A REAL TIME CHANGE DETECTION USING INTEGRATED IMAGE DIFFERENCING AND MINING ALGORITHM

RIZAVANA SHAH, RESEARCH SCHOLAR
Master of Engineering, CE Department,
L.J. Institute of Engg. & Tech,
Ahmedabad, Gujarat,India.

Abstract: The importance of change detection in various area like video surveillance ,land monitoring, satellite videos, remote sensing images, pills monitoring, crop monitoring. This thesis discusses major pixel based techniques and mining based techniques to Detect change and derive knowledge from large collections of images. I have tried Image Differencing technique. Experimental results show that the method used is sufficient to identify the motion from the video. But using Image mining nearest neighbor classification we can add accuracy to our method. my algorithm finding features of frame like spectral and spatial from specific frames and retrieving the similar Image using Euclidean distance measure of KNN .I am here using minimum distance to reset my old method's threshold value. so that I can capture each and every minor changes from video or images.

***keywords*: Change detection, Image Differencing, Image Mining, Integration of Image Differencing and Image Mining.**

I. INTRODUCTION

In the recent trend, change detection is widely used in various areas. to detect change from moving digital video or digital images is necessary for many application."Change Detection is the process of identifying differences in the state of object or phenomenon by observing it at different times", defined by Singh[1]. Moving objects detection is defined as extracting the motion region form a video sequence, and it is very important for the video post-processing. Many different methods have been proposed over the recent years

A. Digital Image

Digital image forms as matrix with m x n size, which m represent height and n represent width of the image.

B. Digital Video

Digital video can be considered as a video file that was arranged by numbers of digital images (image data stored as pixel).

Feature selection and extraction is the pre-processing step of Image Mining. Obviously this is a critical step in the entire scenario of Image Mining.

There are various pixel-based and object-based methods are available for change detection. Pixel-Based Methods includes Background Subtraction, Frame Differencing, Temporal Differencing, Image Differencing and many others. Image Mining is the tool for change detection as a Object-Based Method. **Background subtraction** is most basic and popular method for motion segmentation. In this method moving region is detected by differencing the current and reference background frame in pixel by pixel manner[3].**Temporal Frame Differencing:** The approach of temporal differencing makes use of pixel-wise difference between two or three consecutive frames in an image sequence to extract moving regions[8].**Image Differencing:** In this technique, images of the same area, obtained from times t1 and t2, are subtracted pixel wise. Mathematically, the difference image is Id (x, y) = I1(x, y) − I2(x, y), where I1 and I2 are the images obtained from t1 and t2, (x, y) are the coordinates of the pixels. The resulting image, Id , represents the intensity difference of I1 from I2[1]. **NCC (Normalized Cross Correlation)** Correlation is mainly used for measuring similarity between two images. It is useful in feature recognition and registration[4].We studied several papers related to pixel-based techniques and object-based techniques and provide comparative analysis. Disadvantages of this methods are the existence of threshold parameter which has to be defined by the user to perform motion detection. to resolve this problem I have proposed object based technique -image mining. Image mining is the thrust area in data mining which can be used to extract latent sequential data from the generic image series. The other area in the Image mining system is the Content-Based Image Retrieval (CBIR). Many Content Based Image Retrieval.CBIR system prototypes have been prospect but few are used as commercial systems. CBIR aims at measuring colours for specific images that are similar to a given query colours. It also focuses at developing new techniques that support effective searching and extracting of image libraries based on automatically derived imagery colours and pixel[12]. Experiments with colour similarity mining technique of extracting colour from specific images and retrieving the similar image using Euclidean distance measure, images are grouped in two classes one is similar and another is different on the basis of nearest neighbour algorithm but here in my proposed algorithm I need only Euclidean distance of frames. this minimum distance I use to decide my new threshold.

The paper is organized as follows:
Section 2 is proposed work flow Section 3 is dedicated for detail study of algorithms which have used in my proposed work . Section 4 gives a result analysis which is followed by Conclusion and future scope in section 5.

II. PROPOSED WORK:

By studying various methods of change detection we found that traditional algorithms of Pixel- Based methods like Background Subtraction, Temporal Differencing, Image Differencing ,normalized cross correlation ,running average and Object-Based Image Mining method is not enough.

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In these traditional methods there are some limitations and complexity found like No complete matrices of change information, Optimal threshold selection etc. So there is a need of Integration between Pixel- Based and Image mining Techniques. As in Image Differencing Technique we take images consideration at two different time to detect the change and using image mining we can detect minor changes in image using content based image retrieval(CBIR).before that I apply fold cross validation into the query image and test images. in CBIR I extract frame's spectral and spatial feature and apply KNN to classify frames by finding Euclidian distance of frames So we proposed to research about integration of Image Differencing and Image Mining Methods for the change detection. through which I get maximum accurate result.

Feature selection and extraction is the **pre-processing** step of Image Mining. Obviously this is a critical step in the entire scenario of Image Mining. Our approach to mine from Images – to extract patterns and derive knowledge from large collections of images, deals mainly with identification and extraction of unique features for a particular domain. Though there are various features available, the aim is to identify the best features and thereby extract relevant and different frame from the images database. here I am using spectral and spatial feature of frame's and based on that finding Euclidian distance.

Step1 : As per my proposed work as input I am using video then convert it into number of video frames. after then preprocessing applied on frames for make further operation easier.

Step 2: Then I apply image differencing on each and every frames of input folder to detect change .output of ID method stored in output folder .

Step 3: In ID I have used Random threshold using this threshold I can't detect minor changes .so for finding optimal threshold using kNN based on Euclidian function between frames where one frame I am using as query frame and another frames as test frames.

step 4: Now USING content based image retrieval (CBIR) I will retrieve images based on spectral and spatial features of image .then considering spectral feature I will find Euclidian distance(based on KNN classification) of query image to other test frames.

Step 5: here I fold query frame and test frames and then apply Euclidian distance based on folds among query frame to test frames.

Step 6: which distance value is minimum that value I considers as my new threshold value. so that my output of change detection 98% accurate .because each and every minor changes are detected.

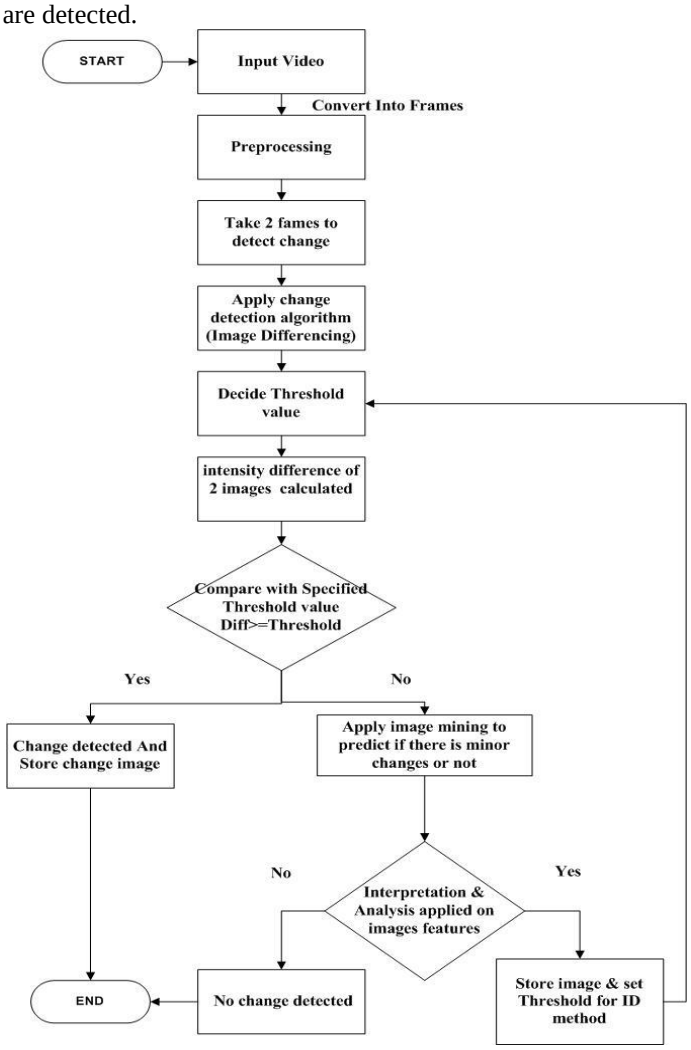

Fig 1: Proposed System Flowchart

III. Algorithms

There are various pixel-based and object-based methods are available for change detection. Pixel-Based Methods includes Background Subtraction, Frame Differencing, Temporal Differencing, Image Differencing and many others. Image Mining.

3.1 Image Differencing

In this technique, images of the same area, obtained from times t1 and t2, are subtracted pixel wise. Mathematically, the difference image is Id (x, y) = I1(x, y) − I2(x, y), where I1 and I2 are the images obtained from t1 and t2, (x, y) are the coordinates of the pixels. The resulting image, Id , represents the intensity difference of I1 from I2. Rosin and Ioannidis investigated the performance of several automated thresholding algorithms using a large set of difference images calculated from an automatically created ground truth database. They give results based on several measures for a complete evaluation. In this study, we benefit from three different threshold selection methods. These are percentile

thresholding, Otsu's method and Kapur's algorithm[6]. here in my proposed work I have implemented image differencing to detect change in video frames. after apply threshold I also applied other operation like finding edge dilation etc to highlight change detected area. so visually we can analyze changes.

3.2 Image Mining:

Feature selection and extraction is the **pre-processing** step of Image Mining. Image Mining is an extended branch of data mining that is concerned with the process of knowledge discovery concerning images. -Image Mining deals with the extraction of image patterns from a large collection of images. In Image Mining, the goal is the discovery of image patterns that are significant in a given collection of images[11].
output of image differencing method is used as input in mining algorithm. I have used cross validation folding method for creating fold of frame. based on spectral spatial features of the frames than classifying frames and find similarity between images. similarity measure based on Euclidian distance of query image and database image. there is 2 probability one is similar Frames then we get 0 ED .second we get digit then different frame. As in Image Differencing Technique we take images consideration at two different time to detect the change and using image mining we can analyze image data to predict there is minor change or not which is not captured by image differencing. So It is good to integrate Image Differencing and Image Mining Methods for the change detection.

Euclidean Distance

The Euclidean distance between points x and y is the length of the line segment connecting them (x,y). if the two pixels that we are considering have coordinates (x1,y1) and (x2,y2) then the Euclidean distance given by

$$DEuclid = (x2-x1)2 + (y2-y1)2$$

If the palette is fixed, as is often the case in real-time color prediction systems such as those used in operating systems, color quantization is usually done using the "straight-line distance" or "nearest color" algorithm, which simply takes each color in the original image and finds the closest palette entry, where distance is determined by the distance between the two corresponding points in three-dimensional space. In other words, if the colors are (r1, g1, b1) and (r2, g2, b2),

We want to minimize the Euclidean distance:

$$\sqrt{\{(r1- r2) 2 + (g1- g2)2 + (b1- b2)2\}}$$

here I have used ED to measure similarity of 2 frames. where I have used spectral information of image and find distance between query frame and database frames .as output I got different values. among this values I used minimum value as my new threshold so that I can detect minor changes. through which I resolve problem for deciding optimal threshold. as per my proposed method I got distance among all frames so minimum distance value I used as threshold of ID then I got minor changes and if I use maximum distance value then I got only major changes. so this is most accurate solution.

IV. Simulation Results

In this section, we simulate two methods using matlab and java. one image differencing using matlab distance based KNN implemented using java. here videos I am captured by my cell's camera.

INPUT VIDEO	TOTAL NO OF FRAMES	RANDOM THRESHOLD		BASED ON MINIMUM DISTANCE THRESHOLD		BASED ON MAXIMUM DISTANCE THRESHOLD	
		VALUE	NO OF CHANGE FRAME DETECTED	VALUE	NO OF CHANGE FRAME DETECTED	VALUE	NO OF CHANGE FRAME DETECTED
VID_20151230_121648	255	40	13	11	199	28	52
VID_20151230_132926	179	40	19	3	178	32	37
VID_20160509_181312	161	40	4	2	159	19	131
VID_20151230_121823	300	20	48	4	298	26	6
VID_20160509_181424	33	40	0	3	31	14	31
VID_20160509_181543	83	30	1	1.300	81	14.200	37
VID_20160509_181712	64	30	8	2	62	17.700	50
VID_20160509_181726	79	30	1	1	77	15.100	62
VID_20160509_181740	90	35	1	0.300	88	30	5
Wildlife	901	50	144	1	899	70	7

Table 1: Different video tested based on my proposed method

output of change detection is based on video quality. if size and motion is small then my method detect no change even when there is motion is present. so based on ED output I got distance of test database frame with query frame's. then I have arrange this values in ascending order. so very first value considered as minimum threshold and last value considered as maximum threshold. so if we use threshold value out of this values then it will not detect change. But when I find out minimum threshold then I detect minor motion also .so problem is with some videos which have slight motion then differencing method detect 0 or 1 different frames .that is resolved by adding mining algorithm I got 98% result .if I set threshold minimum then I got change in every frame which is most accurate result. So it is good to integrate both method to achieve my goal. Based on video output analysis there is some changes which I have detected it shown in figure. 4,7,10,13.

Some videos output:

1) VID_20151230_132926(human is in motion):


Fig 2: Input frame 87 Fig 3: Input frame 88

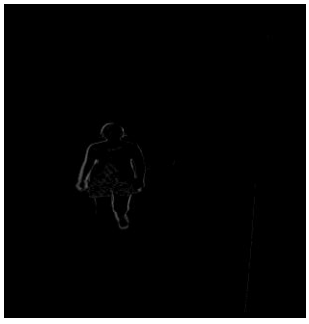

Fig 4: change detected

2) VID_20151230_121648(object is in motion)


Fig 5: Input frame 99 Fig 6: Input frame 100

fig 7: change detected

3)Wildlife(horse and water in motion):


Fig 8: Input frame 49 Fig 9: Input frame 50

Fig 10: change detected

4) Wildlife:


Fig 11: Input frame 426 Fig 12: Input frame 427

fig 13: change detected

V. CONCLUSION

This paper compares several pixel-based and object-based change detection techniques that can be applied to the large image data provided by the video surveillance ,land monitoring, satellite videos, remote sensing images, pills monitoring, crop monitoring. This data can be analyzed in different applications.
By studying various methods of change detection we found that traditional algorithms of Pixel-Based methods like Background Subtraction, Temporal Differencing, Image Differencing method is not enough. In these traditional methods there are some limitations and complexity found like Difficult learning curve, No complete matrices of change information, Optimal threshold selection etc. So there is a need of Integration between Pixel-Based and Object-Based Techniques. In further studies we found that such type of integration can be done between Image Differencing and Image Mining. As in Image Differencing Technique we take images consideration at two different time to detect the change and using image mining we can detect minor changes in video using k nearest neighbor classification based on Euclidian function . So I have implemented integration of Image Differencing and Image Mining Methods for the change detection. and I got most accurate result approx 98%.

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