AUTOMATIC SPORTS HIGHLIGHT EXTRACTION BASED ON LOGO FRAMES AND REPLY ALGORITHM

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Abstract—Digital Image Processing has discovered to be valuable in numerous areas. In games, it can either be utilized as an investigative device to focus vital occurrences in an amusement or can be utilized as a part of the telecast of feature to TV viewers. Current scope of games includes various cameras and a variety of innovations to bolster it, since physically experiencing each feature going to a station would be a close incomprehensible errand, an extensive variety of Digital Image Processing calculations are connected to do likewise. Highlight Generation and Event Discovery are the primary areas in games where a large number of DIP calculations exist. This study gives an understanding into the uses of Digital Image Processing in Sports, focusing on calculations identified with feature show while posting their favorable circumstances and disadvantages.

Keywords—Logo Detection, event detection, sports highlight extraction, replay derection, video summarization, video indexing, Feature extraction.

I. INTRODUCTION

Sports feature engage an expansive populace of individuals all around the world, and have turn into a critical type of multimedia content that is spilled over the web and broadcasting companies. Each and every day a huge number of individuals watch sports feature of different sorts, including football, cricket, tennis, baseball, hockey, and so on. Typically, dons features are somewhat long, comprising of parts which are intriguing or energizing and parts which are uninteresting, moderate, and likely "a waste of the viewer's important time." If conceivable, most viewers want to watch just the fascinating parts of the features, and would rather skirt the uninteresting scenes. In this way, programmed recognition of these highlights in games feature has turn into an essential issue of games feature analysis.

The rest of this paper is organized as follows: In section 2, literature survey on highlight detection are reviewed. The proposed replay based highlight extraction approach is introduced in Section 3. This section also includes logo frame detection and replay detection methods for highlight generation. Experimental results and evaluations are reported in Section 4. Finally, we conclude the paper with future work in Section 5.

II. LITERATURE SURVEY

Qiao Huang et al.[1] have assessed replay is one of the key prompts showing highlights in games features. A replay is normally sandwiched by two indistinguishable logos which provoke begin and end of a replay. A logo move typically contains 10-30 frames, depicts a flying alternately differing object(s). In this paper, a dependable logo and replay distinguishing methodology is proposed. It contains two primary stages: initial, a logo move layout is unsupervised educated, a key edge (Kcasing) and an arrangement of pixels that depicts logo object (logo pixels, L-pixels) precisely are likewise removed; second, and the

educated data are utilized together to distinguish logos and replays in the feature.

Hao Tang et al.[2] have describe that features are transiently disintegrated into a progression of occasions in light of an unsupervised occasion disclosure and identification system. The system singularly relies on upon simple to-concentrate low-level visual highlights for example, shading histogram (CH) or histogram of situated slopes (Pig), which can conceivably be summed up to distinctive sports.

Hossam M. Zawbaa et al.[3] assessed that numerous soccer fans want to watch an outline of football games as viewing an entire soccer match needs a lot of time. Typically, soccer features were considered physically, however this expenses significant time. In this manner, it is important to have a device for doing the feature butt-centricities and outline work naturally. Programmed soccer feature rundown is about extricating critical occasions from soccer coordinates keeping in mind the end goal to deliver general outlines for the most vital minutes in which soccer viewers may be intrigued. This paper presents a machine learning (ML) based occasion location and synopsis framework for emphasizing imperative occasions amid soccer matches. The proposed framework style fragments the entire feature stream into little feature shots, then it classis the came about shots into different shot-sort classes. A short time later, the framework applies two machine learning calculations, specifically; bolster vector machine (SVM) and artificial neural system (ANN), for accentuating important portions with logo appearance with expansion to identifying the subtitle district giving data about the score of the amusement. Hence, the framework recognizes vertical objective posts furthermore, objective net. At last, the most critical occasions amid the match are highlighted in the come about soccer feature rundown.

Mahesh Goyani et al.[4] proposed a calculation to distinguish semantic ideas from cricket feature. In our past work, we have proposed key casing recognition based methodology for semantic occasion identification and characterization. The proposed plan lives up to expectations in two sections. In first section a top-down occasion recognition and characterization is performed utilizing various leveled tree. In second part, larger amount idea is distinguished by applying A-Priori calculation. To some degree 1, key frames are recognized taking into account Hue Histogram contrast at level 1. At level 2, logo moves characterize the frames as ongoing or replay. At level 3, we characterize the constant edges as field perspective, pitch perspective or non-field perspective taking into account limits like Dominant Soli Pixel Apportion (DSPR) and Dominant Grass Pixel Ration (DGPR). At level 4, we distinguish close up and swarm edges based upon edge identification. At level 5a, we group the nearby up frames into player of group A, player of group B and umpire based upon skin shading and comparing pullover shading. At level 5b, we arrange the group outlines into onlookers, player's social affair of group and or player's gettogether of group B. To some extent two, marks are connected with every edge occasion, which is utilized as info to A-Priori calculation for idea mining.

Vilas Naik et al.[5] have describe that Content Based Video Retrieval (CBVR) is a dynamic examination control concentrated on computational systems to scan for important features taking into account multimodal substance examination in feature for example, visual, sound, content to scan and file feature. Be that as it may, discovering the wanted feature or occasion from a lot of feature database remains a testing and lengthy undertaking. Therefore, productive feature recovery/occasion recovery turns out to be all the more difficult. We introduce sound based approaches for occasion recovery from games feature. The methodology has been demonstrated powerful connected to cricket features.

Ganesh Rathod and DipaliNikam [6] gives the Multimedia accumulations are developing quickly in both the expert and buyer environment, and are described by a relentlessly expandinglimit and substance mixture, for example, films, documentaries, sports, news, home features, e-learning, and so forth. Accordingly, it is harder to discover pertinent feature from an expanding feature database. The creation and accessibility of extensive feature gathering required feature recovery pertinent to a client characterized inquiry. This has turn into a standout amongst the most famous points in both genuine life applications and sight and sound examination. There are inconceivable measure of feature files including show news, narrative features, meeting features, sports, films and so forth. The feature sharing on the web is additionally developing with a gigantic rate which makes maybe the most heterogeneous and the biggest freely accessible feature file. The text

based techniques accomplish recovery by utilizing the content data joined to the feature.

Substance based approaches the visual highlights, for example, shading, and composition, shape furthermore, movement.

Dian Tjondronegoro et al. [7] have assessed that outline is a crucial prerequisite to accomplish a more minimized and intriguing representation of games feature substance. To date, most-bland game feature outlines are produced by holding play portions which can be a specific ball-in-play in soccer, race in swimming, or execution in acrobatic. Then again, mostcompacted outlines should be created by space particular highlights, for example, objective in soccer and b-ball, or record softened up swimming also, tumbling. Since these two synopsis approaches have their qualities and shortcomings, this paper will propose a system which coordinates highlights into plays, and uncovering why we ought to still hold breaks. We have utilized a dataset containing a wide-run of games, including soccer, basketball, rugby, swimming, motor race, and tennis.

Pascal Kelm et al.[8] shows a way to deal with key frame extraction for organizing client created features on feature sharing sites (e.g. YouTube). Our methodology is planned to connection existing picture web indexes to feature information. Client produced features are, opposite to expert material, unstructured, don't take after any altered guideline, and their camera work is poor. Besides, the coding quality is awful because of low determination and high pressure. In a first step, we portion feature groupings into shots by recognizing continuous and unexpected cuts. Further, more shots are portioned into sub shots in view of area and camera movement highlights. Yu-Gang Jiang et al.[9] gives the objective of abnormal state occasion acknowledgment is to consequently identify complex abnormal state occasions in a given feature arrangement. This is a troublesome assignment particularly when features are caught under unconstrained conditions by nonprofessionals. Such features delineating complex occasions have constrained quality control, and in this manner, may incorporate serious camera movement, poor lighting, substantial foundation mess, and impediment. Nonetheless, because of the quickly developing ubiquity of such features, particularly on the Web, answers for this issue are in levels of popularity and have pulled in incredible enthusiasm from analysts. In this paper, we survey current advancements for complex occasion acknowledgment in unconstrained features

III.PROPOSED SYSTEM

As the Fig. 1 illustrates, the framework involves one and just stage. Here first the element will be detached into edges.

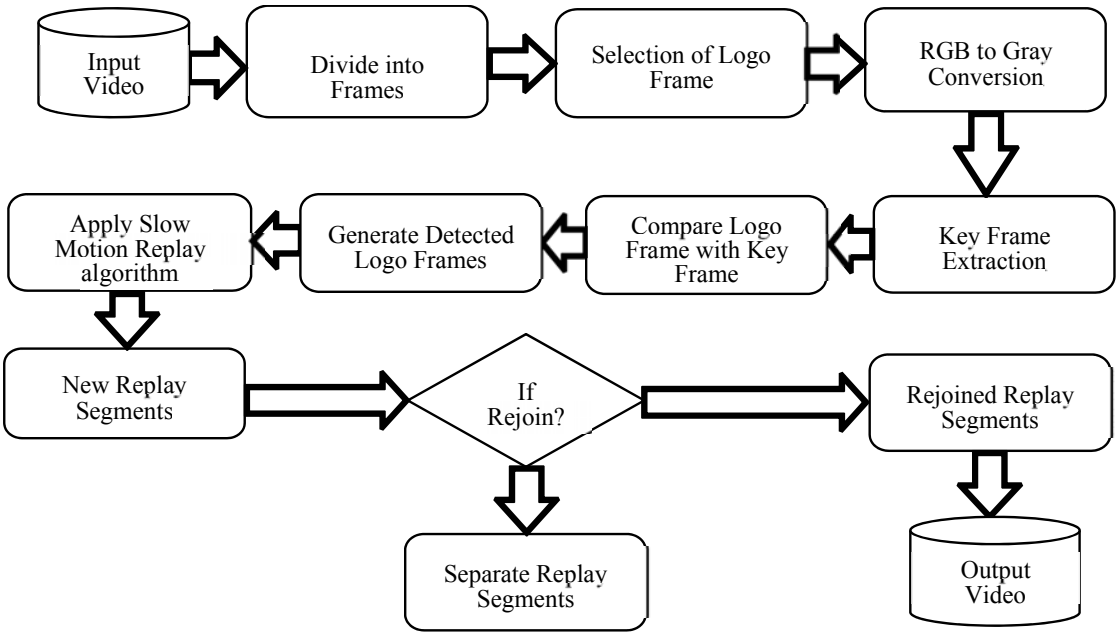

Fig. 1 Proposed Framework

Highlight we are considering is 25fps.

A.Methods

By then each and every edge from the component is analyzed for discovering the cutoff regard. Utmost regard v is the littlest unmistakable sensation on figuring the splendor of the edge. This quality v is the crucial measure to evaluate whether the edge is logo layout or any ordinary packaging be separated into edges.

1) Logo frame detection

In a logo-transition, there is an image frame that has sudden increase in brightness of the frame. The frame having transition not necessarily need to be logo frame or any frame having any different icon. Usually, the logo is highlighted and located at the middle part of a frame. Also the sudden increase in the brightness of the frame can be captured.

2) Replay detection

After logo detection, a video can be divided into segments with taking logos as boundaries. Ideally, a pair of logos determines a replay segment. But actually, there are false and missing detection. Actually, we can recognize replay segments according to logos as we are focusing over the brightness change of the frame and however we are not annotating the significant frame as only the logo frame. Therefore, replay recognition is crucial. This method is quite simple because only we have to detect the replay shot.

B. Proposed algorithm

Algorithm: Logo detection for replay segments

Input: Sport video

Output: No. of Frames

Step 1: Convert video into frames

Step 2: Select logo image for the matching process

Step 3: Convert RGB logo image to gray image and for the size for better comparison.

Step 4: Key frame extraction for reducing time of matching process.

Step 5: for each frame do

Step 6: Convert key frame into gray image with the same size as logo image.

Step 7: Check the frame difference with MSE (Mean Square

Error).

Step 8: Find accuracy and MSE for all the frames.

Step 9: ifany frame contains a small accuracy value (acc Val <0.9) thenStep 10: Get the colored frame.Step 11: if the logo is real thenStep 12: Mark this shot as replay shot.

Step 13: end if

Step 14: end if

Step 15: end for

For the better and accurate Logo detection we are proposed one algorithm which is mention above. As shown in algorithm, we are generate replay segment. For that we are first inserting sport video as an input. After that this video is converted into number of frames. Because video is a sequence of images, so it is easy to compare on it. After the conversion into frames, we have convert the frames into Gray image, which has less information i.e. 0 to 255. After this logo frame is converted into fix size. So comparison process is easy if the matching frames has same size. After this process we will apply MSE (Mean Square Error) for Logo frames and generated frames to detect replay segment. For the generated frame if it has small accuracy value (Here we are taking Threshold as 0.9) then we will get the color image and it is used for replay segments.

C. Performance parameters

In general, there are some parameters that are used to measure the performance of the Replay detection used. Some of the widely used parameters are explained here.

1) Mean-Square-Error (MSE): The comparison of the frames are done using this parameter. If difference is low then the frame is logo frame [12] .

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2 \quad \text{(i)}$$

Where I and K are two different matrix, and m,n are number of pixel values of I and K matrix respectively.

2) Peak Signal-to-Noise Ratio (PSNR): The quality of the Logo frame can be measured using PSNR. The perceptual transparency of the Logo frame with respect to key frame can be measured by PSNR value [12].

$$PSNR = 20\ \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \quad \text{(ii)}$$

$$PSNR = 20\log_{10}(MAX_I) - 10\log_{10}(MSE) \quad \text{(iii)}$$

$$PSNR = 10\ \log_{10}\left(\frac{MAX_I^2}{MSE}\right) \quad \text{(iv)}$$

Where MAXI is the maximum possible pixel value of the image. When the pixels are represented using 8 bits per sample, this is 255.

3) Absolute Difference (absdif): This function measuring the similarity between image blocks and it uses the sum of absolute differences to identify which part of a frame is most similar to a template image (Logo image) [7].

4) Mean and Standard Deviation: The average brightness of a region is calculated by using mean and the brightness within a region with n pixels is calculated by using standard deviation [11].

$$\overline{X} = \frac{\sum_{i=1}^{i=n} X_i}{n} \quad \text{(v)}$$

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{i=n}(X_i - \overline{X})^2} \quad \text{(vi)}$$

Where Xi is matrix of input image, n is total number of pixel value.

IV.EXPERIMENTS AND EVALUATION

We are taking some example of different type of logo used in different cricket matches which is shown in figure 2. So in our implementation we are taking these logos to detect

Fig 2. A logo images of different Cricket Matches.

These logos are displayed on screen when any interesting segments are happen in cricket video. As shown in below figures various graphs are given, by applying our proposed algorithm we get different output of different Cricket matches. We are taking around 50000 frames on which we are applying our algorithm and generate outputs.

We are using our proposed methods to detect logo transition in the video. For that we have taken fifty thousand frames of seven sports video. On this large dataset, we first applied logo detection algorithm. So we get some output which is shown in the first table

After that we will used key-frames extraction to reduce the execution time of generating highlights. So we get less number of frames on which we have to apply our logo detection algorithm, at the end we will get the final output of the highlight generation.

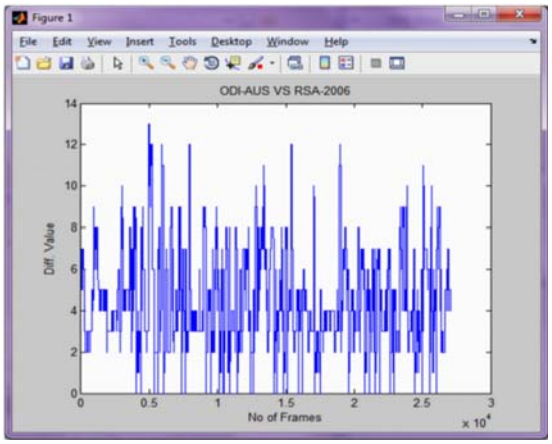

Fig. 3. Graph of Cricket match [Ausvs Rsa-2006]

Fig. 3 to Fig. 7 display different result generated after applying our proposed approaches, Graph represent the values which image has after calculating with the logo image. So this analysis is given for the different cricket matches.

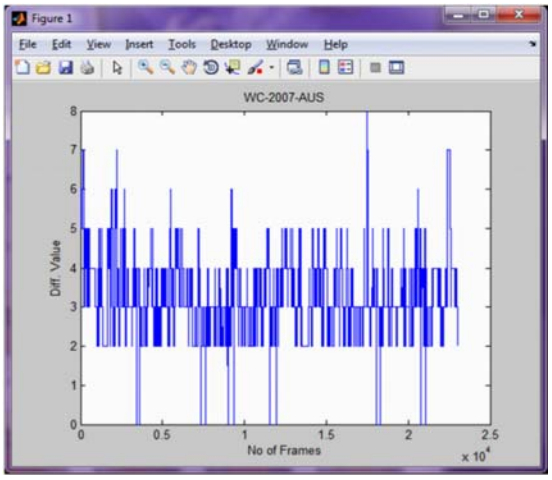

Fig. 4. Graph of Cricket match [WC-2007]

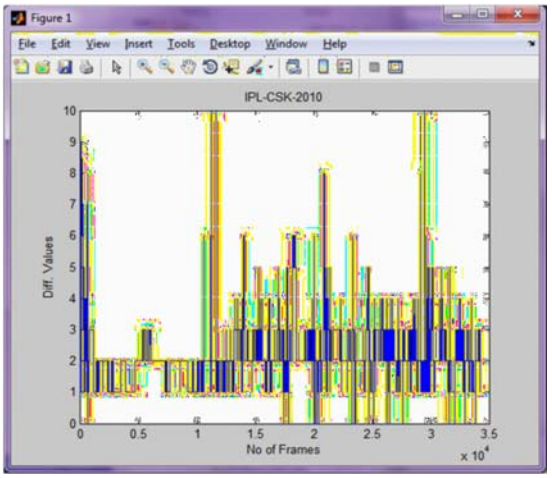

Fig. 5. Graph of Cricket match [IPL-Csk-2010

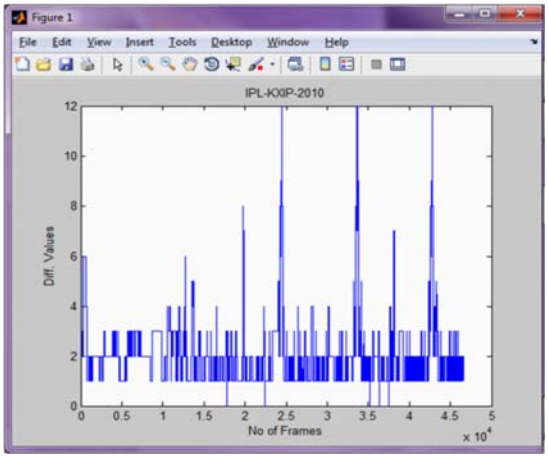

Fig. 6. Graph of Cricket match [IPL-Kxip-2010]

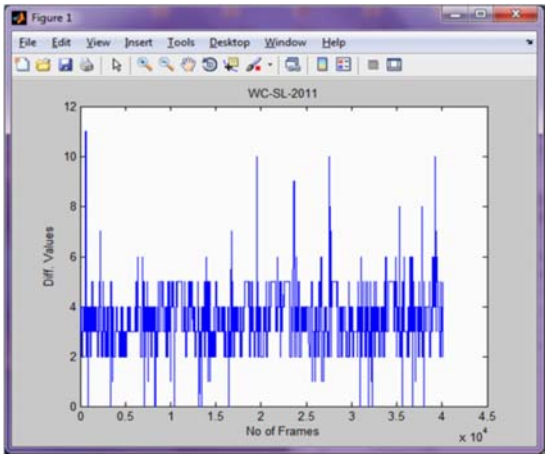

Fig. 7. Graph of Cricket match [WC-SL-2011]

- Precision:Precision is defined as the percentage of retrieved items that are desired items [10].

$$Precision = \frac{tp}{tp+fp} \quad \text{(vii)}$$

- Recall:Recall is defined as the percentage of desired items that are retrieved [10].

$$Recall = \frac{tp}{tp+fn} \quad \text{(viii)}$$

- ***Final:***It is combination of precision and recall [10].

$$Final = \frac{2*precision*recall}{Precision+recall} \quad \text{(ix)}$$

Where, tp=True Positive, fp=False Positive, fn=False Negative.

As shown in the table 1 and 2, we are implement our proposed method on various 7 Cricket matches, it also shows truth and detected logo frames which we get as output. The calculation is based on the parameters like precision and recall. After getting this values we can generate the final accuracy of the sports video

TABLE 1.RESULTS OF APPLYING BOTH ALGORITHMS [50,000FRAMES]

Name of Match	Truth	Detect	False	Miss	Precision	Recall	Final
IND inning ICC Cricket World Cup - 2011	638	616	14	22	**97.77%**	**96.55 %**	**97.15 %**
SL inning ICC Cricket World Cup - 2011	675	627	26	48	**96.01%**	**92.88 %**	**94.14 %**
AUS inning ICC Cricket World Cup - 2007	445	403	24	42	**94.37%**	**90.56 %**	**92.42 %**
AUS Vs RSA ODI - 2006	292	256	22	36	**92.08%**	**87.67 %**	**89.82 %**
CSK inning T20 IPL - 2010	274	250	16	24	**93.98%**	**91.24 %**	**92.58 %**
KXIP inning T20 IPL - 2010	462	434	18	28	**96.01%**	**93.93 %**	**94.95 %**
MI inning T20 IPL - 2010	266	241	14	25	**94.50%**	**90.60 %**	**92.50 %**

TABLE 2.RESULTS OF APPLYING BOTH ALGORITHMS [50,000FRAMES]

Name of Match	Key Frame Extracted	Truth	Logo Frame Extracted	False	Miss	Precision	Recall	Final
IND inning ICC Cricket World Cup - 2011	12053	165	149	9	16	**94.30 %**	**91.41 %**	**92.83 %**

SL inning ICC Cricket World Cup - 2011	13868	148	138	8	10	**94.52 %**	**93.24 %**	**93.87 %**
AUS inning ICC Cricket World Cup - 2007	11282	130	118	6	12	**95.16 %**	**90.76 %**	**92.90 %**
AUS Vs RSA ODI - 2006	10980	316	296	14	20	**95.48 %**	**93.67 %**	**94.56 %**
CSK inning T20 IPL - 2010	13944	186	168	12	18	**93.33 %**	**90.32 %**	**91.45 %**
KXIP inning T20 IPL - 2010	14098	156	142	10	14	**93.42 %**	**91.02 %**	**92.20 %**
MI inning T20 IPL - 2010	12396	168	154	6	14	**96.25 %**	**91.66 %**	**93.61 %**

V.CONCLUSION AND FUTURE WORK

Replay is a vital feature altering path in TV program. Basically noteworthy or interesting area will be played with moderate movement design keeping in mind the end goal to let observers admire the subtle elements. Replay is a huge sign for highlights and routinely taken as an issue angle in occasion location. Cricket, Soccer, American Football, Basketball, Baseball, and Tennis etc. usually contains few semantic events in which viewer are interested. Games highlights can be essentially made out of intriguing occasions that may confinement the viewer's consideration. Surf highlights might be a good choice for spectators to quickly recognize the sports event therefore this review paper present various methods for generating highlights from sports video. This proposed algorithm and framework can applied on cricket. In future, it will also implemented on others sports like Soccer, Tennis, American football, Table tennis, Basketball, Badminton etc. So we can generate highlights of any sports videos by applying our proposed algorithm.

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