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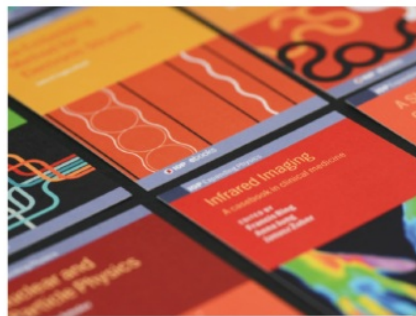
Land Cover Changes Detection Using Region Growing Segmentation

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Abstract . This paper try to explore an image segmentation model using the region growing method, the method used to segment landsat (land satelite) images for detecting land cover changes. More than 100 images was used in the works, and they collecting from google earth start from year 2015 to year 2019. The accuracy and effectiveness of developing area segmentation methods was computed using using ROC (receiver ooperational ccharacteristics) and studying changes or deterioration quality of certain areas using Landsat satellite images. By building a model or pattern of changes that occur over a certain period of time, and ultimately we will know how new conditions will occur in the near future. on a foundation based on the pattern as well as what is expected to occur in the future (disaster forcasting) can be seen the information. Finally, from the experiment more white pixel shown more land cover changes happened.

Keyword: *image segmentation, region growing, land quality*

1. Introduction

Changes 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 imaginary Landsat imagery. In the field of land use management, understanding and the knowledge of landscape structure, changes in nature and height, and how the influence of these processes is the most important thing to do. Satellite image processing has been widely used to identify and analyze changes in shape, area, or other conditions of a region. One of the satellite images used is Landsat 8 imagery [7].

Land covers are physical characteristics of the land surface. Land covers can be forests, plants or trees, waters including lakes and rivers, buildings, and other objects. Land surface can change from time to time by climate change, river channel changes, and human

activities. It's just need to be noted 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. [1] states that the changes in the land or in the use land can be classified into several stages, at different times, environmental characteristics, and human dynamics in certain regions. [7] stated that a change in the land can be caused by a large number of uncontrolled land uses due to the high dependency of the people who occupy the area.

The results of conventional analyzes such as this are the unavailability of aerial and landsat image database that can be built, so that forecasts and models for disaster management and mitigation needs. The results of this study is to design and create a software application system to detect changes in land surface quality quickly, accurately and automatically by utilizing region growing segmentation as a tool used to differentiate land surface changes by comparing the results of image segmentation from current and 5 year landsat images previously in a region. The results of this study are expected to be able to map areas that have experienced damage and / or changes based on binary image segmentation results which are black and white images that represent an area that is being processed by humans and with an area that is not being processed by humans.

2. Research Methodology

2.1. Data
The data used to detect land surface differences by using region growing segmentation are aerial photo images consisting of Landsat images and aerial photo images. To simplify the algorithm and reduce the complexity of the segmentation and detection processes, a pre-processing step is performed which changes the aerial photography and Landsat formats into JPEG images. The reason of this research will be using JPEG images is due to standard considerations, storage, and process simplicity

2.2. Determination / identification of changes in land surface.
The segmentation method used in this study is the Seeded region growing method which was introduced by [10] and is widely used by researchers with satisfying results, among others [11]. The region-growing seed algorithm that will be used in segmentation is:

- Seed determination (starting point) in terms of the highest point of a tree.

- Every time the interation process, the height will decrease by h.

- At each iteration process, all points higher than h are analyzed and then detect a new seed if a new region appears and does not touch the previous pixel that has been labeled.

This region growing segmentation will be explained through a flowchart that will explain what processes will take place at the region growing segmentation stage. Flow diagrams can represent relationships between processes, input data, data during the process and output data involved in segment growing region. Broadly speaking, the way this system is the user enters an image with JPEG format, then the system will process the image in several stages, namely the stage of Landsat image capture, and Landsat image segmentation,
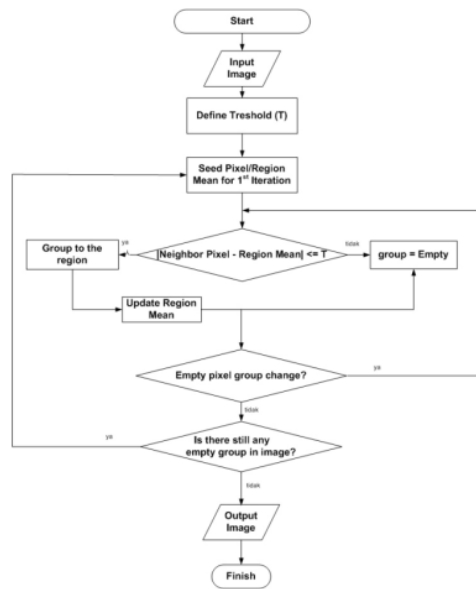
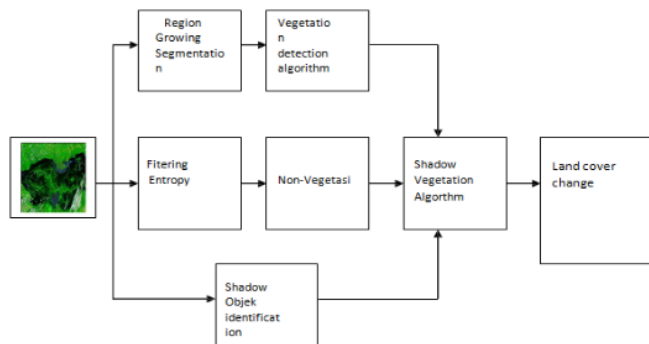**Figure 1.** Flowchart of the region growing algorithm implementation

Figure 2. Diagram of object detection and classification techniques on aerial photographs

In the flow chart diagram above, the input of the system to be built is aerial photography and / or Landsat imagery that has undergone pre-processing, ie the format has been converted to a compressed image format or JPEG format. With JPEG format, the seeded region growing algorithm will become simpler and save storage in other processes and then improve the quality of the image by using several algorithms to eliminate noise and vegetation and the results are obtained in the form of image comparison of current and 5 year images. Then it will get the difference from the region.

2.3. Convert RGB to Grayscale

To convert a color image that has a matrix value of each of r, g and b into a ***grayscale*** image with the value s, then the conversion can be done by taking the average value of r, g and b
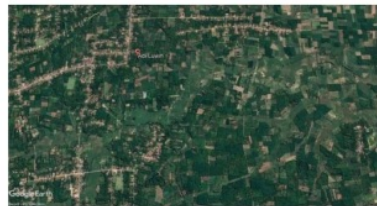

Figure 3. RGB Landsat Image   **Figure 4.** Landsat Grey scale Image

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

Figure 5. Landsat imagery increases contrast

2.4. Determine the Set Point and Threshold

In determining the Seed Points, you should use the Maximum Gray Level value. The maximum gray level value is 255, then S = 255. and the threshold is 60, then T = 60 while in the trial that will be carried out the pixel value will be assumed that all pixels less than 32 will be used as initial seeds.

Figure 6. Region Growing Result

3. Result

This research shown the differences in land surface at a location based on the results of region growing segmentation, the differentiated image is the current image 2019 and the image 5 years back then it will be seen very clearly the difference from the image so that we

do not guess again whether there is a difference land surface quality with very significant or not.

Figure 7. Region for district Adiluwih 2014

Figure 8. Region for district Adiluwih 2019

From the research observations, there are 2 colors of region growing segmentation, namely black and white, the black color represents areas that are still overgrown with trees / higher objects, while the white color represents areas that have been used as residential land or land that is not overgrown with high trees because they are being utilized by humans as processed land such as rice fields and others

4. Conclusion

The difference in land surface changes based on satellite Landsat imagery is possible using the region growing segmentation method, there is a binary image that represents the region between black and white images. So that differences can really be seen and distinguished not only in the perspective of estimates or human feelings.

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