Monitoring system of land cover quality using segmentation and content base image retrieval methods

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Submission date: 28-Jan-2021 05:09PM (UTC+0700)
Submission ID: 1496155207
File name: Handoko_2020_J._Phys.__Conf._Ser._1444_012013.pdf (1.12M)
Word count: 2428
Character count: 12733

Journal of Physics: Conference Series

PAPER · OPEN ACCESS

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To cite this article: Dwi Handoko *et al* 2020 *J. Phys.: Conf. Ser.* **1444** 012013

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Monitoring system of land cover quality using segmentation and content base image retrieval methods

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Abstract. This paper tries to explore level and accuracy Content Based Image Retrieval method on Landsat imaginary. The images include an areal photography and land satellite photoraphy or Landsat which widely used and recognize for spatial information analysis. The analysis uses mapping of situation or state of earth's surface, particularly the land surface. Landsat can be used to create topographic map, determining of attitude or height model of a certain place in the earth. Aerial photographs are used to detect changes of earth surface, in this work the changes by using Content Based Image retrieval or CBIR. The accuracy changes measurement calculates using precision and recall parameters. In this paper, Landsat images also used to detect the appear and dis appear of vegetation and other objects on the earth. More than 100 Landsat images used in this work, and around 15 images were use d as queries. The results show that accuracy of image retrieval is a quite good, which more than 75 %.

1. Introduction

An area always has grown and advanced which will bring changes in physical appearance. The physical growth is increase or decrease of land which is influenced by natural and human factors. Developing an area needs good and accurate planning in order to manage and locate good land use. Therefore, it needs an effective and suitable methods in order to get a valid information related land surface change. Land surface cover or land covers are is physical characteristics of land surfaces. Land covers can be forests, plants or trees, waters including lakes and rivers, buildings, and other objects. Land surface can be changed from time to time by climate change, river channel changes, and human activities. It's just worth noting that most of the changes in land surface caused by human activities / activities. Human activities that can usually change the surface of the land are agricultural activities, settlement, mining, and recreation. Belongie et al. [1] states that changes in land or land use can be classified in several stages, at different times, environmental characteristics, and human activities in certain regions. Changes of land surfaces to either increase or decrease or even damage to the surface of the land can be detected by conventional means or by utilizing satellite imagery such as aerial photography, remote sensing, and Landsat imaginary imagery [2]. This research can map areas which have experienced damage and or change. This research is also intended to build a software application system to detect changes in land surface quality as quickly as possible, accurately and automatically.

The purpose of this work tried to investigate the accuracy and effectiveness of the region growing segmentation method. Another purpose is to determine changes or deterioration in land or surface quality in certain areas using satellite imagery of Landsat and Aerial photography. By building a database of aerial photographic images (Landsat and Aerial photography). In addition, this research used to detect and is also intended to determine and predict when land covers occur. The work builds a model or pattern of changes that occur in a certain period of time, and finally forecast how new circumstances will occur in the future on a land based on the pattern and what disasters are likely to occur in the future (disaster forecasting). The purpose of this work tried to investigate the accuracy and effectiveness of the region growing segmentation.

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In the field of land use management, understanding and knowledge of landscape structures, changes in nature and height, and how these processes influenced are the most important things to do. Stated by [3] that detection and monitoring changes and decreases in soil surface quality, is one of the factors causing ecological imbalance which can directly or indirectly cause natural disaster. The results of aerial photographs taken from aircraft and Landsat taken from satellites are still identified manually by relying on human capabilities which are very limited and very subjective as well as influenced by one's conditions and circumstances so that the results of the analysis are sometimes difficult to justify. Further more [4] stated that one of important thing in this manual analysis is that there is no aerial or Landsat aerial image database has been built, so to predict a model for disaster management and mitigation are quite difficult.

2. Research Methods

2.1. Data

In this work landsat imaginary data used to determine the quality of land using the CBIR method. Aerial photographic images consisting of Landsat images and aerial photo images. In streamlining the algorithm and reducing the complexity of the segmentation and detection processes, pre-processing is carried out to convert aerial photography and Landsat formats into JPEG images, due to standard considerations, storage, and simple process. The image will be be extracted which is call extraction process with a single or multiple extraction approach. Then the image will be processed to measure a level of image similarity. This process aimed to obtain image values which is similar to test images.

2.2 Determination / Identification of Individual Vegetation

BIR method that is often used is a search based on the similarity of color, shape, and texture. CBIR can also be interpreted as a technique to find images related and have the characteristics of a collection of images.

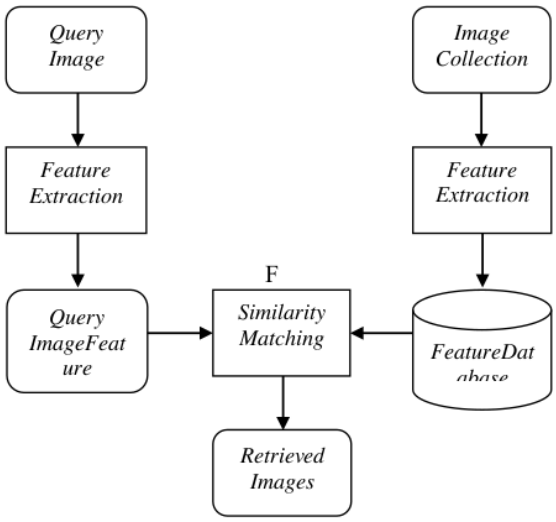

Figure 1. CBIR Architecture Diagram

According to [5,6] the CBIR diagram can be explained as follows:

- The user first enters a query formation in the form of an image, then the query is extracted

- In order to produce feature vectors (special image features), whilst image data stored in databases will experience the same structure as query formation so that feature vectors are found
- Then will be compared with each other to find similarities
- After the comparison process, several images which have identitical or nearly the precisly same, vector values will be selected
- Then indexing and retrieval of the selected data was carried out
- So that the sequence of images is found (in the database) that has similarities with the formation of images (according to user wishes).
-

CBIR (Content Based Image Retrieval) flowcharts proposed in this study are as follows:

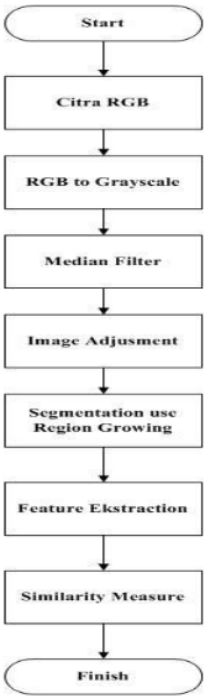

Figure 2. CBIR Flowchart (Content Based Image Retrieval)

Whilst [7] and [8] described that CBIR system in study uses several stages of the process, namely, RGB image, RGB to Grayscale, Median Filter, Image Adjustment, Feature Extraction, Similarity Measure.

3. Results and Discussion

RGB image is also called truecolor image. RGB image is a digital image that contains a data matrix of size m x n x 3 which represents red, green and blue for each pixel. Each base color is given a range of values. For computer monitors, the smallest range value is 0 and the largest is 255. The choice of the 256 scale is based on how to reveal the 8-digit binary numbers used by the computer. So that the total color that can be obtained is more than 16 million colors. The color of each pixel is determined by a combination of red, green and blue intensities. The advantages of the JPEG format include:

- JPEG format is also able to provide colors with a depth of 24 Bits, equivalent to 16 million colors
- The JPEG format is able to compress objects with a quality level in accordance with the options provided.
- The JPEG format is relatively smaller compared to other file formats.
- Almost all digital cameras use the JPEG format.

3.1. RGB to Grayscale

The first process carried out is to convert RGB images into grayscale images. In this process, first of all, the input image (RGB image) will be converted into a gray image, the gray image itself is a digital image that only has one channel value at each pixel, in other words the value of the RED = GREEN = BLUE. JPG image used as input is an image that has RGB color, so it must be converted to a gray image or also called a grayscale image. To convert a colored image that has a matrix value of each r, g and b into a grayscale image with the value s, then the conversion can be done by taking an average of the values of r, g and b.

Figure 3. RGB satellite images

Figure 4. Satellite images after Grayscale

3.2 Image Enhancement

Image quality improvement is done to correct the image of all disturbances that occur during image capture. Image quality improvement is carried out until the image is ready to be analyzed. The first process is conversion. In this research, the conversion made is RGB to Grayscale. The second process is filtering. Filtering is used to remove noise contained in the image. Filtering is done with a median filter, which is a filter to remove salt-and-pepper noise. The third process is setting the image intensity (adjustment) to increase the brightness of all images to be processed. Adjust the intensity of the image with Image Adjustment.

Figure 5. Landsat image applied median filter

Figure 6. Landsat image contrast applied

3.3 Feature Extraction

At this stage, the image will go through an extraction process with a single or multiple extraction approach. The single feature extraction used is HSV and GLCM. Combination feature extraction is a

combination of HSV + GLCM feature extraction. Similarity measure of the image will go through the process of measuring the level of similarity of the image. This process aims to obtain image values that are similar to test images.

This research will display the test results to prove the accuracy of CBIR (Content Based Image Retrieval) using query images and datasets in the form of landsat images.

Image	Similar or unsimilar
	Similar
	Similar

Figure 7. Example of Image Matching Similarity and Not Similarity

From the research observations as many as 40 query images, the results obtained from the level of similarity of images that match the similarity with the test images as many as 35 query images, and as many as 5 query images do not match the similarity.

4. Conclusion and Future Works

4.1. Conclusiom

From the work carried out , it can be concluded that CBIR (Content Based Image Retrieval) method can be used to detect changes in land surface, from 5 years ago (2014) to present year (2019). It also can be used to predict changes in land surface over the next 2 years (from 2019 to 2021). Finally, The accuracy of the Landsat image segmentation using Content Based Image Retrieval (CBIR) method is quite good which has value of 84.0%.

4.2. Future Works

Researchers have limitations in conducting this research so that researchers have suggestions for further research. The suggestions given to the authors are:

- This research is expected to be used as a reference for researchers who will discuss changes in land surface.
- In this study only discusses land changes using the CBIR method, so that it can be further developed by researchers further with other methods in order to get better results.

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Acknowledgements
Thanks to the Ministry of Research and Technology and Higher Education, the Republic of Indonesia who support with the Post Graduate Fund. Also thank to Darmajaya Research Centre who give us full support from the beginning to finishing this research. Finally, we very appreciate to all colleagues with their help and patien this work could be carried out well.

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