Design and Development of Pest Monitoring System for Implementing Precision Agriculture using IOT

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Abstract

In the existing system the problem of agriculture is found manually so there is more chances for loses to the farmers. Now a day’s agriculture grow is reducing because of more pollution and pest in the world. India’s most of the farmer grow sugarcane but did not get yielding due to bugs and larvae in sugarcane. To avoid this situation, the proposed design has been developed with acoustic sensor and pir sensor. In this proposed design system used arduino for monitoring the noise and temperature. So finding the problem can be simplified and solved easily.

Keywords: Pest Monitoring, Arduino, Acoustic, Internet of Things

I. INTRODUCTION

Pests and diseases cause great economic loss to farmers through reduced yields and increased costs of pesticides and other control measures. The early detection of hotspots of insect or disease attack in crop paddocks is critical for timely and targeted application of pesticides. Precise knowledge of areas where pest or disease activity has started would enable the farmer to apply just the right amounts of pesticides to the affected areas, thereby yielding both economic and environmental benefits.

The common method for detection of pest or disease damage in crops is by visual inspection of the foliage in the field. Such methods are labor intensive and costly, and only a limited number of field samples can be examined at any one time. Also with fields counting methods small areas of pest/disease onset in healthy paddocks may often go undetected. Furthermore the effects of many pest/disease infestations are often not noticeable to the human eye, until it reaches an advanced stage when it becomes too late to control the outbreak.

II. EXISTING METHOD

The Existing method was not perfect controlled in pest. Not have a pest monitoring system for sugarcane. The human eye is the no perfectly detect the bugs and larvae and more then issue in this existing method.

A. Disadvantage of Existing Method

- Human energy
- Timing
- Affect near sugarcane
- Cost

III. PROPOSED SYSTEM OF PEST MONITERRING

Remote sensing with acoustic sensors provides an alternate cost effective method to obtain detailed spatial information for entire crop fields at frequent intervals during the cropping season. It is already known that important changes in plant growth and function caused by nutrient and water stress, diseases symptoms, etc. are detectable through their canopy reflectance (especially in the near infrared) much earlier than these effects become visible to the human eye.

We are proposing an efficient pest monitor system for sugarcane crop production. The systems will be using an acoustic device sensor which will monitor the noise level of the pests and whenever the noise crosses the threshold it will notify the farmer of the area where the infestation is occurring. This will help to induce automation in the field of farming and reduce the efforts of farmers. Through acoustic detection technology there will be no need of the farmer to go to each and every part of the field and perform periodical surveys over widespread plantation. This will help to reduce time and increase the productivity and help to grow better...
and healthier sugarcanes. The collection of the noise levels will be done using a number of wireless sensor nodes spread over an area.

These wireless sensor nodes will be connected to a mobile over a wireless protocol to which the sensors will transmit the noise levels in form of digital data. Whenever the noise level crosses a threshold level after comparison through an analytics module, the analytics module will then transmit the information or insight to the farmer on his mobile phone. Now the farmer knows where the infestation is occurring so that the necessary action can be undertaken. The transmission and reception of the data in the solution is done through an appropriate digital communication standard.

Fig. 1: Architecture of Smart pest monitoring and controlling system for Precision Agriculture

A. Wireless sensor network & Internet of Things (IoT) techniques used for pest monitoring and controlling system for precision Agriculture

The multiple elements of the solution architecture are

- **Acoustic Sensors** - The acoustic wireless device sensor will send the information over the wireless network to the gateway for further action. The data is being sent continuously to the gateway at pre-defined time intervals.
- **Wireless Protocol** – It is using these protocols that the data from the sensors is passed to the gateway for further direction.
- **The IoT Gateway Device (GSM MODULE)** - is a stand-alone device that can meet the IP connectivity requirements of most applications. It directly interfaces with the cloud system and passes the data received from the sensors to the mobile.
- **Arduino** – Arduino is one of the best microcontrollers for this process.
- **Analytics** – will take continuous data stream from the cloud system, and compare it with the threshold values set in the system. Any abnormality outside the threshold is identified as an alarm and appropriate messages are sent to the farmer on his mobile device.
- **Mobility** – The farmer sees all important news and insights related to the pest monitoring system on his mobile phone. Mobility acts as the last mile delivery of important insights to the farmer.

Monitoring pest insect population is currently a key issue in crop protection. This system is using an acoustic device sensor that is able to monitor the noise level of pests and gives an indication to the farmer through an alarm (message) when the noise crosses a threshold. This system thus helps in early detection of pests in the field and can help save a lot of damage to the crops and to the earnings of the farmer.

1) **Acoustic (Sound) Sensors**

An acoustic wave sensor is an electronic device that can measure sound levels. They are called acoustic wave sensors because their detection mechanism is a mechanical (or acoustic) wave. When an acoustic wave (input) travels through a certain material or along the surface of a material, it is influenced by the different material properties and obstacles it travels through. Any changes to the characteristics of this travelling path affect the velocity and/or amplitude of the wave. These characteristics are translated into a digital signal (output) using transducers. These changes can be monitored by measuring the frequency or phase characteristics of the sensor. Then these changes can be translated to the corresponding physical differences being measured.

When using with the above solution architecture, a range will be determined for deviations of readings to the acoustic sensor. This range will be enough to cover the minute sound patterns produced by a lower amount of pests. Only when the pests increase and the volatility of the sound measured by the sensor is high, it will be treated as an alarm for a reasonable pest infection that needs human intervention. Here, the insights will be created and messages will be passed to the mobility on the farmer’s mobile device for his immediate action.

There is a wide range of acoustic sensor hardware available, ranging from small devices with 8-bit microcontrollers as Arduino. The performance of a program will strongly depend on the selected hardware; especially the quality of the transceiver and communication technology is of high importance.

Acoustic sensors are able to distinguish between various pests which give this technology an edge over others. Some of the important features of the acoustic sensor that makes it the sensor of our choice are: Listening Device, self-monitoring system, radio
Frequency remote access, wireless Network functionalities, long battery lifetime / Low power system, no need for specialists on
the field. Hence the acoustic detection is the best and most cost-effective.

2) Testing
Testing of such system in outdoor fields is always a challenging task. Some of the reasons are harsh environmental conditions (e.
g. low temperatures), long-term unattended operation, and complex deployment process, connection to the wired world, and large
number of nodes.

Outdoor applications like pest monitoring system present an additional set of challenges not seen in indoor experiments. To
withstand variable weather conditions, protective packaging that minimally obstructs the sensing and communication functionality
can be provided. The effect of the packaging on the quality of the communication must be analyzed prior to deployment. Another
aspect that is usually not present in indoor experiments is the variation in temperature during the trial. Temperature directly affects
battery voltage, which in turn affects radio communication.

Thus with effective testing tools and mechanism, the field app can be easily testing with a simulation for the same. Much of
the damage caused by borers to sugarcane could be mitigated by early detection and treatment of infestations. This project describes
implementation of an end to end solution to identify the early infestations of borers on sugarcane crops. The acoustic sensors will
be used to identify a rise in sound levels around the crop, this indicating borer movement. This will then be wirelessly transmitted
to the cloud where the data will be analyzed and the alarms or insights will be sent to the farmer on the mobile. This complete
solution will be designed and implemented.

IV. IMPLEMENTATION AND RESULT ANALYSIS

Pest monitoring system using to the arduino micro controller, PIR sensor, audio sensor, GSM module (GSM 900A), real time
module. When reach the level of value automatically GSM module send SMS in farmers. then farmer will be do the pest control
action.

Fig. 2: Pest monitoring system

V. CONCLUSION

Averting environmental pest is one of the tedious tasks since the humans are responsible for this hazardous nature which poses
threat to whole world. And we are responsible to eradicate pest problems. Virtually all emissions vary from time to time. It is an
excellent concept that will show a new dimension. Although the general and specific objective is very similar, the technological
solutions employed are very different.

REFERENCES

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