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A Survey on Low Level Feature Identification of Satellite Images and Knowledge Discovery from Identified Features using Image Mining

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Abstract*—Image mining is a used to mining the images for the extraction of knowledge. Different types of satellite images contain earlier prediction of forecasting weather & their important information. Several works has been done on Satellite image mining, databases are used to store the images & query image technique is used to retrieve the images. The technique used Content Based Image Retrieval [CBIR] for the feature extraction & image retrieval from the image. The CBIR extracted laver of cloud, high pressure, etc. from Satellite Images contain more information High Cloud, Low Cloud, Thick Cloud and Thin Cloud which can be extracted knowledge efficiently in a proper manner & to discover knowledge technique of association rule is applied. It uses low level feature to extraction information and discovering knowledge from this feature using Mining Rule.*

Keywords:*—Satellite Image, CBIR, Knowledge Discovery, Feature Extraction, Association Rule.*

1. INTRODUCTION

Image mining technique is used for the implicit knowledge, relationship of image data or some more other pattern explicitly not stored in images of extraction and uses the idea of processing, retrieval, data mining and machine learning database from computer vision.[2]. Image mining face the challenge to analyze pixel containing low level or image containing pixels group. High level spatial object & relationships analyze images effectively and efficiently. The final knowledge Evaluation and interpretation of image mining can be measure by preprocessing, transmutation, mining, feature extraction.

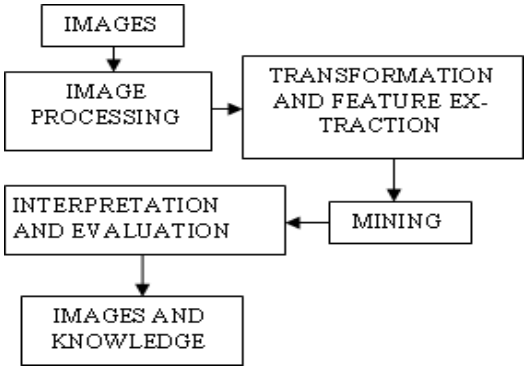

Figure 1 Image Mining System

The most encouraging technique in image mining is Association rule mining. The database image system is used to store weather forecasting images & fetch them next time for research to forecast temperature, analogous humidity, raindrops, cyclone and meteorological pressure.

Image retrieval is established on Content Based Image Retrieval. The CBIR is not so adequate, if the volume of image is broad. These approaches commonly use low level features such as surface (texture), intensity (color) and architecture (shape) to calculate the resemblance between the images. Content based image retrieval is also recognized by Query by image content (QBIC). Content Based Visual Information Retrieval (CBVIR) is the utilization of techniques in computer vision for image retrieval problem. The images contain metadata such as keywords, tags, and / or information link with the images, but the content based means that the exploration will evaluate the actual contents of the image. The phrase 'content' in this efficacy specifies to surface (texture), intensity (color) and architecture (shape) or any alternative science that can be derived from the image itself. CBIR is fascinating on account of most web based image search engines have confidence purely on metadata, this produces bunch of garbage in the results. Due to inadequacy of semantic knowledge in the data, conventional Database Management System (DBMS) does not endeavor strong for the image data.

In recent years, automated indexing and retrieval based on image content has develop into more fascinating for promoting enormous quantity image retrieval utilizations. Color, Texture & Shape is the main appearance for both humans & computers used to notice images. Several systems have been recommended in the analysis state for CBIR such as QBIC by International Business Machine (IBM) & Visual SEEK by Columbia University. Most of the content based image retrieval approaches apply the consecutive two steps to retrieve the images. Firstly, the image databases are stored with calculated image feature vector. Secondly, calculated image feature vector is correlated with a given query image whose feature vector is calculated. A convinced image's feature vector that is convenient to the feature vector of query image is restituted to the user.

2. LITERATURE REVIEW

A data mining is an approach for monsoon affirmation using satellite image information forecast the monsoon on the ground of some specification which as Sea Surface Temperature (SST), Cloud Top Temperature (CTT), Cloud Thickness and Water Vapor or Moisture. The difference can be measure by Infra Red (IR) spectrum sensor [2]. The analogous heterogeneous features of a allocate satellite images have been proposed by Semantics-based technique. With the help of one satellite image using consolidation of a sliding window & interpolation, the semantic based technique is capable to discover multiple semantics classes. The unproved conclusions have shown that the disciplined semantics classifiers together with the interpolation accession accomplish an adequate & competent recognition of the semantics classes within the satellite spectacle. As a conclusion not just only the query-by-terms approach but also the query-by-example technique is supported.

Query-by-terms approach and Query-by-example technique both resulted in very gratify retrieval even for cross-scanner queries, i.e. queries have to retrieve symbol from one scanner even though the semantics was access over statistics from a distinct scanner. Thence, an immense intensity of freedom was attained [4].

A model was proposed for the cloud transform (cloud processing) and retrieval system named as Satellite Cloud Image Processing & Information Retrieval system. The database structure part is designed to establish immense performance by deriving a feature set for each of the image in database at storing time & loading the feature set ahead

with its comparable image in the database, so when the questioning image is conferred to the system, each database image in the system does not perform feature extraction. The retrieval features from the satellite image stored in database are color, texture and shape which has been developed by CBIR.

Histogram values have been used to extract the grey level/ color properties of an image. Morphological operations are used to extract the four functions of texture features i.e. Entropy, Energy, Correlation and Contrast and the shape features i.e. Area, perimeter and metrics [11].

For weather forecasting a system is build to store weather forecasting images & retrieve them for prediction. To extract the feature & retrieve images CBIR technique is also used. For the prediction of weather forecasting, association rule mining is applied [4].

3. FEATURE EXTRACTION FROM IMAGES

An Image and Feature Extraction is done by the following techniques:-

A. Content Based Image Retrieval

Retrieving images from a huge dataset of images CBIR technique is used. CBIR is established for the low level visual features of the images, Colors, Shape & Texture are the features [11]. Euclidean distance [12] is used to calculate the similarities between the images.

$$I\,|Q,T|=\sum |\omega i - ti| \quad (1)$$

2Where Q is query image

3q_i is low level feature of Q.

4T is a certain image in database

5 t_i is low level feature of T

6ω_i is the weight factor

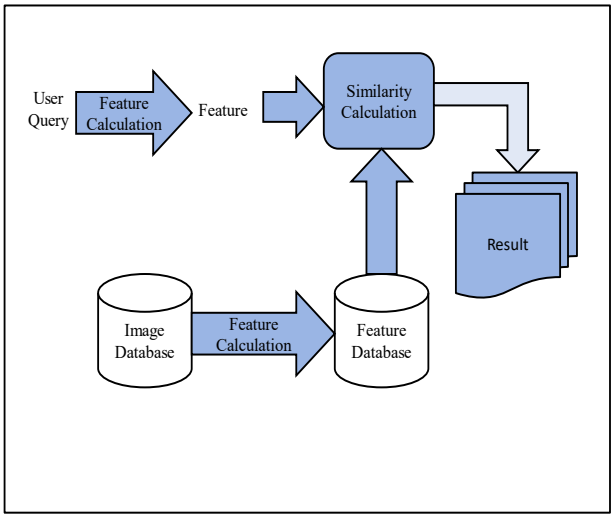

Figure 2 CBIR Process

Figure 2 represents the entire functioning of Content Based Image Retrieval. Image database already contains the images and their feature along with image stored in database.

At the beginning query image is used as input by user for the image retrieval process, and then the feature extraction starts by the system from the queried image. Subsequently, the measurement of the similarity between the feature set of the query image & the images gathered in database is done by the system. The ranks on the basis of purpose provided by the system based on the similarity and acknowledge the result.

B. Feature Extraction

1) Intensity (Color) /Grey Level Feature Extraction:

In Content Based Image Retrieval (CBIR) scheme the most extensively used visual features is Color property. There are three main areas in this research field:

1. For an accustomed mark application description of suitable color space.
2. Recommendation of Applicable Extraction Algorithm.
3. Analysis / Interpretation of similarity portion.

Three-dimensional color spaces are used to expressed the Color intelligence as points

(such as HSV, RGB, YIQ, L*u*v*, L*a*b* [17]). They grant intolerance between color incentives and allow similarity knowledge and recognition [17]. Hardware oriented is also used among all (e.g, RGB & CMY color capacity), as they give description by communicable version properties of the devices used to emulate colors. Others are User -Stimulated (e.g., L*u*v*, L*a*B) as they were characterize to evaluate color distinction as recognized by humans. Color Moments [21] is an example of the descriptor that does not examine color spatial distribution. Generally, to structure the feature vector, the *mean* (first order), *variance* (second order), and *skewness* (third order) are used. These points are designate, accordingly, as

$$E_i = (1/N)\sum_{j=1}^{N}[p_{ij}], \quad \sigma_i = \sqrt{(2\&(1/N)\sum_{j=1}^{N}[(p_{ij} - E_i)]^2)} \quad \ldots\ldots(2)$$

$$s_i = \sqrt[3]{\left(\frac{1}{N}\right)\sum_{j=1}^{N}(p_{ij} - E_i)^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where

p_{ij} = i-th color constituent of the image pixel.

N = pixels number in the image.

2) Surface (Texture) Feature Extraction:

Wide collections of procedure are there for measuring surface such as co-occurrence matrix, fractals gabor filter and variation of wavelet transform. One of the most conventional procedure for encrypt texture information is Co-occurrence matrix. In this description of the spatial relationships among grey-levels in a image. A cell represent by the position (i, j) in this matrix list the feasibility at which two pixels of grey levels i and j occur in two respective position.

A set of co-occurrence feasibilities (such as Energy, Entropy, and Contrast) has been recommended to represent textured regions.

Normalized feasibility density P(i, j) of the co-occurrence matrices can be describe as follows-

P (i, j)

$$\frac{\#\{(x,y),(x+d,x+y)|S|f(x,y)=i,f(x+d,y+d)=j\}}{\#S} \quad \ldots\ldots(4)$$

Where

x, y=0,1,……N-1 are co-ordinates of the pixel

i, j=0,1,…….L-1 are the gray levels

S is the set of pixel which have certain relationship in the image.

=S is the number of elements in S.

P (i, j) is the probability density that the first pixel has intensity value i and the second j, which separated by distance δ= (dx, dy) [6].

3) Architecture (Shape) Feature Extraction:

To recognize and discriminate objects in pattern recognition& relation, it is an important distinctive. *Boundary-based (Contour-based)* and *Region based* mechanism [18] are the classification methods for shape descriptors. This is because classification takes into account either shape features are extracted from the contour only or from the whole shape region.

The two classes which in turn are divided into Local (Structural) and Global descriptors. This subclass is based on either the shape is expressed as a whole or expressed by segments/ sections. Spatial & Transform domain techniques are other possible categorization shape definition methods, rely upon either direct dimension of the shape are used or transformation is enforced.

4. KNOWLEDGE DISCOVERY IN IAMGES BY ASSOCIATION RULE

The database of knowledge discovery, an influential part of data mining, is describe as the automated discovery of valuable, anonymous, non-trivial facts[10].The recognition of identical objects from images is the main constituent in image discovery. In this paper, the definition of rules uses the knowledge mining from images, for the conversion of low-level primitives of images

into semantic high level concepts. The procedures used in this analysis bring valuable enhancements associated to the particularized characterization of images, which are essential for giving description relationships between: Objects/ region, Classes of visual component.

5. PROPOSED WORK

Various works have been done on satellite images. In most of them, they tried to retrieve similar type images from a big database of satellite images by a query image. They used CBIR to extract feature database images and queried image and retrieve the images from database. Many of them were use only one type of satellite image but no one used all the three types of images. The proposed work uses all the three types of satellite images. CBIR is used not for image retrieval rather for feature extraction using from the satellite image. The entire features extracted from these images are stored in a table that is called inter-transaction association rule table. Then the association rule mining algorithm is applied to this table to discover the knowledge. The Satellite Images may contain High Cloud, Low Cloud, Thick Cloud and Thin Cloud.

Once the information is extracted the information is stored in a table in which 0 represents 'not exist' and 1 represents 'exist' that particular information. The table is l called transaction table. Discovering the knowledge about the weather includes association rule which is applied to the transition table created with the help of feature extracted from the Satellite Images.

6. CONCLUSION

This work discovers different types of cloud from satellite images and associates them to discover the relation between them. This work will have two results in which one is association table that is create by histogram and second is applying association rule mining to get knowledge. The association table will show different cloud and existence of that cloud is represented by Y. If clouds not exist then N is presented in the table.

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