrast enhancement
- Histogram equalization

This enhanced image is segmented using k-means clustering where the faulty parts are differentiated from fault-free parts. Based on the analysis of diseases, a feature set consists of statistical and gray-level co-occurrence matrix (GLCM) features is selected for recognizing the diseases.

III. PROPOSED SYSTEM

This proposed system is focuses on whiteflies as early detection of this pest which is crucial for effective intervention. Image dataset for this project is acquired through various real captured photos. In this proposed system the same image dataset images are chosen as the image quality is optimal. The algorithm used here is CNN. CNN has several stages of image processing techniques. This project methodology consists of three main working stages, namely: pre-processing, detection, and classification. The system is capable of detecting various stages of white flies. It can detect it in the early stages and sprays pesticides automatically. **So that the level of using pesticides can be reduced.**

IV. BLOCK DIAGRAM



V. SOFTWARE REQUIREMENTS

MATLAB SOFTWARE

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

EMBEEDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded C uses most of the syntax and

semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc. A Technical Report was published in 2004 and a second revision in 2006.

During infancy years of microprocessor-based systems, programs were developed using assemblers and fused into the EPROMs. There used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check for correct execution of the program. Some 'very fortunate' developers had In-circuit Simulators (ICEs), but they were too costly and were not quite reliable as well. As time progressed, use of microprocessor-specific assembly-only as the programming language reduced and embedded systems moved onto C as the embedded programming language of choice. C is the most widely used programming language for embedded processors/controllers. Assembly is also used but mainly to implement those portions of the code where very high timing accuracy, code size efficiency,etc.are prime requirements.

VI. HARDWARE REQUIREMENTS

POWER SUPPLY

Power supply is a reference to a source of electrical pow. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

TRANSFORMER

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase voltage; step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Turns ratio=Vp/Vs=Nn/Ns and Power out=Power in Vs*Is=Vp * Ip Vp = primary (input) vol Np = number of turns on primaryIp = primary (input) current Vs = secondary (output) vol Ns = number of turns on secondary Is = secondary (output) current. The low voltage AC output is suitable for lamps, heaters and special AC motors. It is not suitable for electronic circuits unless they include a rectifier and a smoothing capacitor.

RECTIFIER:

There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a center-tap transformer is used, but this method is rarely used now that diodes are cheaper.

SMOOTHING:

Smoothing is performed by a large value electrolytic capacitor connected across the DC supply to act as a reservoir, supplying current to the output when the varying DC voltage from the rectifier is falling. The diagram shows the unsmoothed varying DC 26 (dotted line) and the smoothed DC (solid line).

MOTOR DRIVER:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positivesupply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

UART:

A universal Asynchronous Receiver/Transmitter. Abbreviated UART is a computer hardware device that translates data between parallel and serial forms.

UARTs are commonly used in conjunction with communication standards such as TIA (formerly EIA)RS-232, RS-422 or RS485.The *universal* designation indicates that the data format and transmission speeds are configurable. The electric signalling levels and methods (such as differential signalling etc.) are handled by a driver circuit external to the UART.

VII. REFERENCES

[1]. Saradhambal.G , Dhivya.R , Latha.S , R.Rajesh," Plant disease detection and its solution using image classification", International Journal of Pure and Applied Mathematics, Vol.119, No.14,2018.

[2]. Vaijinath B. Batule, Gaurav U. Chavan, Vishal P. Sanap and Kiran D. Wadkar, "Leaf Disease Detection using Image Processing and Support Vector Machine", Journal for Research, Vol.2,No.2,pp.74-77,2016.

[3]. M. N. Jige and V. R. Ratnaparkhe, "Population estimation of whitefly for cotton plant using image processing approach," 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2017.

[4]. W. Li, P. Chen, B. Wang, and C. Xie, "Automatic Localization and Count of Agricultural Crop Pests Based on an Improved Deep Learning Pipeline," Scientific Reports, vol. 9, no. 1, 2019.

[5]. Pandey, Rashmi, Sapan Naik, and Roma Marfatia. "„Image Processing and Machine Learning for Automated Fruit Grading System: A Technical Review"." International Journal of Computer Applications 81.16 (2013).

[6]. Masood, Rabia, S. A. Khan, and M. N. A. Khan. "Plants Disease Segmentation using Image Processing." International Journal of Modern Education & Computer Science 8.1 (2016).

[7]. H.Al-Hiary, S. Bani-Ahmad, M.Reyalat, M.Braik & Z.AlRahamneh, "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications, Vol. 17, No.1, pp. 31-38.March 2011

[8]. Y. Tian, L. Wang and Q. Zhou, “Grading method of Crop disease based on Image Processing”, Computer and computing technologies in agriculture 427-433, 2011.

[9]. F. Fina, P. Birch, R. Young, J. Obu, B. Faithpraise and C. Chatwin, “Automatic Plant Pest detection and recognition using k-meansclustering algorithm and correspondence filters”, International Journal of Advanced Biotechnology and Research, Vol. 4, Issue 2, pp 189-199, 2013.

[10]. He, Qinghai, et al. "Cotton pests and diseases detection based on image processing." Telkomnika Indonesian Journal of Electrical Engineering 11.6 (2013): 3445-3450.

[11]. Mainkar, Prakash M., Shreekant Ghorpade, and Mayur Adawadkar. "Plant Leaf Disease Detection and Classification Using Image Processing Techniques." International Journal of Innovative and Emerging Research in Engineering 2.4 (2015).

[12]. Warne, Pawan P., and S. R. Ganorkar. "Detection of Diseases on Cotton Leaves Using K-Mean Clustering Method." (2015).

[13]. Patil, Rupali, et al. "Grape Leaf Disease Detection Using K-meansClustering Algorithm." (2016).

[14]. Mrs.S.Rathinam, Dr.S.Selvarajan; “ Comparison of Image Preprocessing Techniques on Fundus Images for Early Diagnosis of Glaucoma”; International Journal of Scientific & Engineering Research, Volume 4, Issue 12, December-

[15]. S.Sri Abirami, S.J Grace Shoba; “Glaucoma Images Classification Using Fuzzy Min-Max Neural Network Based On Data-Core”; International Journal of Science and Modern Engineering (IJISME), ISSN: 2319-6386, Volume-1, Issue-7, June 2013

[16]. Kumar, Satish, and Raghavendra Srinivas. "A Study on Image Segmentation and its Methods." International Journal of Advanced Research in Computer Science and Software Engineering 3.9 (2013).

[17]. Dubey, Shiv Ram, and Anand Singh Jalal. "Adapted approach for fruit disease identification using images." preprintarXiv:1405.4930 (2014).

[18]. G. Castellano, L. Bonilha, L.M. Li, F. Cendes; “Texture analysis of medical images”; Clinical radiology 59 (12), 2004, pp. 1061-1069

[19]. Manoj kumar M, Manu A.R; “A Study On Texture Feature Analysis And Effect Of Window Size On Texture”; Journal of Research in Electrical and Electronics Engineering (ISTP-JREEE), Volume 2, Issue 1, Jan. 2013, pp. 6-13

[20]. Hari Babu Nandpuru, Dr. S. S. Salankar, Prof. V. R. Bora; “IEEE Students' Conference on Electrical, Electronics and Computer Science”; 2014, pp. 1-6

[21]. Alaa Eleyan, Hasan Demirel; “Co-occurrence matrix and its statistical features as a new approach for face recognition”; Turk J Elec Eng & Comp Sci, Vol.19, No.1, 2011, pp. 97-107

[22]. Lee You Tai Danny, Dr. Rajendra Acharya Udyavara; “COMPUTER BASED DIAGNOSIS OF GLAUCOMA USING PRINCIPAL COMPONENT ANALYSIS (PCA): A COMPARATIVE STUDY”; SIM university, 2011