

Integrated Pest Management using IoT, Robotics and Machine Learning

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ABSTRACT

Agriculture is a very integral part of our life and so is technology in today's life. The primary goal of this paper is to demonstrate the use of Technology for the betterment of agricultural yield. Technologies such as IoT, Machine learning and Robotics can be used in a very productive way to increase the agricultural yield and to reduce losses. Agriculture is a very vast field but this paper focuses exclusively on pest management. The final yield is directly or indirectly related to pest management. The healthier the plant the better to yield and if the plant is infected there is no question of profit. Pests are a major problem to agriculture since the beginning of time. They cause a huge amount of loss in terms of money, time and effort. Hence Pest Management is very essential.

Keywords: Agriculture, Integrated pest management, IoT, Machine Learning, Pest control

I. INTRODUCTION

Pest management a field of agriculture which has been continuous change and improvement. Since the beginning of time, farmers have always tried different methods to prevent pest infestation. But what a farmer does not know is when exactly his plant is infected and how severe the infestation is and also he does not know the exact amount of pesticides he is supposed to use. Hence he ends up using more or less than the required amount of pesticides. It is scientifically proven that an excess amount of pesticides can actually be harmful to plants. Additionally, pesticides are also harmful to farmers health

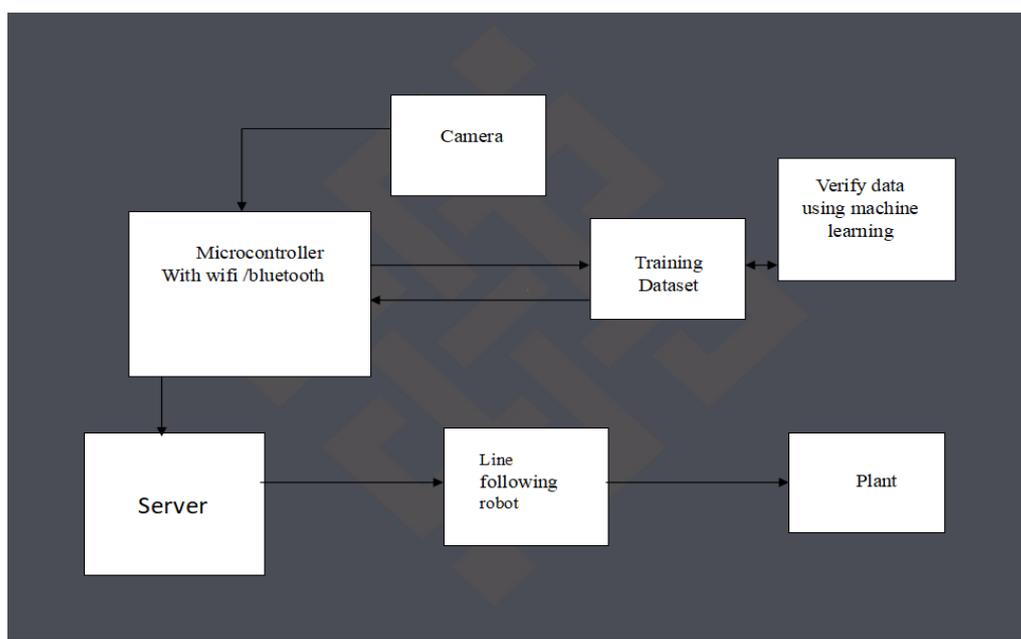
Chemical pest control can be said to be the method which is widely used. Chemical control is nothing but direct spraying of pesticides. Yes, it is effective but this method poses a serious threat to farmers health. Apart from this, there is this problem with Pollution and soil erosion. Continuous use of pesticides can result in loss of soil fertility. The main problem here is the farmer does not realize the exact amount of pesticides he is supposed to use and also he is not aware of when exactly you supposed to use it. This paper focuses on demonstrating how Technologies such as IoT, Machine Learning and Robotics can be used to automate the pest management system.

ii. OBJECTIVES

1. Automate pest management system by making use of robot and hence achieve a more efficient yield.
2. To Internet of things to update data continuously by monitoring plants.

3. To demonstrate the use of Machine Learning in Agriculture.

III. BLOCK DIAGRAM



IV. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware components:

- ✓ Robot
- ✓ High definition Camera
- ✓ Raspberry pi
- ✓ Node MCU

Software components:

- ✓ Python
- ✓ Embedded C
- ✓ Django
- ✓ Tensor Flow
- ✓ MQTT/HTTP

V. METHODOLOGY

The method used here simple and straightforward. The plants are continuously monitored by a wide angle, high definition camera. Machines are capable of detecting pest infestation at a early stage. This is why we make use of machine learning. Machine Learning requires Python Software and frameworks such as Tensor flow and

Django. The machine is previously trained using data sets. Data set is a collection of images of a given plant. These images act as a reference to the machine. The machine has to be properly trained, this is a very vital step. This is the stage where we use Python and Tensor flow software.

The continuously monitored data is updated on a server with the help of IoT. When a plant is identified to be infected the machine sends a message to the robot to spray the required pesticides. This is exactly where automation comes in. The robot has to be instructed precisely as to how much amount of pesticides is to be sprayed, which depends on the stage of infection. For this function to run smoothly we should have predefined spots for different pesticides and we should be clear with our instructions as to which pesticide is to be used for which disease. This is the major step of the automation of pest management. The robot then automatically picks up the required pesticide, goes to the infected plant on the basis of instructions received and then sprays the exact quantity of pesticide on the basis of algorithms and coding done. This idea can further be extended to an entire agricultural land provided the database is perfect.

VI. CONCLUSION

The conclusion of this project is that the entire process of pest management can be efficiently and effectively automated. When we use only the required amount of pesticides there is a reduced chance of pollution and soil erosion. If the infestation is identified in its beginning stage, it can be dealt with more effectively. The spraying of pesticides is taken care of completely by the machine itself. The Robot is instructed to do this job in a timely manner. And so the farmer's health will also be not affected. This system saves time and also makes sure that only the required amount of pesticides is used. When the infestation is treated at an early stage there is no loss in the crop yield. Hence the crops remain healthier and the farmer will not face any losses.

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