Smart Irrigation System through WSN by Insects Monitoring

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ABSTRACT

Intelligent irrigation with WSN where we can control insects’ movement its presence checking soil contents for farming. Intelligent irrigation required to check water level soil moisture level, PH value, etc. With these we can’t stop the insect from damaging the crops, in this paper we have read the behavior of Insect then monitors according to their behavior. Monitoring we are doing through proper sensor placement. One controller circuit required for processing the data then GPS unit to send the data to base station. Remote monitoring of crops and saving of crops from insect is target of this research paper.

Keywords--- Insect monitoring, WSN, Intelligent smart house, smart irrigation system.

I. INTRODUCTION

The largest proportion of India’s economy depends on Agriculture. India stands in the second position in farm output. In India, agriculture contributes 16% to GDP, 10.23% to total export and 52% to total employment. Most of the nation’s agriculture exports aids developing and least developed nations. India is still based on the conventional method of agronomy. However, due to the improvement of technologies, other countries have ranked above India as the better supplier of food for the past few years.

The main reason of this decrement of supply is the damage of the crops by the insects. The traditional method does not provide many ideas for the prevention of crops against pest. The pests have directly impact on food production by feeding on the leaves of crops, tunneling within the roots, leaves or stems, scattering the plant infested micro-organisms, sucking out plant juices [A class of distinction, John R. Meyer]. Hence the solution to reduce insects’ infestation is the use of wireless sensor network. Implementation of wireless sensor network in the pastures will bring out a profitable change in the farm output.

II. ANALYSIS OF INSECTS BEHAVIOR

Entomology is a boundless field which includes study of enormous insects in context with cross-section of issue as varied as nutrition, ecology, anthropology, agriculture, molecular genetics, biomechanics, forensic science, behavior, paleontology, robotics, developmental biology and more. This area can be studied with ease by dividing the insects according to their beneficial nature and damaging.

III. BENEFICIAL INSECTS AND ITS MONITORING

Beneficial insects are the one which welfare in the growth of plants. These insects assist the crops in various ways such as being a pollinator, with the use of worm casting and by pest control. Some of these insects are Green Lacewing, praying mantids, Ground beetles, small pirate bugs, syrphid flies, assassin bugs, predator bugs, bugs nymphs, big eyed insects, wasps, bumble bee.

Beneficial insects also supports organic farming. Organic farming is the method which uses compost, worm cast, vermicomposting instead of fertilizer. The production of organic farming has more output rather than the use of artificial fertilizer.

Earthworm is the major agent of vermicomposting. The growth of crops cultivated by vermicomposting are very healthy and have a rapid vegetation though putting up the real earthworms will give much better yield[ 1]. Using the earthworm in the tillage will improve the aeration of the soil thus increasing the fertility of the soil. Earthworms signifies a very high percentage of biomass of invertebrate in the soil as soil...
macro fauna and play a vital role in structuring and improving plant nutrients and hence they can be successfully used as bio indicators for the evaluation of toxic risks of xenobiotic in terrestrial ecosystems [5]. Earthworms are major component of soil fauna in a wide variety of soils and climates and are involved directly or indirectly in biodegradation, stabilization through humus formation and various soil processes ([3] and [4]). Earthworm populations are influenced by various factors (soil, temperature, moisture, and pH) and the availability of organic matter for food, which may come from plant residues and animal or human waste applied to the land. The abundance of earthworms in soils represents the health of soil ecosystems and the level of environmental safety. However, the spreading out large number of worm will also have a negative effect.

Slapdash scattering of worm will attract their natural enemies for sure which are rodents and predator birds consequently damaging the terrain too. Moreover, managing the birds and rodents will be much difficult for a farmer. Large quantity of worms will perturb the aeration of the soil. The preferable type of soil for agriculture is humus. The habitation of large worm will make the humus turn into clayey, thus making the soil improper for farming. The amount of nitrogen will also increase which will upsurge the pH value of soil. Therefore, the level of earthworm required to fertile the soil can be measured with the help of wireless sensor network.

IV. DAMAGING INSECTS AND ITS MONITORING

Pests are very lethal for agronomy. From being the agents to spread pathogens to deforming the whole plants, they can generate multiple damages to the crops. Most damage to plants caused by insects is a result of direct feeding on above-ground and below-ground plant parts. The types of damages caused by insects utterly depends on the kinds of insects’ mouthparts [8].

a) Insects with sucking mouthparts- These type of insect species feed by sucking sap from the plant tissue. Some of insects are aphids, scales, leafhoppers, and true bugs. They can cause spotting or stippling of foliage, leaf curling, and stunted or misshapen fruits.

b) Insects with chewing mouthparts- These bugs cause are very harmful and causes the damages such as holes or notches in foliage and other plant parts, leaf defoliation, leaf skeletonizing (removal of tissue between the leaf veins), consumption of roots or cutting plants off at the soil surface. Some examples are grasshoppers, caterpillars, and beetles.

c) Some insects like thrips causes the plants in an intense way. They scrape the surface of foliage or flower parts as they have rasping mouthparts. Thrips suck up the spilled contents from the damaged cells.

d) Some insects with chewing mouthparts- These insects bore or tunnel into plant tissue. Leaf mining insects feed between the upper and lower surfaces of leaves, creating distinctive tunnel patterns visible as translucent lines or blotches on leaves. Stem-boring insects can kill or deform individual stems or whole plants.

Some insect even injures the crops by laying their eggs into the plant tissue. These types of damages are known as oviposit damage. Large no. of oviposites into the stem can cause dieback of stems and branches or even the death of the plant. Oviposition can also lead to abnormal growth of plant and misshapen or aborted of fruits. Spreading of plant pathogens is one of the other work done by the insects. These pathogens can cause severe diseases to vegetation.

V. PROPOSED SOLUTION THROUGH WSN

Monitoring pest insect population is very big issue in crop protection. At farm level it is continuously check by a human operator for adhesive traps, disseminated through the field, where insects remain stuck when attracted. This is a labor and time-taking activity, and it would be of great advantage for farmers to have an affordable system doing this task automatically. A successful development of such system would potentially allow taking decisions about insect control strategies at a farm or at district level, based on continuously updated spatial maps of pest insect population levels which are retrieved in a server from a distributed network of sensor wireless units transmitting from the field. Some of these methods and sensors are as follows:-

Chemiresistor Sensor

A Chemiresistor sensor with a poly3-Hexylthiophene active layer for the detection of insect infestation is used at early stages. [6] This is a method to detect volatile compound emitted by the plants. This volatile compound is been secreted by plants when insects onslaught these plants. A poly3- hexylthiophene (P3HT) thin film sensor is used for detection at early stages. The vapors of the volatile compound interacts with the optimized P3HT film causing an increase in the resistance of the sensor by more than two orders of magnitude at room temperature. A threshold value of the resistance is decided. When the output increases beyond threshold, the insect infestation is said to be detected.

Acoustic traps:- Another technique which can be used to monitor movement is the use of sound to attract insects to traps; tax a include mosquitoes, mole crickets and field crickets and their ormine tachinid parasitoids, and galleria moths (waxmoths)[7]. Sound traps have mainly been used in (apparently rather futile) control campaigns, and to
monitor populations, but they can also give useful information on migration and local movements.

Image processing

To detect the insect we can use the image processing tools like MATLAB or Python and sending these images to base station through camera. We can easily compare the difference in the image in real and threshold and finally histogram compare with normal image seeing huge change in the image. After comparing the image of normal histogram and infected histogram farmers can take action by applying pesticides.

Designing of Controlling Circuit

Now with the help fog Atmega16/32 we can use multiple sensors to check the different parameters of soils, insects through their unique behavior.

In figure 3 we have placed multiple sensors for insect and controlled by microprocessor.

VI. CONCLUSION

Commercial packages are available in market for collection and management of data. In addition to that, Computer voice recognition will help in identification of flying insects for the observers following the insects on foot or in a vehicle. Insects that fly in short hops like butterfly can be marked by flags and the ground location of these can be surveyed later with an electronic theodolite connected to a data logger.
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