RECENT ADVANCES OF HYPERSPECTRAL IMAGE CLASSIFICATION USED IN PREDICTING THE QUALITY OF FRUITS AND VEGITABLES IN AGRICULTURE.

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ABSTRACT:

Image Classification in remote sensing mainly deals with clustering of the pixels of an image to a set of classes such that pixels in the same class are having similar properties. Hyperspectral Imaging (HSI) composed of a very large number spectral channel which ranges from visible to infrared spectrum. Remote sensing involves measurement of energy in various parts of the electromagnetic spectrum. Hyperspectral images has crucial role in remote sensing as spectral bands are in rich information which is helpful to classify the spectrally similar objects. process that results in collected and processed information of the electromagnetic spectrum by a specific sensor device. It's data provide a wealth of information. This data can be used to address a variety of problems in a number of applications. Hyperspectral Imaging classification assorts all pixels in a digital image into groups. In this paper, unsupervised hyperspectral image classification algorithms used to obtain a classified hyperspectral image.

KEYWORDS: *Hyperspectral Imaging,* Supervised Classification Method, Unsupervised Classification Method, Semisupervised Classification Method.

INTRODUCTION

Hyperspectral imaging, known also as chemical or spectroscopic imaging, is an emerging technique that integrates conventional imaging and spectroscopy to simultaneously collect spatial and spectral information from an object. The term "hyperspectral imaging" was derived from works in remote sensing irst mentioned by With the development of optical sensing and imaging techniques, Hyperspectral imaging has recently emerged as a scientific and assessment tool for quality of fruits and vegetables. The goal of hyperspectral imaging is to obtain the spectrum for each pixel in the image of a scene, with the purpose of inding objects, identifying materials, or detecting processes [10]. To obtain high spectral resolution and narrow band image data, hyperspectral imaging is generally combined with

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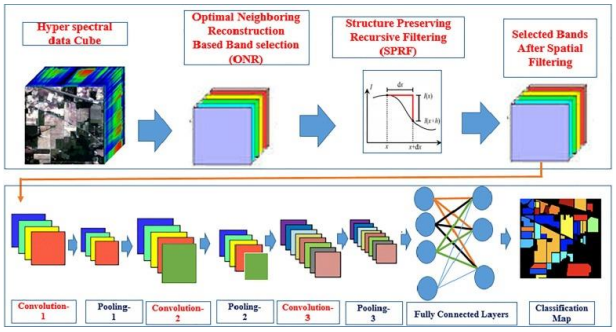
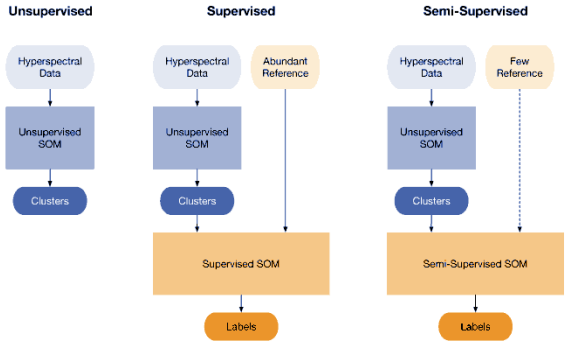
spectroscopic technique, two-dimensional geometric space and one-dimensional spectral information detection.Remote sensing is the art and science to obtain information about an object, area. It is viewed as the measurement and analysis of electromagnetic radiation transmitted through, reflected from, or absorbed and dissipated by the ambiance, the hydrosphere and by material at or near the land surface, for the purpose of interpreting and managing the Earth's resources and surroundings. Optical remote sensing makes use of visible, near infrared and short-wave infrared sensors to make pictures of the earth's surface by observing the solar radiation reflected from targets on the background as indicated in Fig. 1. Different materials reflect and absorb differently at different wavelengths. Thus, the targets can be differentiated by their spectral reflectance signatures in the remotely sensed images.



HYPERSPECTRAL IMAGE CLASSIFICATION

hyperspectral image classification fall under three categories supervised hyperspectal image classification, unsupervised hyperspectal image classification, semisupervised hyperspectal image classification to handle the various issues which are faced while classifying hyperspectral images such as large number of spectral channels, acquisition of labeled data etc. The task of acquisition of labeled data is time consuming and costly. And last part of this section introduces the some well known applications of hypergraph.



Supervised Classification Methods: spanning forest (MSF) approach to classify hyperspectral data is proposed. In this method a pixel wise classification is first performed on hyperspectal image .From this

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classification map, marker maps are created with random selection of pixels and labeling them as markers for the purpose building of MSFs. MSF is built from each of the marker maps and final classification map generated with a maximum vote decision rule. As these methods fall under supervised category they make use of only labeled data to train the classifier and in case of hyperspectral images label data is a very few and obtaining labeled data is more time consuming and costly. So research goes towards such methods which will conduct hyperspectral image classification under a very few training samples or absence of samples

Unsupervised Classification Methods: In unsupervised method based on fuzzy approach which uses linear 1-D discrete wavelet transform (DWT) for reducing dimensionality of hyperspectral data. In this approach segmentation of hyperspectral images by applying fuzzy c-means (FCM) clustering as well as its extended version Gustafson–Kessel clustering (GKC). Image categorization is done with the help of hypergraph partition [6]. Hypergraph has advantages over simple graph. Complex relationship between unlabeled is represented with help of hypergraph.

Semisupervised Classification Methods: In semi-supervised methods the algorithm is provided with some available labeled data in addition with unlabeled data. In literature three different classes of semi-supervised learning algorithm s are introduced

1. Generative models-In these types of algorithm conditional density p(x|y) (e.g. expectation maximization (EM) algorithms with finite mixture models are calculated.

2. Low density separation –These algorithms, maximize the hyperplane between labeled and unlabeled samples simultaneously (e.g. Transductive SVM [7]).

3. Graph-based methods-Each sample spreads its label information to its neighbors until a global stable state is achieved on the whole data set.

Semisupervised version of neural network introduced to overcome limitations of TSVM such as falling under local minima by adding a regularizer to the loss function which issued for training neural networks

LITERATURE SURVEY

Goez et al. in [5] to make a direct identification of surface materials in the form of images. Although originally developed for remote sensing,hyperspectral imaging system is gradually found to have natural advantages over the traditional computer vision systems [2] in such diverse ields as agriculture [6–9].

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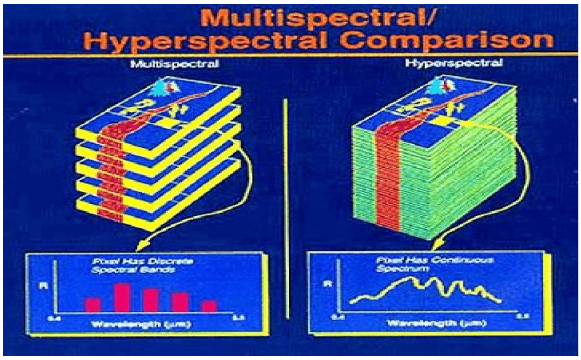
R. Ji et al. proposed spectral-spatial constraint hyperspectral To construct hyperedge in feature space the pixels which are close to each other in feature space are connected to form hyperedge .This closeness is measured in distance metric. The pixels with small distance are considered as close to each other. The pixels which are close to each other has same label.

Yue Gao et al. [11] proposed the improved version of hypergraph construction performed in two steps. At first simple graph constructed and unsupervised learning conducted over simple graph to identify grouping relation while in second step hypergraph constructed from previous step and semisupervised learning conducted to achieve desired classification result.

HYPERSPECTRAL IMAGE PROCESSING FOR AGRICULTURE APPLICATIONS

The hyperspectral imaging used in many areas, including medical domains, security and defense areas, monitoring and target recognition, mining and oil exploration, agriculture fields, and food safety areas.



1. Security

Detection the changes of the optical characteristics of material surfaces that can not be observed by the human eye, such as discrimination of the zero added with a different ink in document.

2. Geological Applications

Hyperspectral imaging used in defense and military applications for target detection and recognition, mapping applications, and marine mapping applications such as penetrating the barriers to detect troop and vehicles as evidenced.

3.Environment Monitoring: Detection of environmental change such as pollution investigation of land areas.

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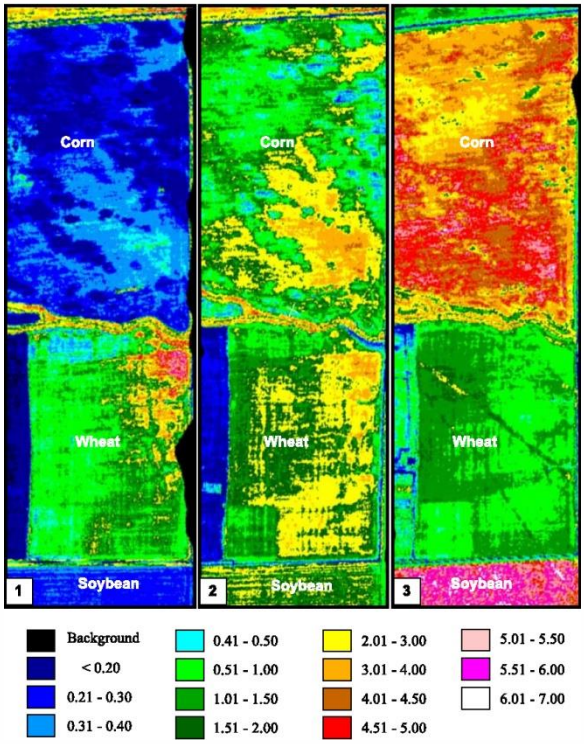

4.Clustering

The Clustering (or cluster analysis) is grouping the similar data items into a cluster or group such that the items in a cluster have more similarity than the items in others. One of the optimization problems is clustering pixels in multidimensional space. Clustering is a very important technique in the unsupervised classification since there is no information available about to which class the pixel belongs.

CONCLUSION

In this paper, Hyperspectral images have broad spectral information to identify and distinguish materials spectrally unique. Classification of hyperspectral image means assigning objects with the same level of a class with homogeneous characteristics. Hyperspectral classification become promising task because of some challenging task like Curse of dimensionality, Few labeled samples, the spatial variability of the spectral signature, exploring Spatial correlation among pixels and adding contextual information along with spectral information during classification.

Future research will be in direction of constructing hypergraph and conducting learning on hypergraph to get final classification results.

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