International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Tomato Leaf Disease Detection and Monitoring System

Megha M.

Student, MCA, R V College of Engineering, Bangalore, India

Abstract: ***Agriculture plays an important role in Indian economy. Technology helps in increasing the production of food. However, the production of food can be affected by number of factors such as climatic change, diseases, soil fertility etc. Tomato leaf disease has the potential to result in 40 percent of crop loss. Economic loss of about USD 11 billion was estimated to disease detection alone in 10 major crops of India. Tomato leaf disease increases the cost of agriculture and hinders the progress of work and damages crops by affecting their growth. Disease control is an important aspect of crop management, as failure to adequately control disease it leads to reduce yields and product quality. Automatic detection of Tomato leaf disease proves benefits in monitoring large fields of crops. The proposed work consists of modules namely tomato leaf disease detection module to detect the disease and automate the agribot to spray the pesticides, Robot movement module to control the agribot movements based on the presence of leaf disease. Tools and technologies used to implement the proposed work are arduino IDE, python IDLE, Embedded C. Flask is a framework where CNN algorithm is used in it. The outcome of the proposed project is to help the farmers through an agribot which detects the tomato leaf disease in the field by image processing and sprays the pesticides to prevent the damages for crops. It will be very useful to increase the production of food and also reduces the man power.***

Keywords: Tomato, Leaf Disease Detection, Monitoring

1. Introduction

Agriculture is the practice of growing plants for food, fibre, and other desired products. More than 42% of the world's population chooses agriculture as their major occupation. Agriculture is referred to as the "Backbone of India" since it supports more than 70% of the population in India.

The precision of the final product suffers as a result of farmers continuing to do agricultural duties in the conventional manner, according to recent studies. In the past, personnel were specifically hired for the aim of detecting tomato diseases. By inspecting every area of the field, they will find the sick tomato leaf. Then they will personally remove them with their hands. Later, as technology developed, they began employing insecticides to eradicate the sickness. However, many parts of the world still rely on physical labour to detect the leaf disease. Later, a few automated approaches to identify tomato leaf disease were developed, but due to their poor accuracy, they were unable to reach the public. After that, they began employing image processing for this.

The main objective of the proposed study is to identify tomato leaf disease in the crop using image processing. These methods have the disadvantages of increased labor force; tractors can be expensive and tractor's work rate depends on tractor's capacity and the amount of soil on which it works.

The project intends to develop a leaf disease detection module that, based on the shape, colour, and spots present on the leaf, can identify the disease of the leaf and advise the farmer on the appropriate pesticide to apply for the disease. The goal of this initiative is to increase the speed of work, decrease the workload of farmers, and increase agricultural productivity.

The country's economy is changing daily due to agriculture. A loss of agricultural goods arises from improper crop management. There are Kisan call centers, but farmers don't inform the experts about the disease. Farmers cannot adequately explain the condition over the phone, so it will be necessary to examine photographs of the damaged areas. Although agro scientists can offer a better solution and provide better views of the crop through images and videos, this does not reach all farmers. According to the suggested prototype, tomato leaf disease can be found with less computational effort.

2. Literature Survey

S. No	Author and Paper title	Details of Publication	Summary of the Paper
1	**Authors:** Prakash, P., et al. **Title of Paper:** "Early Detection of Pests on Leaves Using Support Vector Machine."	Asian J Appl Sci Technol 2.2 (2018): 730-736.	It takes the pictures of the infested leaves are created. In order to detect pests on leaves, it s necessary to manage the leaves that have pest images in order to obtain a grayscale image.
2	**Authors:** Saurabh Umarkar and Anil Karwankar **Title of Paper:** "A Multipurpose Agricultural robot."	Global Research and Development Journal for Engineering 3.5 (2018): 2455-5703.	It increase the labor shortage interest has grown for the development of the autonomous vehicles like robots in the agriculture.
3	**Authors:** T. Balaji, R. Bhalamurugan, M. R. Stalin john, Dr. K. Velmurugan **Title of Paper:** "Versatil Applied For Agricultural Robot Vehicles."	Computers and electronics in agriculture 158 (2019): 226-240	The paper focuses difficulty of weed detection lies in discriminating between crops.

3. Implementation

Since the project's goal is to construct a tomato leaf disease detection and monitoring system, employing machine learning and image processing techniques, it will be accomplished by developing a programme that can distinguish between healthy and unhealthy leaf. The development and implementation of a programme to distinguish between healthy and unhealthy behaviours using the technologies at hand constitute this project's technical component. However, it is also a research project because it examines the state of the art in this field of study in terms of knowledge and practical applications. By integrating a novel technique into Agribot's operations, as stated by Oates (2006), this kind of endeavour advances knowledge. To develop this kind of project, the methodology explained in this chapter is followed.

The project mainly consists of 3 modules:

1) Identify the diseased leaf in the tomato crops
2) Intimation to the farmer about disease and remedies
3) Automate the process to the diseased leaf and spraying of pesticides

The Block diagram of the project describes the flow of data. The below figure shows Block of the system. It is a well-defined and well-specified software application architecture that organizes applications into logical and physical computing.

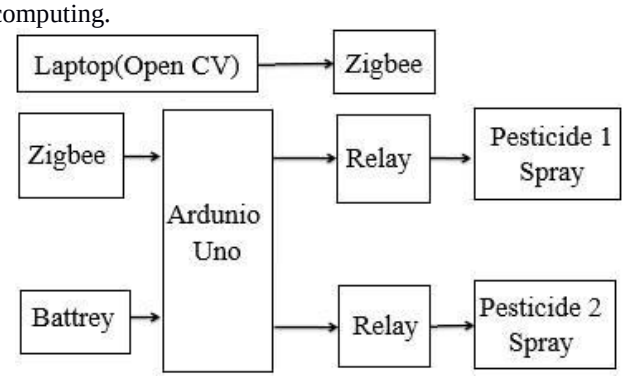

Figure 1: Block Diagram

4. Analysis of tomato leaf disease detection

1) **Leaf disease Identification:** It takes Input as a tomato leaf image and using trained dataset detect the leaf whether it is healthy or unhealthy leaf. Then detection and categorization of leaf

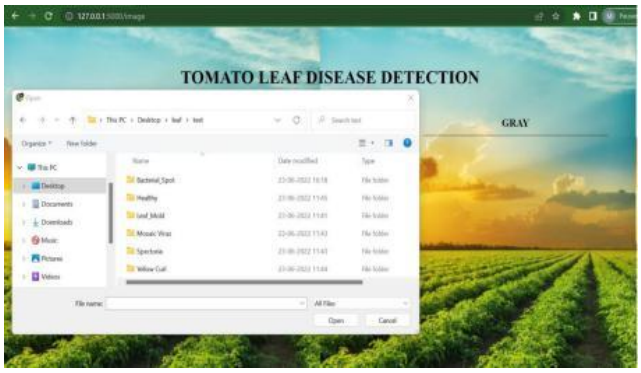

Figure 2: Selecting Tomato Image

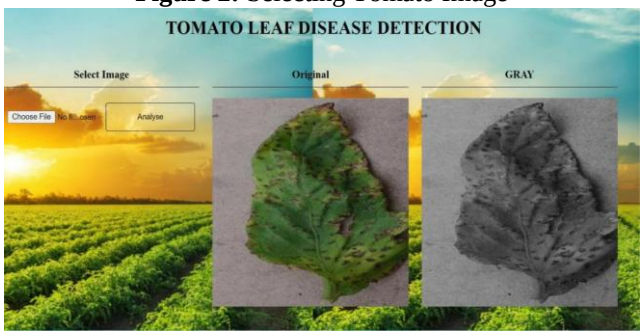

Figure 3: Selected Input Image

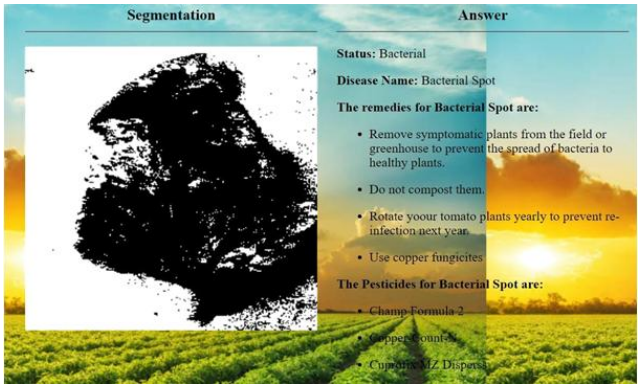

Figure 4: Tomato Leaf disease detection successful

2) **Sending SMS:** It takes diseased leaf image based on the image input recognize diseased leaf and Twilio API will send the SMS to mobile numbers.

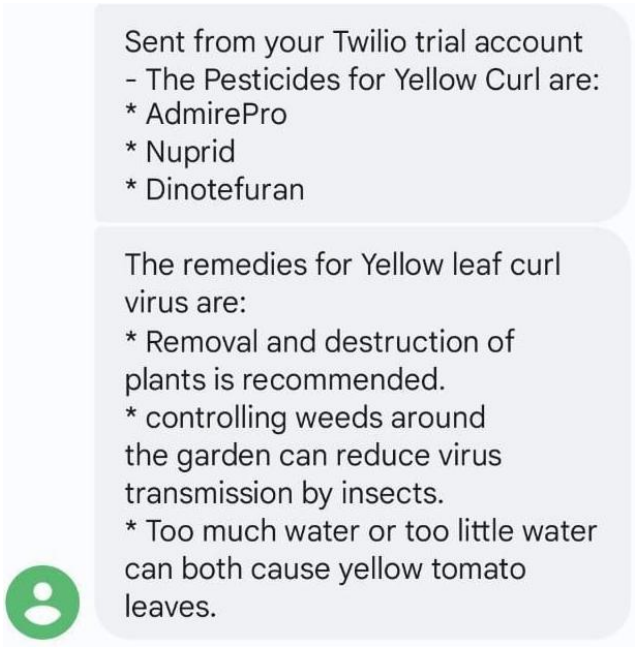

Figure 5: Sending SMS Successful

3) **Spraying Pesticide:** Type of disease in the form of a character, based on the character received spraying appropriate pesticide to the diseased leaf and treating the diseased leaf by using spraying pesticide.

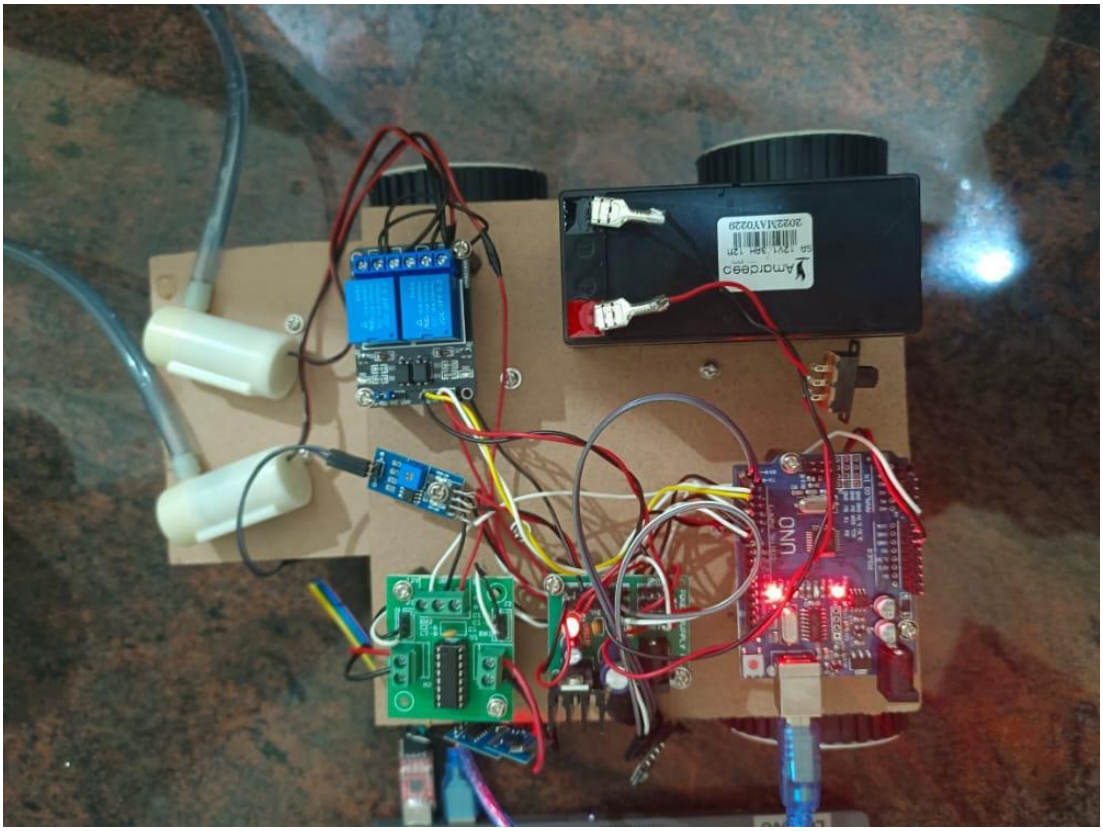

Figure 6: Spraying pesticide robot

5. Result and Conclusion

This project is for developing a agribot model to detect the diseased tomato leaf and automate the pesticides spray to the tomato leaf. For developing a systematic approach has been taken into account. The extreme Programming method of the waterfall model has been applied to develop the system. The application has been developed using a Python and Embedded C.

The project successfully implemented a working complex prototype in agriculture field. The implemented prototype software has been fully tested to demonstrate the quality and performance of the system. This report also documented all the relevant research details. In summary, the project has satisfied its objectives and fulfilled its purpose. I hope, the application can meet most of the requirements of tomato leaf disease detection accurately and spray pesticide and also send the SMS to former.

Acknowledgement

We are happy to present this project after completing it successfully. This project would not have been possible without the guidance, assistance and suggestions of many individuals. We would also take this opportunity to offer our sincere gratitude to our project guide, Prof. Saravanan C, for his excellent support throughout the development of this project and for providing the necessary information on our demand at all times. We are also thankful to the lab in-charge, staff and all faculty of the department for their help and support during the project.

References

[1] Khirade Sachin D. and A. B. Patil, "Plant disease detection using image processing", 2015 International conference on computing communication control and automation, pp. 768-771, 2020

[2] A. Sehgal and S. Mathur, "Plant Disease Classification Using SOFT COMPUTING Supervised Machine Learning", 3rd International Conference on Electronics Communication and Aerospace Technology (ICECA), pp. 75-80, 12-14June 2019.

[3] Shruthi, U., Nagaveni, V., & Raghavendra, B. K. (2019, March). A Review on Machine Learning Classification Techniques for Plant Disease Detection. In 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS) (pp. 281- 284) IEEE.

[4] N. Petrillis, "Plant Disease Diagnosis With color Normalization", 8th International Conference on Modern Circuits and Systems Technologies (MOCAST), 13-15 May 2019.

[5] L. S. Puspha Annabel, T. Annapoorani and P. Deepalakshmi, "Machine Learning for Plant Leaf Disease Detection and Classification – A Review," 2019 International Conference on Communication and Signal Processing (ICCSP), Chennai, India, 2019, pp. 0538-0542.

[6] C. Khitthuk, A. Srikaew, K. Attakitmongcol and P. Kumsawat, "Plant Leaf Disease Diagnosis from Color Imagery Using Co-Occurrence Matrix and Artificial Intelligence System", International Electrical Engineering Congress(iEECON), 7-9 March 2018.

[7] M. Sardogan, A. Tuncer and Y. Ozen, "Plant Leaf Disease Detection and Classification based on CNN

with LVQ Algorithm", 3rd International Conference on Computer Science and Engineering (UBMK), pp. 382-385, 20-23 Sept. 2018.

[8] Wang Guan, Yu Sun and Jianxin Wang, "Automatic image-based plant disease severity estimation using deep learning", Computational intelligence and neuroscience 2017.

[9] H. Sabrol and K. Satish, "Tomato Plant Disease Classification in Digital Images using Classification Tree", International Conference on Communication and Signal Processing (ICCSP), pp. 1242-1246, 6-8 April 2017.

[10] U. Mokhtar, M.A.S. Ali, A.E. Hassenian and H. Hefny, "Tomato leaves disease detection approach based on support vector machines", 11th international computer engineering conference (ICENCO), pp. 246-250, 29-30 Dec.2018.