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High Resolution Image Classification with Edge Detection based Segmentation and AdaBoost

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Abstract - *Image classification is the most significant a part of digital image analysis. Classification of remotely detected information is employed to assign corresponding levels with relevancy teams with uniform characteristics, with the aim of discerning multiple objects within the image. A Geoeye-1 image is employed for experimental information. Firstly, the Geoeye-1 image is segmented, then abstraction, spectral, textural, color area and band ration options are designated. During this paper, image segmentation and AdaBoost technique is given and applied to object-oriented high resolution image classification. AdaBoost is an Adaptive Boosting machine learning meta-algorithm. AdaBoost classifier is intended considerately of confidence, support of well-mined rules. The visual comparison with the results of SVM and accuracy estimation validates the result of the projected approach.*

Key Words: **high resolution images, classification, adaboost, image segmentation, thresholding.**

1. INTRODUCTION

Data mining is a vital research area in computer technology. It's far a computational process of figuring out patterns in massive information. Image mining is certainly one of crucial strategies in records mining, which worried in more than one disciplines. Picture type refers the tagging the photos into some of predefined sets. It's also consists of picture preprocessing, feature extraction, item detection, object classification, item segmentation, object class and lots of extra techniques. Image classification produces the accurate prediction outcomes of their goal magnificence for every case inside the data. It is a completely essential and challenging undertaking in diverse application domains, consisting of video surveillance, biometry, bio-scientific imaging, industrial visible inspection, vehicle navigation, remote sensing and robot navigation [1].

Resolution is that the capability of the detector to look at or live the tiniest objects clearly with distinct boundaries. Resolution depends upon the dimensions of the picture element. Usually, with any given lens setting, the smaller the dimensions of the picture element, the upper the resolution are going to be and also the clearer the item within the image are going to be. Picture having smaller picture element sizes may carries with it a lot of pixels. The amount of pixels correlates to the number of data at intervals the image.

Image classification [2] is one altogether the foremost ways in which for information extraction from remote sensing image. Comparison with moderate-resolution, high-resolution image provides extra snug abstraction information, thus it's come-at-able to extract ground object extra accurately. The key issue of image classification is that the development of classifier. Classification of high resolution remote sensing information from urban areas is investigated. The foremost challenge in classification of high resolution remote sensing image information is to involve native spatial information inside the classification methodology.

Image segmentation [4] is that the method of partitioning a digital image into multiple segments (sets of pixels, additionally called super-pixels). The goal of segmentation is to modify and/or modification the illustration of a picture into one thing that's additional meaning and easier to research. Image segmentation is usually wont to find objects and bounds in pictures. Segmentation of high resolution black and white geoeye-1 image is delineated. The regions were classified based on anyone of the 2 classes: Natural and Artificial. GeoEye-1 represents an additional step on the thanks to higher resolution capabilities for remote sensing satellites. This paper describes associate degree early experimental assessment of the accuracy of geo-referencing from GeoEye-1 imaging.

Thresholding is that the simplest methodology of image segmentation. From a gray-scale image, thresholding

may be accustomed produce binary pictures. The aim of thresholding is to extract those pixels from some image that represent associate degree object (either text or different line image knowledge like graphs, maps). Although the knowledge is binary the pixels represent a variety of intensities. So the target of binarization is to mark pixels that belong to true foreground regions with one intensity and background regions with totally different intensities [6].

AdaBoost is a machine learning meta-algorithm. It can be utilized in conjunction with several different sorts of learning algorithms to boost their performance. The output of the other learning algorithms ('weak learners') is combined into a weighted add that represents the ultimate output of the boosted classifier. AdaBoost is adaptive in the sense that subsequent weak learners are tweaked in favor of these instances misclassified by previous classifiers. AdaBoost is sensitive to noisy knowledge and outliers [11].

AdaBoost may be a successive rule that minimizes associate bound of the empirical classification error by choosing the weak classifiers and their weights. These square measure pursued" one-by-one with all being hand-picked to maximally cut back the bound of error. AdaBoost denes a distribution of weights over the info samples. These weights square measure updated every time a replacement weak classier is additional specified samples misclassified by this new weak classifiers square measure given additional weight. During this manner, presently misclassified samples square measure emphasized additional throughout the choice of the following weak classier [3].

2. METHODOLOGY

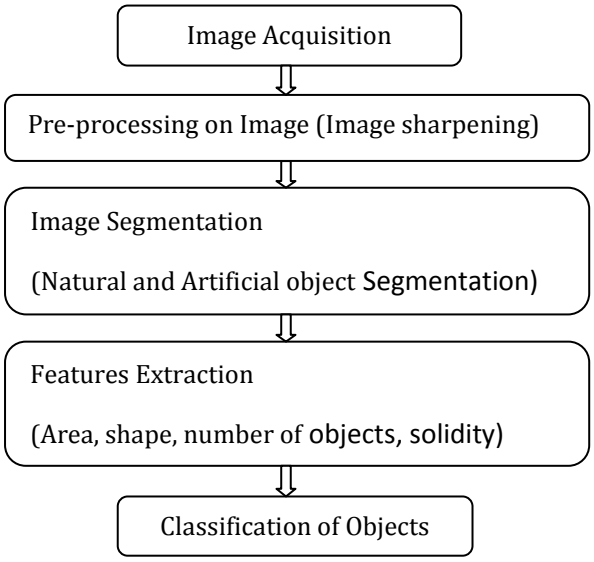

Fig-1: Block Diagram

2.1 Image Acquisition

The first stage of any vision system is that the image acquisition stage. When the image has been obtained, varied ways of process will be applied to the image to perform the numerous completely different vision tasks needed. However, if the image has not been non heritable satisfactorily then the meant tasks might not be possible, even with the help of some sort of image improvement.

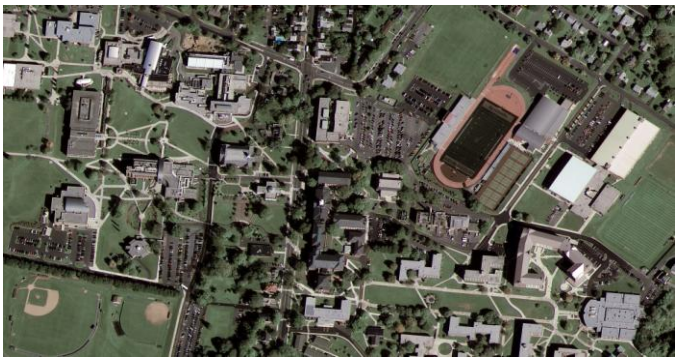

Fig-2: Pseudo color Geoeye-1 image of study area

2.2 Pre-processing on image

Image process and improvement stage is that the simplest classes of image process. This stage is employed for reducing image noise, highlight edges, or displaying digital pictures. The improvement stage includes resolution improvement and distinction improvement. These are accustomed suppress noise and imaging of spectral parameters.

The aim of pre-processing is an improvement of the image knowledge that suppresses unwanted distortions or enhances some image options necessary for any process [6].

2.3 Image Segmentation

Segmentation [10] partitions a picture into distinct regions containing every pixel with similar attributes. To be purposeful and helpful for image analysis and interpretation, the regions ought to powerfully relate to delineate objects or options of interest. Purposeful segmentation is that the commencement from low-level image process remodeling a grey-scale or color image into one or additional alternative pictures to high-level image description in terms of options, objects, and scenes.

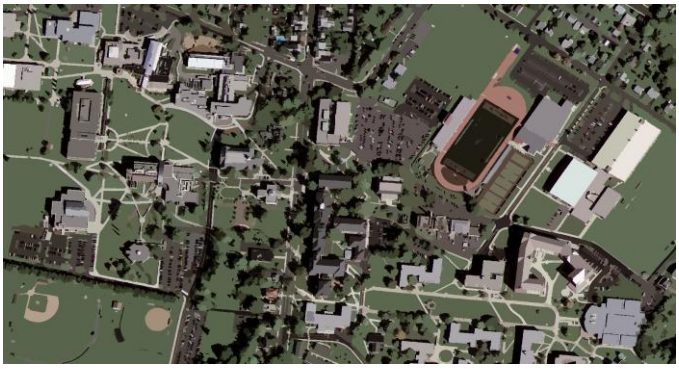

Fig-3: The segmentation of the image

Fig-4: The segmented boundary of image

Fig-5: The segmented threshold of image

2.4 Features Extraction

Feature extraction [8] starts from associate initial set of measured information and builds derived values (features) meant to be informative and non-redundant, facilitating the following learning and generalization steps, and in some cases resulting in higher human interpretations. Feature extraction is expounded to dimensional reduction. Once the computer file to associate rule is simply too massive to be processed and it's suspected to be redundant, then it may be remodeled into a reduced set of options. This method is termed feature choice. The chosen options are expected to contain the relevant info from the computer file, so the specified task may be performed by exploitation this reduced illustration rather than the entire initial information [9].

Table -1: Name and descriptions of spatial features

Name of feature	Description
Area	Total area of the polygon, minus the area of the holes.
Length	The combined length of all boundaries of the polygon, including the boundaries of the holes.
Compactness	Sqrt(4 * Area/π) / outer contour length
Convexity	Length of convex hull / Length
Solidity	Area / area of convex hull
Roundness	Roundness = 4 * (Area) / (π * Major_Length ^{2})
Form_Factor	4 * π * (Area) / (total perimeter)^2
Elongation	Major_Length / Minor_Length
Major_Length	The length of the major axis of an oriented bounding box enclosing the polygon.
Minor_Length	The length of the minor axis of an oriented bounding box enclosing the polygon.

2.5 Classification of Objects

Object classification [5] is that the detection and classification of any object, that could be a member of a given set of abstract categories into one such abstract category. The necessary distinction here is 2 fold; initial, any object, even antecedently unseen objects shall be classified properly, and second, the item category is Associate abstract category like “car”, “fruit”, etc.

In this paper, AdaBoost classifier is used for classification.

Algorithm: **AdaBoost** [3]. A boosting algorithm creates an ensemble of classifiers. Each one gives a weighted vote.

Input:

- D, a set of d class-labeled training tuples;
- k, the number of rounds (one classifier is generated per round);
- A classification learning scheme.

Output: A composite model.

Method:

(1) initialize the weight of each tuple in D to 1/d;
(2) for i=1 to k **do** // for each round:
(3) sample D with replacement according to the tuple weights to obtain D_i ;
(4) Use training set D_i to derive a model, M_i ;
(5) Compute error (M_i), the error rate of M_i

(6) **if** error (M_i) > 0.5 **then**
(7) go back to step 3 and try again;
(8) **end if**
(9) **for** each tuple in D_i that was correctly classified **do**
(10) Multiply the weight of the tuple by error (M_i) / (1-error (M_i)); // update weights
(11) Normalize the weight of each tuple;
(12) **end for**

3. RESULT

It can be seen from the table II that the overall accuracy of proposed method AdaBoost is 95.9 % versus the SVM 74.7%, thus the accuracy of proposed method is 21.2% higher than the SVM method. AdaBoost is a very good method for boosting the accuracy result, as compared to any other methods. It generally gives the best result.

Table -2: Comparison of accuracy (%)

Images	Methods	
	AdaBoost	SVM
Kutztown	100	62.5
Cape town	100	75
Hurricane	83	83.3
Hoover-dam	100	80
Marcellus	100	66.7
Arecibo	100	75
Rothera-station	100	95
Bismarck-north	100	83.3
Dubai	76	46.2
Canberra	100	80
Overall	**95.9**	**74.7**

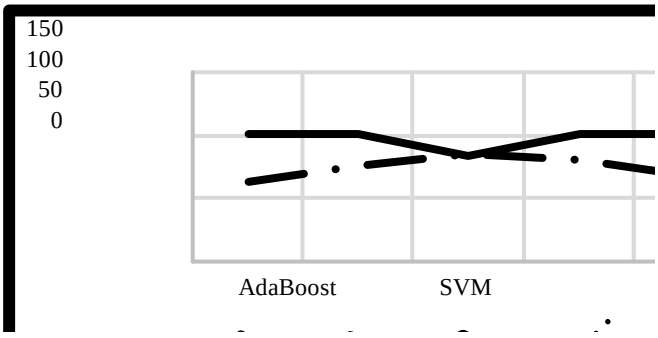

Chart-1: Graph shows Comparison of Accuracy between AdaBoost and SVM

AdaBoost gives more accurate classification result than SVM. As shown in Figure 6, both AdaBoost and SVM intersect at Hurricane image, means that both have the same accuracy at this point and due to the image quality. Remaining point's shows that AdaBoost gives higher accuracy than SVM. AdaBoost gives 100% accuracy to the many of the images, as shown. Total 10 different images are used for classification by AdaBoost method and SVM method is used for Comparison, as SVM is also another good method.

4. CONCLUSION AND FUTURE WORK

The Segmentation and AdaBoost Algorithm are applied for the classification of Geoeye-1 image. In this paper, we classified two classes, Natural and Artificial objects. The Segmentation reveals the combination of features of classes and the AdaBoost finds the optimal rules for classification. Thus, the AdaBoost makes it possible to result in a more accurate classification, and the visual illustration and accuracy analysis validate the effect of the proposed approach. In Future, we can classify classes such as Streets, Roads, lakes, buildings, etc.

REFERENCES

[1] P Thamilselvan, Dr. J.G.R. Sathiaseelan, " A Comparative Study of Data Mining Algorithms for Image Classification", june 2015 ijeme.
[2] Ziyong Zhou, Yang Zhang " Integration Of Association-rule and Decision Tree for High Resolution Image Classification", China, IEEE.
[3] Jiawei Han, Micheline Kamber, Jian Pei "Data Mining Concepts and Techniques" Third Edition, pp. 380-382.
[4] Segmentation of a high-resolution urban scene using texture operators. (Richard W. Conners, Mohan M. Trivedi, Charles A. Harlow)
[5] Ms. Chandrakal.M , Mrs. R. Amsaveni, "Classification of Remote Sensing Image Areas Using Surf Features and Latent Dirichlet Allocation", vol. 3, Issue 9 sept 2013.
[6] H.K. Anasuya Devi, "Thresholding: A Pixel-level Image Processing Methodology Preprocessing Technique for an OCR System for the Brahmi Script".
[7] Priyanka G. Kumbhar, Prof. Sushilkumar N. Holambe, " A Review of Image Thresholding Techniques", vol. 5, Issue 6 june 2015.
[8] J.A. Benediktsson, M. Pesaresi, " Classification and feature extraction for remote sensing images from urban areas based on morphological transformations", vol. 41, Issue sept 2003, IEEE.
[9] Mark Nixon & Alberto Aguado, "Feature Extraction & Image Processing", 2nd edition, pp. 183-221.
[10] K.M. Sharavana Raju, Dr. V. Karthikeyani, "Improved Satellite Image Preprocessing and Segmentation using Wavelets and Enhanced Watershed Algorithms", vol 3, Issue 10 oct 2012.
[11] Ryuei Nishii, Shinto Eguchi, " Supervised Image Classification based on AdaBoost with Contextual Weak Classifiers" vol 2, 2004 IEEE.