

# Review of Techniques Used For the Detection of Change in Remotely Sensed Images

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**Abstract-** The earth's surface is ever increasing so the propensity towards up to date information are needed. The information generated through the satellites is used in wide range of applications such as land monitoring, whether forecasting, resource monitoring and environment monitoring. By utilizing the applications of distance routing we can detect this change with various techniques and also there is still research for new techniques. In this paper the statistics based technique for change detection and slandered based techniques are to be discussed. These techniques are further analyzed the object oriented technique and uses data mining approaches for detecting the changes. The comparative study of all techniques is also described for determining optimal methodology in future research.

**Index Terms-** distance routing, pixel based, satellites, object oriented, data mining.

## I. INTRODUCTION

The changes are inevitable as surface component alter with varying rate in distance routing application. Land cover and land use vary information is critical because of its practical uses in critically vast applications, including deforestation, assessment of damage, monitoring of disaster, land expansion and land management. Change detection is the process of identifying differences in the state of an object or phenomena by observing it at different times[1]. Change detection framework utilizes multi time varying datasets to analyze time dependent event and determine changes which are required in current system[2]. The distance routing data becomes major source for change detection studies because of its accuracy in determining stabilized point in given time series. Digital format which suits for computation, synoptic view and vast selection of space dependent and spectral resolution is great application supported by distance routing application. The general

objectives of change detection in distance routing includes determine location over wide area along with distinct changes and then determining amount of changes in particular location. Also accuracy of result is analyzed produced through change detection using distance routing.

The change detection methods researched within distance routing is ongoing agenda. The principal behind utilizing distance routing data in change detection is to detect other factors which are causing changes so that those factors could be separable from distance routing with change detection. Rest of the paper is organized as follows: Section II describes general considerations used in change detection. Section III describes pixel oriented methods for change detection, section IV describes object oriented methods for change detection, section V describes data mining approach whereas section VI provides comparison of relative merit and demerit of various approaches and last section provides conclusion and future scope.

## II. GENERAL CONSIDERATION IN CHANGE DETECTION

Change detection has legion of assumptions and general facts associated with it. Most general factors involves

- Feature Extraction: it is expressed in terms of ratio or difference.
- List of functions for Decision making: it is used to form decision regarding change in current environment or not.

These are general assumptions but may not be always followed. The change detection is divided into following categories.

- Pre-processing
- Selection

- Checking Accuracy or assessing Accuracy of prediction

Pre-processing is the process by which radiometric, atmospheric and image registration process is tackled. Data from same sensor is required to handle such parameters. There are legion of factors which distort the collected data. These factors include sunlight, noise from the medium of transmission, phonological difference, angle deviation etc. corrections are required to tackle such issues. Corrective measures are applied by the use of error correction metrics such as root mean square error, absolute error and relative error. The amount of discrepancy is predicted through the corrective measure metrics[3].

Legion of techniques after corrective metrics application are utilized for change detection in distance routing areas. These methods include pixel, object and Data mining based approaches for change detection. These methods are discussed in proceeding sections.

### III. PIXEL DRIVEN APPROACH FOR CHANGE DETECTION

Pixel is picture element and is basic unit of image analysis. Pixel is a atomic analytical technique in which spatial characteristics are not considered. Most commonly statistical methods are used to evaluate individual pixel. Different pixel based approach for change detection are described in this section. The relative merits and demerits are described in tabular structure as follows

The classification based approach is most cited and most commonly used for change detection. GIS based approach is used to support decisions regarding change detection based on distance routing. Most of the techniques fetch binary information indicating change vs no change approach. Next section describes object oriented approach for change detection.

### IV.OBJECT ORIENTED APPROCH FOR CHANGE DETECTION

TECHNIQUE	CATEGORY	APPROACH	MERITS	DEMERITS
PIXEL BASED APPROACH	COMPARISON OF PIXELS [8]	Image Differencing[ 9]	simple in nature and Interpretation is easy	For change detection the complete metrics is absent It is difficult to fetch Optimal threshold The Information may have different meanings as it is fetched malicious

Object oriented approach provides higher levels of security while fetching of information. Multi spectral images and higher computational capabilities challenge pixel driven approaches. Distance routing using this approach is capable of determining damage occurring through earthquakes. It is determined that pixel is not a geographical object. Hence pixel based approach is not recommended for GIS systems[4]. This section provides summary of object oriented techniques used to detect changes.

Object based approach is commonly utilized in geographical object based image analysis. Object based approach helps fetch more richer information in terms of texture, shape and spatial resolution[5].

### V.DATA MINING APPROACH FOR CHANGE DETECTION

Repository of datasets relating to distance routing is available which can be used to detect changes. Images available through the datasets are at very high resolution. This causes criticality of data mining approach to promote data based approach for change detection in distance routing. Data rich and information poor is promoted through this approach[6]. Data mining approach is used in this section and described in comparative manner as follows

Distance routing can be greatly improved by the use of data mining approach. Clustering of information can be generated using K-Means, C means, and fuzzy approaches [7] of neural network. Hybrid approaches are generally preferred in the area of change detection in distance routing images. Since optimal features can be extracted using the hybrid approach[3].

### VI.COMPARISON OF VARIOUS TECHNIQUES OF CHANGE DETECTION

This section provides the collaborative material specified in distinct sections of this paper. Table 1, Table 2 and Table 3 are combined together to use in future endeavours. Comparison is listed as follows

		Image rationing[10] Regression Analysis technique [11]	Information calibration is handled better  The error arises due to lightning or illumination are <i>reduced</i>	It is binary in nature which means data which is fetched either give change detection or no change detection. All other information is discarded. It is binary in nature The Subtle changes are poorly detected Less accurate Noise prone It is binary in nature
	Transformation based approach	Index Differencing[12]	The error arises due to lightning or topological effect are reduced	Prone to coherence noise Binary in nature
		Vector Change Analysis[13]	Any number of spectral bands are processed With detailed information, Change detection is determined Spectral manifestation if not known then this method is useful	It is difficult to detect Land cover trajectories  The requirement for prediction of the Information from same period.
		Principal Component Analysis technique[14]	Handles redundancy efficiently Information from derived components is used	Difficult to label information fetched for change detection Change types are difficult to differentiate
		Tesselled cap transformation [15]	Platform independence Stable spectral components is produced	Metrics is absent or below power Difficult to label information
		Analysis of texture (Texture analysis)[16]	Statistical information is present hence information is better classified Higher textured value is analysed Spatial transformation is analysed easily	Window size is critical for this process. Success rate is low
	Classification based Approach	Technique of post classification[17]	Environmental effects are analysed effectively Metric to detect complete change is present	Accurate and complete dataset is required for prediction Accuracy of individual image determine accuracy of entire process
		Direct Comparison[18]	One classification is used for multiple situations Environmental changes does not affect accuracy of this system	It is difficult to label information Change metrics are absent or below power
	Geographical information system	GIS integration support[11]	Image interpretation and analysis has additional support of GIS	Quality of data fetched is low Accuracy is low since data source are different along with distinct formats
OBJECT ORIENTED APPROACH	Direct Approach based on comparison[19]	Object fetched from image and compare against the similar object based from other image	Simple in nature Implementation is fairly easy Similar properties reduces complexity in calculation	Segmentation Dependent From-to changes is not handled Multi temporal images is not handled effectively
	Classification based approach[20]	Segments created separately are compared	Objects available in images can participate in such approach Topological measure can easily be detected Classification based changes can be detected using this approach	Difference in size can cause the problem Locational changes leads to error in change detection Accuracy of segmentation is critical in this approach Accuracy of classification determine accuracy of change detection

Data Mining	Data Mining of Distance routing images [21]	Distance routing through data mining	Allow to search through large number of images represented as datasets Spatial and temporal based images are easily tackled Knowledge and relationship is extracted easily Clustering of information provides graphical means of analysis	Integration of data mining approach with image analysis is difficult. Learning graphs generated through this approach is difficult to understand.
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TABLE 4: collaborative comparison table of Pixel, Object and data mining approaches for change detection

By looking at the listed table future endeavours can be decided to provide better approach for change detection in future.

VII. CONCLUSION AND FUTURE SCOPE

In this paper the already researched and utilised remotely sensed legion of techniques for change detection are described. The main focused images are Bi temporal and multi temporal image through which changes detection techniques are implied. This paper provides details analysis of all the techniques along with merits and demerits of each. The distance routing is the way by which mostly environment change detection are focused. The use of high end images datasets in these techniques data mining approach are analysed that show their potential towards distance routing applications also.

In future collaboration of various techniques such as data mining along with object oriented approach can serve effective mechanism to detect changes in remotely sensed images.

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