Convergence of Wireless Sensor Network and Data Mining for Pest Mangement in Agriculture

Deepa.B, Jeen Marseline .K.S, Nandhini.S

Abstract: ***Agriculture is the most important sector in our country. Indian agriculture faces several problems. Some of the problems are natural and some of them are manmade. Various problems faced in agriculture are Manures, Fertilizers, Pesticides, soil erosion, agricultural marketing, lack of mechanization and Irrigation. Among these problems, pests, germs and weeds cause heavy loss to crops. Excessive use of pesticides damages crops and results in heavy loss of yield. To optimize its use and help the farmers to know the proper use of pesticides, we propose a solution using data mining techniques. Technology plays a vital role in agriculture industry. It helps the farmers in reducing cost of production and increasing the quality and quantity of production. There are several parameters which are being monitored using wireless sensor networks in agriculture. Among these parameters, our main focus is pest control using Wireless Sensor Networks. This paper proposes a solution to the pest control using data mining and wireless sensor networks***

Index Terms: Agriculture, Wireless Sensor Networks, Data Mining, Pest control, decision tree

I. INTRODUCTION

Precision Agriculture is a concept which focuses on information technology tools and techniques for obtaining optimum crop production. Wireless Sensor Networks (WSN) help in building a decision support system for agriculture using field monitoring.

Though there are various parameters available for field monitoring like soil moisture, changes in climate, hydrology, pressure, motion and pest, in this paper we focus on pest management in agriculture [1].

Climate and weather conditions are major causes of concern in crops. WSN are helpful in collecting real time data for further analysis. It helps to find out solution for various problems in agriculture. This technique allows us to deploy various sensor nodes in the field in a cost efficient way and also makes communication among these nodes as efficient.

WSN does not require an infrastructure for its operation [2]. In WSN there are multiple nodes which collect data like soil temperature, moisture, pressure from the sensors.

Revised Manuscript Received on December 22, 2018.

Deepa.B,Assistant Professor,Dept of Information Technology Sri Krishna Arts and Science College,Coimbatore,India deepab@skasc.ac.in

Jeen Marseline .K.S,Assistant Professor,Dept of Information Technology,Sri Krishna Arts and Science College Coimbatore,India,Jeenmarselineks@skasc.ac.in

Nandhini.S,Assistant Professor,Dept of Computer Technology Sri Krishna Arts and Science College,Coimbatore,India nandhinis@skasc.ac.in

WSN has both advantages and disadvantages. Since WSN does not require any kind of infrastructure, it is very easy to deploy. It consists of large number of nodes for collecting accurate and reliable data [3]. Data collected are sent to powerful nodes called sink nodes. These nodes are capable of collecting, storing, computing and integrating vital information which is required for field monitoring. In addition to this, WSN are capable of connecting sink nodes to transmission networks and client terminal. Using Wi-Fi, GPS or GPRS the collected data can be sent to the client terminal for data analysis and decision making.

To predict the future trends in agriculture, we can use various data mining techniques. Analyzing data in an efficient manner requires more understanding and knowledge in data mining techniques.[11,13] The process of data mining can be classified into major categories namely descriptive and predictive data mining.

Descriptive data mining is used to characterize the general properties of data in database. Predictive data mining technique takes values from known results and predicts explicit values based on patterns. Predictive data mining is used in future crop prediction, weather forecasting, usage of fertilizers and pesticides etc., [4]

Various data mining techniques namely K means, K nearest neighbor, Support Vector Machine can be employed to solve yield prediction problems in agriculture.

II . WIRELESS SENSOR NETWORKS

The characteristic features of wireless sensor networks make it suitable for precision agriculture. They include limited power consumption, simplicity of usage, scalability, mobility, heterogeneity and cross layer design.[10]

WSN is infrastructure less. So it avoids plenty of wiring. The cost of execution is less. The network arrangements can be carried out without disturbing the existing infrastructure. WSN is suitable for non-reachable places. WSN can accommodate new devices at any time.

WSN plays a vital role in handling water resources for irrigation, in analyzing changes in crops, in estimating fertilizer requirement, in predicting accurate crop performance and controlling pests in crops.

WSN can be used in an experimental set up in the agricultural field. The experimental set up makes possible the real time monitoring of the field conditions. Based on the data collected, pest management can be efficiently employed.

To monitor insect movement and their behavior electromagnetic remote sensing methods can be used. RFID is another technology which monitors and tracks the insect movement through the transmission of radio signal from the scanner [6].

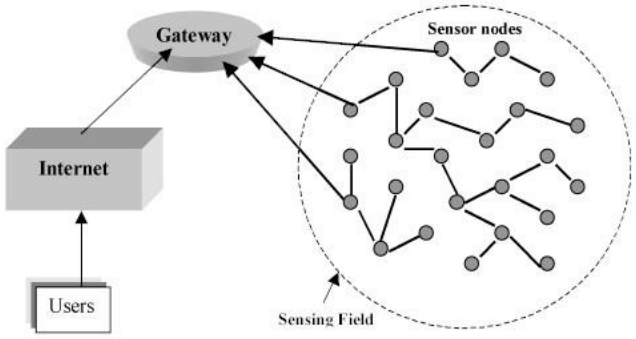

Fig I: WSN System Architecture

III. Data Mining Techniques

. Data mining uses clustering technique for mining useful information in agriculture field. The various mining techniques which may be adapted for mining are k-means, k-nearest neighbor and SVM [5].

When we have data without categories or groups, k-means is a useful technique. In this algorithm the variable k represents the number of groups in the data. Based on the features that are provided, the algorithm works iteratively to assign each data point to one of K groups.

The clustering technique is useful in sorting sensor measurements. It helps to detect the activity types in motion sensors. K-means also helps in classifying soils when combined with GPS based techniques.

The k-nearest neighbor is a classification technique. In this approach, a known training set is used to classify samples of unknown classification.

Here we have a basic assumption that similar samples have similar classification. The parameter K in k-nearest neighbor indicates the number of similar known samples used for assigning a classification to an unknown sample [6].

SVM is a machine learning algorithm for classifying data based on statistical learning concepts. It is a binary classifier which is able to classify the data sample into two disjoint classes.[14,12] Here the two considered classes are linearly separable. In this technique a hyper plane separates all samples which are exists in two classes. SVMs can also be used for data which are not linearly separable. In such cases, the data space is transformed into higher dimensional space so that the classes become linearly separable [7]. SVMs can be used to classify crops in agriculture.

SVMs and k-nearest neighbor algorithm give better results in the literature to predict diseases and damages in crops [8].

IV . Conclusion

This paper highlights the convergence of data mining with wireless sensor networks for pest management. Real time monitoring can be done efficiently with sensor nodes and data thus collected can be classified and analyzed with data mining algorithms to predict damages in crops and optimize the use of pesticides to increase crop yield.

References

1. Joshi P P1, Dr.Kanade S S2, Dr.Joshi S P3 1(Electronics & Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, India) 2(Electronics & Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, India) 3(Mechanical Engineering, JSPM's ICOER, Pune, India) Wireless Sensor Network and Monitoring of Crop Field
2. M.C.S.Geetha Assistant Professor, Dept. of Computer Applications, Kumaraguru College of Technology, Coimbatore, India. A Survey on Data Mining Techniques in Agriculture
3. Saeed Azfar, Adnan Nadeem, Abdul Pest detection and control techniques using wireless sensor network: A review
4. Haider Mahmood Jawad 1,2, Rosdiadee Nordin 1 , Sadik Kamel Gharghan 3,*, Aqeel Mahmood Jawad 1,2 and Mahamod Ismail 1 Energy-Efficient Wireless Sensor Networks for Precision Agriculture: A Review
5. Yingli Zhua*, Jingjiang Songa , Fuzhou Donga a College of Communication and Electronics Jiangxi Science &Technology Normal University, Nanchang and 330013 China International Workshop on Automobile, Power and Energy Engineering Applications of wireless sensor network in the agriculture environment monitoring
6. Rashid Hussain1 , Tanuja Jha2 , Yusuf Saleh3 Wireless Sensor Network Controlled Insects Monitoring: Identification of Onion Thrips
7. YETHIRAJ N G Assistant Professor, Department of Computer Science Maharani's Science College for Women, Bangalore, India APPLYING DATA MINING TECHNIQUES IN THE FIELD OF AGRICULTURE AND ALLIED SCIENCES
8. U. Ayub and S. A. Moqurrab, "Predicting crop diseases using data mining approaches: Classification," 2018 1st International Conference on Power, Energy and Smart Grid (ICPESG), Mirpur Azad Kashmir, 2018, pp. 1-6.
9. R. P. L. DURGABAI, P. BHARGAVI & S. JYOTHI Department of Computer Science, Sri Padmavati Mahila Visva vidyalayam, Tirupati, Andhra Pradesh, India PEST MANAGEMENT USING MACHINE LEARNING ALGORITHMS: A REVIEW
10. R. Revathy, R. Lawrance Research Scholar, Department of Computer Science, Ayya Nadar Janaki Ammal College, Sivakasi, Tamil Nadu, India Director, Department of Computer Applications, Ayya Nadar Janaki Ammal College, Sivakasi, Tamil Nadu, India
Comparative Analysis of C4.5 and C5.0 Algorithms on Crop Pest Data
11. Aditya Kumar Naik1, Rajendra Kumar Dwivedi2 1,2Dept. of CSE, MMMUT A REVIEW ON USE OF DATA MINING METHODS IN WIRELESS SENSOR NETWORK

Retrieval Number:F1096010476S519/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

12. Yingli Zhua*, Jingjiang Songa , Fuzhou Donga a College of Communication and Electronics Jiangxi Science &Technology Normal University, Nanchang and 330013 ChinaCommunication and Electronics Jiangxi Science &Technology Normal University, Nanchang and 330013 China Applications of wireless sensor network in the agriculture environment monitoring

13. Utkarsha P. Narkhede1, K.P.Adhiya2 Evaluation of Modified K-Means Clustering Algorithm in Crop Prediction

14. Solanki, Prof. (Dr.) Yusuf Mulge PDM College of Engineering & Technology Bahadurgarh, Haryana, India Jyotshna Different Techniques Used in Data Mining in Agriculture