

Review on Different Techniques of Image Classification

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Abstract

In present day classification of image plays an important role in engineering and computer vision application like image processing in remote sensing image. The classification of images is a challenging and important task nowadays. The main problems in image classification are uncertainties in position of object borders and multiplex resemblance of segments to different classes. This paper proposes different techniques for image classification.

Keywords: *Artificial neural network, Classification, decision tree, Fuzzy logic, Image processing, support vector machine.*

1. Introduction

Image processing is used to convert an image into digital form and performs some operations on it, in order to get an enhanced image or to extract some useful information from it. The various purpose of image processing are visualization, image sharpening and restoration, image retrieval, measurement of pattern, image recognition. image processing is used in remote sensing, biomedical imaging techniques, moving object tracking, intelligent transportation system etc. Classification between the objects is easy task for human but it is difficult task for machines. Classification system consists of database that contains predefined patterns and compares with detected object to classify in to proper category.

2. Image classification

Image classification is contextual information in image. Contextual means it will focus on relationship of nearby pixels. Image classification is an important and challenging task in various application domains including biomedical imaging, biometry, video surveillance, vehicle navigation, industrial visual inspection, robot navigation, and remote sensing. Image classification steps include different digital data, preprocessing, feature extraction, selection of training data, decision and classification, classification output, post-processing and accuracy assessment^[5]. Satellite

image is an image of the whole or part of earth taken using artificial satellites. Satellite image plays an important role in showing what cannot be measured or seen. It gives good representation of what is happening at every point in the world. Satellite images provide informative information. The output of classified remotely sensed images will classify different areas from satellite image in form of land, vegetation, water bodies, rock etc ^[1].

The paper aims to describe various techniques in detail. Section 2 shows concept of image classification. Section 3 describes the survey done to know the work done and history. Section 4 shows different techniques for image classification. Section 5 shows comparison of various techniques.

3. Literature survey

Four supervised classification techniques such as mahalanobis, maximum likelihood classification, minimum distance and parallelepiped are classified with different time period of satellite images. Comparison of all supervised classification is done with different Landsat satellite images of different time period. ^[1]

Object based image analysis method is used which is also known as image analysis method based on image segment. Initial classification is done through semantic based analysis method. Then the result of initial classification will be modified based on qualitative matching and classification is done using proposed method. ^[2]

In object oriented classification the image is divided into series of image object adopting fuzzy classification to achieve classification and information extraction. The classification is done using object oriented and maximum likelihood classification. Comparisons are made between object oriented and maximum likelihood classification. ^[3]

Proposed method shows how an image can be classified

from given large image data base. Artificial neural network and k nearest neighbour methods are used for classification and comparison is done between them in terms of training data and testing data [4].

4. Different techniques for image classification

4.1 Artificial neural network

It is a artificial intelligence that imitates some functions of the person's mind. ANN has a normal tendency for Storing experimental knowledge.

It consists of a sequence of layers and each layer consists of a set of neurones. All neurones of every layer are linked by weighted connections to all neurones on the preceding and succeeding layers.

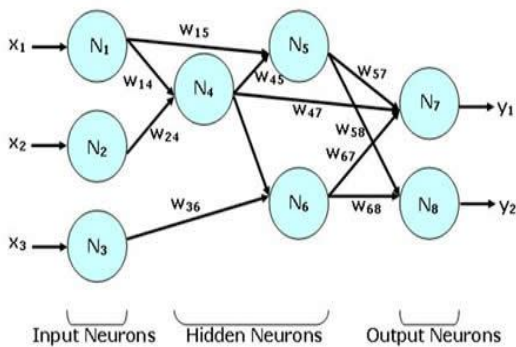


Fig.1 Artificial neural network

4.2 Support vector machine

A support vector machine builds a hyper plane or set of hyper planes in a high- or infinite dimensional space, used for classification. Good separation is achieved by the hyper plane that has the largest distance to the nearest training data point of any class generally having larger the margin lower the generalization error of the classifier.

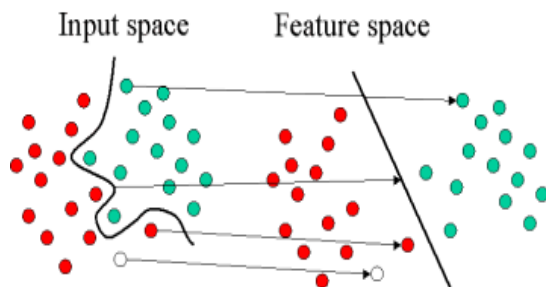


Fig.2 Support vector machine

4.3 Decision tree

It calculates class membership by repeatedly partitioning a dataset into uniform subsets. Hierarchical classifier permits the acceptations and rejection of class labels at each intermediary stage. This method consists of 3 parts: Partitioning the nodes, find the terminal nodes and allocation of class label to terminal nodes.

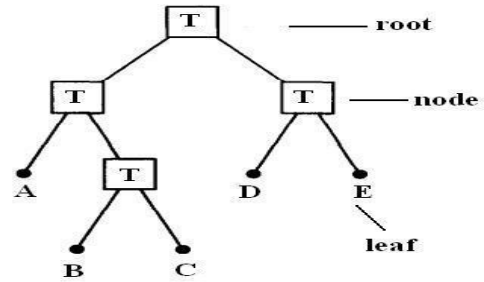


Fig.3 Decision tree

4.4 Fuzzy logic

It is a problem-solving control system methodology that lends itself to implementation in systems ranging from simple, small, embedded micro-controllers to large, networked, multi-channel PC or workstation-based data acquisition and control systems. It can be implemented in hardware, software, or a combination of both. It provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information. In Fuzzy classification, various stochastic associations are determined to describe characteristics of an image. The various types of stochastic are Combined in which the members are fuzzy in nature. It provides the opportunity to describe different categories of stochastic characteristics in the similar form. The areas of applications where fuzzy are used are process control, management and decision making, operations research, economies, pattern recognition and classification. The major advantage is natural description of problems, in linguistic terms, rather than in terms of relationships between precise numerical^[6]. In traditional classification methods each pixel or each segment in the image will have an attribute equal to 1 or 0 expressing whether the pixel or segment belongs to a certain class or not, respectively. In fuzzy classification, instead of a binary decision-making, the possibility of each pixel belonging to a specific class is considered, which is defined using membership functions.

A membership function offers membership degree values ranging from 0 to 1, where 1 means fully belonging to the class and 0 means not belonging to the class.

5. Comparison of various techniques

Table 1: Comparison of classification techniques

Classification techniques	Advantages	Disadvantages
Decision tree	It Can handle nonparametric training data Does not require an extensive design and training	Becomes complex calculation when various values are undecided and/or when various outcomes are correlated
Support vector machine	The problem of over fitting is eliminated here. There is reduction in computational complexity	Its training is time consuming Structure of algorithm is difficult to understand
Fuzzy logic	It is a user defined function. Efficiently handles uncertainty	It depends on predefined database.

5. Conclusion

Image classification being a complex technique faces many challenges in terms of efficiency. This paper helps understanding of various techniques used for classification of various images. Also it shows the comparison of different techniques are shown.

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