A Review on Use of Wireless Sensor Network for Pest Control in Agricultural Field

[1]Manoj A. Mechkul, [2]Aditya A. Jain, [3]Dhananjay J. Pawar, [4]Ramprasad M. Gawande

[1to 4]Assistant Professors

[1to 4]Department of E & TC,

[1to 4]SNJB's Late Sau. Kantabai Bhavarlalji Jain College of Engineering, Chandwad, Nashik, India

Abstract

As on today, numerous innovations are developing on keen agriculture. Increase in production is the main aim of new era agriculture. To increase the production use of chemicals in farming is a practice since very long time. But it reduces quality of the agricultural products. Today the nourishment stuffs are bound with chemicals and unsafe deposits of pesticides and anti-infection agents. On account of this numerous incessant sicknesses are on the ascent. Synthetic cultivating is one of the significant causes, however it has improved harvest yield a few times yet toxicities all sustenance stuff. The cost of generation of the vital chemicals like composts and pesticides is raising a seemingly endless amount of time. Consequently forward for a sound life great quality agribusiness is required. Keeping in mind the end goal to maximize the production, it is beneficial to care the crops. Natural cultivating is the best choices. A lot many types of pesticides and chemicals are connected to both influenced and non-influenced region of a plant. Though it increases the productivity, the quality of crop gets affected. As most of the pesticides and fertilizers are toxic in nature, they causes various chronic diseases in humans and animals.. Natural vegetation is fundamental to increase the food production with great quality of agricultural products. One of the significant difficulties lies in natural vegetation is to recognize the influenced zone and control the pest development. At the point when the supervision is done physically or physically initial development of pest are not recognized on time, crops are harmed which result in reduced production. While controlling the pest development, the pesticides are used on the influenced crops as well as the entire field. The real merits of natural vegetation are it can likewise spare the time, wastage of pesticides and man power required of the agriculturists. In this paper the review on different procedures for bother distinguishing proof and control strategies are examined. The laser sensor, optical sensors, acoustic sensors assumes a fundamental part in pest identification. By using these sensors just the third phase of the pest can be recognized. But By utilizing Wireless Sensor Networks starting phase of the pest can be recognized.

IndexTerms -Pest, Disease, chemical farming, WSN, Fuzzy Nodes

INTRODUCTION

In a country like India the economy and the production are dependent on agriculture. Technology based agriculture increases the production rate of agricultural products and thus helps in development of economy of the country. Indian agricultural field mainly gets influenced by various elements:

- Extreme change in climatic conditions
- Infertility of soil due to natural disasters
- Pest Attack on agricultural fields

Random and excessive use of toxic synthetic pesticides destructs the environment and agribusiness but has also affects the food chain. This causes the influence on living organisms. To get rid of the pest in field, instead of applying pesticide to the affected area the farmers are applying pesticides over the entire region. This causes following effects:

- Reduction in the quality of crops.
- Wastage of pesticide.
- Unaffected crops get affected by unwanted pesticides. Apart from that the good crops are affected by the consumption of pesticide.

To get rid of above said problems it is needed to develop a system which will reduce the use of pesticides. WSN is identified as a feasible solution to overcome the drawbacks. There are various methods used to identify the pest like:

- Laser sensors,
- Acoustic sensors;

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- Optical sensors etc

By using these sensors just the third phase of the pest can be recognized. By using laser sensors it captures the flight using laser light andtheinsects classification is done according to their species. This strategy is extremely compelling yet just the insects having wings are recognized. It cannot recognize the early stage of pest. WSN is widely used in agriculture. WSN helps in finding the way for recognition of pest and also helps in controlling the pests located in remote areas. Since the remote area crops are observed from long distance this method is extremely useful..Meanwhile numerous fields have been observed at the same time. This technique won't make any harm to the crops.

PLANT INFECTIONS

Common infections that affect crops are bacterial blight, black spot, canker, powdery mildew etc. The main cause of these diseases in plants is the attack of pests on crops. These pests are harmful to the plants and also degrade the products produced by plants. This causes the decrease in the production. The living organisms including human consumes such infected products and thus the health get affected. Few plant diseases and their impacts are given in the below table. [2]

TABLE I. PLANT INFECTIONS AND THEIR EFFECTS

Plant diseases	Impacts
Blights	Weakening of leaves or branches suddenly, Growth Stop, and expire
Cankers	Cold-injury symptoms
Decomposition	Decaying of fruits, flowers, stems roots of the plant
Rusts	Powder is observed on plantsIt is most often found on mature plants where symptoms appear primarily on the surfaces of lower leaves.
Anthracnose	Infected plants develop dark, water soaked lesions on stems, leaves or fruit. [6]
Brown Rot	The disease first infects blossoms in spring and grows back into the small branches to cause cankers that can kill stems. Large numbers of flower-bearing stems are killed when the disease is severe.[6]
Leaf Curl	Symptoms appears in spring as reddish areas on developing leaves. These areas become thick and puckered causing leaves to curl and distort. When severe, leaf curl can substantially reduce fruit production.[6]
Downy Mildew	Downy mildew affects many plants and appears as yellow to white patches on the upper surfaces of older leaves. On the undersides, these areas are covered with white to grayish, cotton-like fungi. These "downy" masses are most often noticed after rain or heavy dew and disappear soon after sunny weather resumes. As the disease progresses leaves may eventually turn crisp and brown and fall off even though the plant has ample water.[6]

Pest damage results in economic production losses to the agricultural industry, estimated as [5]:
- 50% in Asia and Africa
- 31.2% in North America,
- 28.2% in Europe

PEST RECOGNITION METHODOLOGIES

N.Vinushree et al, suggested Kernal – Based Fuzzy C-Means Clustering for Pest Detection and Classification [7]. The proposed strategy gets just the amount of ofpests population. Here Kernalfuzzyy C implies grouping calculation is utilized for the foundation of amount of ofpests population. For feature extraction of leaf supervisory learning neural system was used. The disadvantage of this strategy is Neural systems are only approximations of wanted arrangement and errors in them are unavoidable. They require extensive sum training set to be prepared and to give outputs that would be sufficiently close to the expected output would be absolutely dependent on the trainer itself [7].

Yuxuan Wang et al , proposed non-intrusive sensor advances and to decide the early occurrence of the infection. Pathogens influence Respiration, water-nutrients translocation, photosynthesis are influenced by pathogens, and generally the visual aids used to detect gives late indication due to which the protection of the plants or crops becomes difficult. [8].

Martin et al (2015)., talked about the pest, its infections and distinguishing proof techniques. Recognizable proof and Counting of irritation is finished by utilizing Extended Region Grow Algorithm. The locale developing calculation is utilized to effectively separate the districts. This strategy is powerful yet it is tedious [1].

Diego F.Silva et al (2015), proposed laser sensors for identification of flying insects. The laser sensor catches the flying insects using laser light and classify them according to their species. Machine learning method is executed to the sensor to recognize the species without human interference[4].

WIRELESS SENSOR NETWORK

WSN framework will recognize the pest at its beginning period and will inform the farmer about the places where the infection has been occurred. It will make the farmer free from the process of manual inspection of the crops. It will help to produce good quality crops and thus will increase the production.

The advantages of WSN in pest identification and control are

- Pesticides will be either applied or sprayed only in pest affected area.
- It will result in reduced manpower.
- It will reduce the time of identification and control of pests.
- It will reduce the cost required.
- It will help to provide healthy and hygienic food.
- It will reduce the loss of nearby plants during manual inspection.

The different pest control methods are

- Pesticide control: The pesticides increase the productivity but reduce the quality of agricultural products. Pesticides are harmful for health of human being.
- Chemical control: Chemical control methods increase the productivity but are dangerous for human as well as soil health.
- Biological control: Biological control methods are useful but they affects the environment.
- WSN: WSN is the method which will not affect the productivity and will help to reduce the excessive use of pesticides.

CONCLUSION

Great nature of nourishment is important to give satisfactory supplements for the human body. Yet, a large portion of the products of the soil are infected by pests and plant infections. With a specific end goal to control and destroy the pests and illnesses numerous pest control strategies are utilized. According to the above discussion all the pest control techniques aside from WSN makes adverse effects on human health.

WSN Reduces:

- Time,
- Manpower;
- Wastage of pesticides

Hence pest control in agricultural field using WSN results in enhancement in quality of crops and production.

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