

Key Information Retrieval System by using Diagonal Block Based Method

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Abstract-Video information retrieval is one of the research areas for big image data. Key frame extraction point out main information in large video sequences. This paper proposes block based method using diagonal movement comparison techniques for video information retrieval system. Block based method divide each frames as eight rows and eight columns block and compare their features by moving diagonally on these blocks. This paper uses color moment features, color histogram feature and edge feature to find information shots. Key information is selected by analysis of these shots. Key information is on behalf of that video information. This system can support to user with compact, accurate and correct information. The performance comparison of block based method and diagonal block base method are presented in this paper.

Key Words- Block base, Histogram, Edges count, Color moment, Min-max approach

1. Introduction

In the world, information is used every field, every person, everywhere and every time. Information system support many areas of human life such as education, business, health, political and defense. All information represents difference ways such as song, image, text, videos, and so on. All information flow one place to another and one person to other person every time. So, information extraction system is very important and that is serious for image processing. Information extraction system needs to have excellent performance for every user. Our research can support to get excellent information from video sequence.

Key frame extraction is the fundamental step in video summarization system. Video includes big combination of image frames with sequence. It is difficult to extract accurate information from video frame sequence. This paper purposed to find key information extraction from video sequence that is using diagonal movement block technique. We test video files from surveillance video cameras. These are used for security system, patient care system, old person care system and so on.

Our system can extract important key information from video sequences. User can use some information key frames by instead of long video.

In this system, Diagonal block base method finds different values between two frames. Every frame is divided into nun overlap blocks and we compare adjacent blocks with diagonal movement method between candidate frame and other continuous frames. These blocks have eleven features to compare base on these feature. Feature extraction from video image is very important role in information extraction approach. Our system extracted and considered combination of these features to extract key information.

To detect object images from the frame could be use color and texture features to identify regions. E. R. Vimina group found out those values were computing from the histograms of HSV color space and Gray Level [1]. Marco Loog et. al discussed about standard linear discriminant analysis (LDA) method by extending as a new technique. Their research based on pixel value and considered on medical record images dataset [2]. M. Tin et al. discussed diagonal blocks detection method to classify weak shots and strong shorts. They used three candidate key frames to extract key information in weak transition shots [3].

Key frame Extraction on the histogram difference technique and edge matching rate technique give good result but these approaches avoid shot segmentation. Kintu group tested new method to get frames different values. They emphasized histogram difference on color values and edges matching rates values base on block. They divided every frame as nine block and considered feature on these blocks. Their feature extraction is based on all blocks [4]. Zhuang et.al discussed key frame extraction base on unsupervised cluster technique. They used color features, motion base feature and shots based criteria [5]. Their algorithm determines the complexity of the sequence in terms of changes in the visual content expressed by different frame descriptors [6]. Researchers discussed min-max approach to extract key information frame shots [7]. K.Pascal et.al used virtual attention features such as lighting, camera motion and text appearance for their research [8]. Researchers compared visual attention features base method and IBM Multimedia

Analysis and Retrieval System method to find key frames. They used moving objects and moving camera data [9]. This research group analyzed base on two methods to reduce features dimension. They analyzed principal component analysis (PCA) and linear discriminant analysis (LDA) [10].

This paper is organized as follows. Proposed methodology is presented in section 2. This section brief descript of diagonal movement block base method and feature extraction methods. Section 3 presented about analysis steps and experiment results of our research. The paper is concluded in section 4.

2. Proposed Methodology

Key frame is useful to summarize between big video sequences. Our block-based method has many capable of dealing with noise, illumination variations and dynamic backgrounds, while still obtaining smooth contours of foreground objects using different foreground detection methods. This system can remove the redundant frames and select significant key information frames from long video sequence.

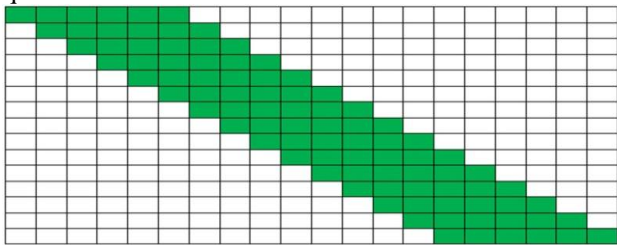


Figure 1 . Diagonal movement block base

In this system, input video file will convert to continuous frame sequences. First frame of sequences can be considered as candidate key frame.

Every frame is divided into combination of 8*8 blocks. First block from candidate key frame is compared with adjacent blocks of other continuous frames. The diagonal movement technique is used for matching process between each block as figure 1. This technique extracts two types of frames sequences. These are weak transition frame sequences and strong transition frame sequences as weak transition shots and strong transition shots.

Our system chooses threshold value from frame difference values and use to define shots. Detect block count depends on the frame dimension. When the different value of frame dimension x and y is large, the detection amount on blocks is more. Frame difference value between candidate frame and other continuous frame can be classified as equation 1.

$$\sum_{i=1}^{z+1} \sum_{j=1}^y (cb - ob) \quad (1)$$

$z=x-y$

cb =feature value on candidate frame

ob = feature value on other frame

Diagonal block base technique can easily detect object movement and frames differences.

Table 1. Comparison of Total Blocks and Diagonal Blocks

Dataset	Total Frames	Dimension on frame	Total Block on one frame	Calculate block on one frame	Total block to calculate
ATM	426	704*576	6336	1224	426*1224
HALLWAY	390	704*576	6336	1224	390*1224
NO 8	446	320*240	1200	330	446*330
STAIR	390	704*576	6336	1224	390*1224
SURV I	2115	2600*1520	61750	25840	2115*25840
SURV II	1028	1920*1080	31920	14310	1028*14310

Table 1 show to compare of total blocks on frame sequences and diagonal blocks on frame sequences. In ATM dataset, it has 6336 total blocks on a frame. Our system compares only 1224 diagonal blocks for finding frame differences. We can neglect others blocks and comparison time will be reduced. Figure 2 shows processing step for key information extraction.

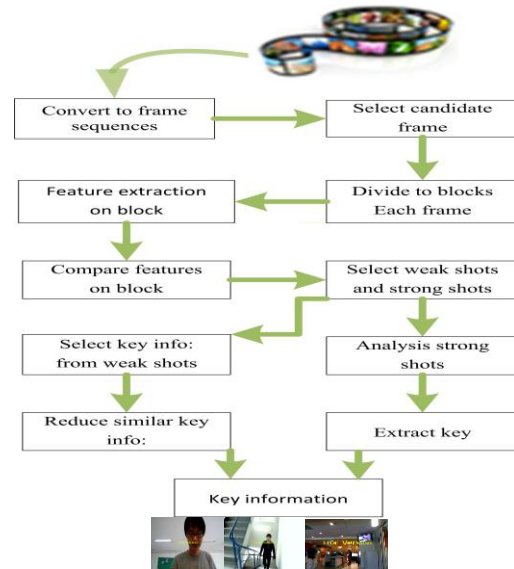


Figure 2 . Key information extraction steps

Block base method can classify different shots using the frames difference values. Every frames sequence is classified as strong transition shots and weak transition shots. Three candidate keys are extracted from weak transition frame shots. They are first candidate key, middle candidate key and last candidate key. These three candidate frames are compared to find key information from weak shots.

If the difference value is greater than threshold value, that continuous frames are classified as strong transition shot. To extract key information frame from strong transition shots, it need to calculate.

2.1 Feature extraction

Feature extraction process retrieves the most important data as information from the raw data. This system consider

color feature as color moment mean, color moment standard deviation and color moment skewness values. These three color moments are considered on color components RGB values of each image. Color moment features are very compact represent than the other color features. Nine features of color moments are used in this system.

Color moment Mean:

$$\mu_i = \frac{1}{N} \sum_{i=1}^n P_{ij} \quad (2)$$

Color moment standard deviation;

$$\sigma_i = \frac{1}{N} \sum_{i=0}^n ((P_{ij} - \mu_i)^2)^{1/2} \quad (3)$$

Color moment skewness:

$$s_i = \frac{1}{N} \sum_{i=0}^n ((P_{ij} - \mu_i)^3)^{1/3} \quad (4)$$

P_{ij} = value image address $i \times j$
 N = size of block

We consider edges detection feature on blocks. Edge detection is used to remove irrelevant information. It gets important structural properties of image and can detect transition frames. This paper use sobel edge detection. The result of the sobel–feldman operator is a 2-dimensional map of the gradient at each point. The edge count of a graph, sometimes also called the edge numbers. It is the cardinality of the edge set. That edge set is known as edge count.

System calculate histogram difference base on blocks. A histogram is a graphical representation of the number of pixels in an image. Blocks in an image is transformed to gray level images and calculate these block histogram value. These value are compared with histogram value from adjacent block other continuous frames. Histograms comparison technique has two classes of comparison functions: bin-to-bin comparison and cross-bin comparison. This paper uses bin-to-bin comparison technique. Given two blocks, one is from candidate key frame and other is adjacent blocks from continuous frames, we compute on their histograms. We calculate cumulative distribution functions of these two blocks histogram.

2.2 Dataset

Our system test with 4 international research datasets and 2 own datasets. We test all datasets in same environment and CPU.

2.3 Key Information Selection

This paper calculates the different intensity value on candidate key frame and other continuous frames. Every intensity values are considered on their features. Color moment features based on RGB values and considered on nine features. Histogram feature and edge detection rate

features are considered to find different intensity values. Block base diagonal movement technique compares feature intensity value on block by block. If we get different value, can define object transition frame. Research group found out unsupervised segmentation of moving and static objects occurring in a video. They used new circular dynamic-time warping (CDTW) algorithm to match region contours [11].

3. Analysis and experimental result

In this experiment, threshold value can consider with two difference ways. These two types of threshold values can detect transition frames. Our approach uses mean value on differences that is more accurately and deeply detect frame transition.

3.1 Results on features

First, frame difference values are analyzed on their color moment features, edges detection rate feature, and histogram feature separately. Histogram feature is more accurate and exactly detect transformation. It detection rate depends on dataset. Some case, color moment features have a few errors, when image frame has light changes. We find frames different value based on all combination of these eleven features. Our system can easily extract transition frame. Finally, system classified two types of frames or shots, strong transition frame or strong transition shot and weak transition frame or weak transition shots.

3.2 Shots defining

System classifies strong transition shots and weak transition shots base on frame difference value. Shot length is very important for information extraction steps. Some shots have short shot length and not sufficient to get information.

In a strong transition shots, key frames are selected on their frame difference values. In this process min-max algorithm is used to extract key frame. A min-max algorithm is a recursive algorithm for choosing the next search. We can get key frames as accurate and compact key information for that video sequence. We get at least three key frames per strong transition shot. System analyzed frames transition rate base on their features. By combining of all these features, system easily detects accurate and compact information shots. Strong transition shots information are showed in Table 2. Some shots are neglected as noise shots because their shots length short than predefined shots length. These noise shots have less than 15 continuous frames. It behalf 0.5 second long video. We select key frames as compact and accurate key information frames from related video sequence.

3.3 Result

This table shows that diagonal block base method is more quickly detect transition frames than total block base method.

Table 2. Comparison result of datasets

Dataset	Processing time (sec)		Transition frames		Key information shots	
	Diagonal Blocks	All Blocks	Diagonal Blocks	All Blocks	Diagonal Blocks	All Blocks
ATM	251.2585	1114.7050	224	148	5	5
HALLWAY	234.9837	1114.6028	166	183	2	3
NO 8	75.3371	228.8089	125	108	2	1
STAIR	217.9177	902.6800	132	138	1	2
SURV I	51905.0744	175730.178	1074	1156	30	24
SURV II	6602.1775	14230.47	455	519	8	3

Table 2 presents comparison result of processing time, extracted amount of transition frames and total strong transition shots to extract key information. Our method can classify strong transition shots like all blocks calculate method but reduce processing times.

Table 3. Shots information on two methods

Dataset	Strong shots	
	Diagonal blocks	All Blocks
ATM	18-38, 333-362, 385-402	17-48, 53-66, 81-108, 332-363, 384-401
HALLWAY	192-274, 298-385	159-191, 231-335, 249-390
NOS	42-65, 250-345	244-350
STAIR	270-390	266-288, 289-390
SURV I	13-34, 56-90, 147-170, 187-220, 233-260, 268-300, 324-356, 401-436, 447-482, 484-516, 518-556, 566-596, 653-687, 696-726, 734-766, 2081-2103	12-35, 51-85, 133-160, 190-212, 240-306, 326-334, 400-489, 470-511, 518-560, 573-596, 655-690, 696-729, 740-761, 2078-2107
SURV II	479-954	466-768, 773-783, 785-978

Strong shot lengths are presented in table 3. Diagonal block base method is better than block base method for transition frames detection.



Figure 3. Key information frames

Figure 3 shows some key information frame from strong transition sequences.

4. Conclusion

Key frame extraction is essential analysis on large amount of video sequences. The main objective is to remove the redundant frames and extract key frames information from long video sequence. Our system calculates the different feature intensity values in each block on candidate key frame and other continuous frames. The diagonal movement technique is used for pair wise comparison process between each block. This technique is easily and quickly detects object's transition in frame sequences. Our further research is to find objects movement on difference background by using their features.

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