Frame by frame analysis on Different Cases Of Sports video

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Abstract:
Sport data analysis is becoming increasingly large scale, diversified and shared, but differently persists in rapidly accessing the most crucial information. Previous survey have been focused on the methodologies of sports video analysis of traditional problems of coaching, databases and other commercial software could also relieve many of the organizational, administrative and security problems of modern team games. This study develops interpretation of content based video analysis system by examining the structure of content under different scenarios of Kabaddi Game. Player detection and tracking has done using the play-by-play analysis by centroid detection adapting the Kalman Filtering(KF) technique. The Algorithm is tested and results are compared with self developed video and broadcasted videos for the expected accuracy.

Key words: Kabaddi video, Kalman Filter, player tracking, line detection, Event handling.

I INTRODUCTION

Sports video always appeals to large audiences. In recent years, the amount of digitized video content has been increasing rapidly and users need to access this content through various network solutions by various digital equipments. Because of more occlusions, camera moments, disturbances by audience or umpires, non clarity by effect of lights or weather the analysis of sports video became more challenging. These problems we face usually in the broadcasted videos. To overcome with these issues the proposed system uses the self developed videos which is stated in detailed in this present work.

Sport is a medium through which a player develops both physical and mental abilities and finally it results into a conscious method of doing whatever one does most effectively. In India Kabaddi is a major sport, which is played all over the country. It has high grading in the Asian sports. This game is classified as a team game which requires both skill and power. It combines the characteristics of wrestling and rugby. Kabaddi is played in more than sixty five countries especially in Asian countries [2][4].

II PROPOSED MODEL

While dealing with the individual frames in MATLAB, quality of each frame has major effects on the output. Using continuous frame flow to set up the statistical background model shows great performance at fixed camera view. Broadcasted videos may not meet out our expected accuracy ratio. These problems can be overcome in the self-developed video to proceed for the algorithm testing, content analysis and decision making.

Sports video analysis systems are mainly used for highlighting the events, falls detection, goal point identification, line detection and individual player performance justification. Concentrating on these major criteria's the Kabaddi video database (DB) is developed to capture major events of the games. Mainly concentrating on half of the track, each camera is fixed in the different location to analyze the structured queries of individual event.

In the proposed system self developed videos are used for algorithm testing. Kabaddi video shoot has done by Two fixed cameras of 13 and 16 Mega Pixel with High Defined resolution. The game is played by international kabaddi players only concentrating on half of the court. DB videos followed standard measurements, camera fixing with equal distance and height as per the guidance and instructions of the coach. Based on the rules and game event analysis, the DB is referred for the algorithm design testing in image processing using the MATLAB tool. Further testing will be done on the standard DB of Kabaddi matches conducted in international kabaddi court. On bases of game analysis present scenarios have categorized into different events as different cases of kabaddi game. Individual algorithm will be developed on each event and implemented based on the efficient methods. The performance of the system will be act as the third umpire at the point of content analysis and decision making. The blue print of the full Kabaddi game court is as shown in the figure 1.

The process is explained in detail as different events. The proposed work has categorized in three major criteria's, A. Court lines detection, Player detection and then Event handling. This paper mainly elaborates on player detection and detailed study of various event handling. The overall proposed work will be referred as an third umpire in Kabaddi video analysis and passing decisions on game points.
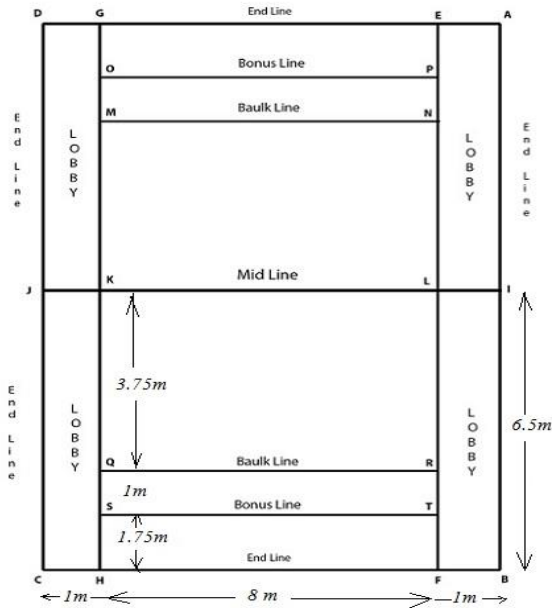
Fig 1: Complete Kabaddi court picture with measurements

. Detailed event analysis has done and explained as follows.

A. End line Event:

(a)

(b)

(c)

Fig 2: Events of kabaddi game a. End line event, b. Lobby line event, c. Middle line event

B. Middle Line Event:

Once the rider finishes his ride with any event and returns back to his team through middle line. In this scenario any of players touches the rider at the same time he touches the middle line, the player will be declared as out and rider gets the points.

C. Lobby line Event:

Lobby line will be drawn 1m distance through the 12m long court line both side. Including this 1m lobby line both the side the court width will be considered as 8m wide. This will be the playing boundary for all the players who starts the game. Any one player either rider or chaser (out of 7) will touch these line will be out of the game. In this case I captured both rider fall and chasers falls events in the videos.

III METHODOLOGY

A. Player Object Detection

In order to detect the player initial position, the first image as A and next image as B are considered,
• Frame difference between A and B is applied and the obtained result as C.
• Perform background subtraction with the created background model of image A and the obtained result D.
• Apply logical AND operation between C and D is performed.
• Based on the frequent changes on the pixels will be recognized.
• The biggest blob is founded, which is a player.
• It fills the whole region as player with full team moment towards the teaser.

B. Multiple Object Tracking

• Kalman Filter

A Kalman filter is an optical estimator. It is recursive in such a way that new measurements can be processed as they arrive. The Kalman filter consists of the prediction process and the updating process [12][18]. The position measurement and the occupation rate from the player object detection are fed into the updating process. Then, the occupation rate is used to predict the new position of the player object. The new position is applied to detect the player object in the next frame. Initially background estimation and foreground modeling has to be done. First ten frames will be red and considered for the background images with the averaging of number of frames. Then Initialize the Kalman filter values on bases of position of pixel changes over the constant values based on the x-y measurements on the each frames. Then the predicted value will be set on 4 sides of the structured area of play court. Then we initialize the Kalman parameters R - measurement noise, H - transform from measure to state, Q - system noise, P - the status covariance matrix and A - state transform matrix.

R=[[0.2845,0.0045]',[0.0045,0.0455]'];
H=[[1,0]',[0,1]',[0,0]',[0,0]'];
Q=0.01*eye(4);   (1)
P = 100*eye(4);
A=[[1,0,0,0]',[0,1,0,0]',[dt,0,1,0]',[0,dt,0,1]'];

set the threshold value for maximum 40 to detect the actual pixel variation. Then calculate the difference over previous frames and the existing frame[13]. These Kalman Values will predict the player moment in the next state of the frame. This will repeat until the complete moments of the player team is estimated. For this bubble sort technique is applied. Then we get the x and y axis corner with the Kalman window to predict the new centroid and velocity.

Following Steps elaborate the Algorithm process for Player tracking

1. Background subtraction(BG) has done on bases of starting 10 frames
2. Frame difference will be calculated from the initial frame by setting the threshold value to extract the pixel.
3. Do bubble sort (large to small) on regions in case there are more than 1. The largest region is the object.
4. Selected region's centroid and other parameter have been used to calculate time and measurement update equations.
5. Plat the rectangle for BG state with blue color
6. Use Kalman window size to predict the velocity and new centroid.
    Ppre = A*P*A' + Q;   (2)
    K = Ppre*H'/(H*Ppre*H'+R);   (3)
7. Plot the tracking rectangle after the Kalman Filter-red
8. Repeat the steps until all frames have covered till the destination frame.

IV EXPERIMENTAL RESULTS

The Kalman filter is essentially a set of mathematical equations that implement a predictor-corrector type estimator that is optimal. It minimizes the estimated error covariance-when some presumed conditions are met.

Algorithm tested on self developed videos as stated in the proposed model section. And it is compared with the broadcasted video results as well [12]. We can estimate that, self developed videos give the more accuracy in the tracking process of each player moments as team inside the court.
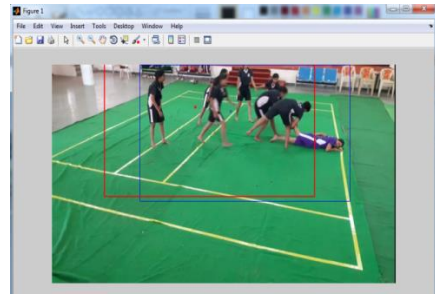

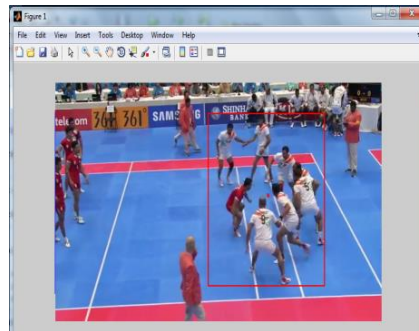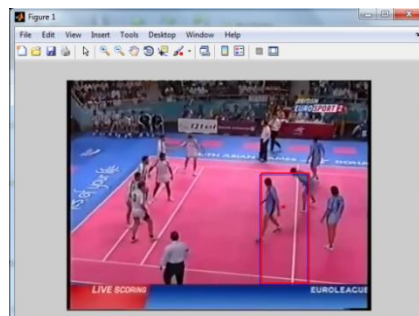Fig 5: Player tracking on Self developed Videos

Fig 6: Player tracking on Broadcasted videos

V FUTURE WORK

As stated above the proposed case study, kabaddi is a team game. Every event of the kabaddi has to be detected and tracked. In this game each line of the court (half court) essential in the result analysis on every event. This has to be processed by individual player tracking on each frame difference. Each scenario will predicted and line touch will be recognized on frame by frame analysis.

VI   CONCLUSION

In the Computer vision system the sports video analysis process is running with many challenging issues. Since the less work has done on the Asian game "Kabaddi" has taken to develop the detailed content analysis system. By enhancing the criteria's of the proposed game the possible events and scenarios are studied. Pixel differencing on each frame has estimated. Play-by-play segmentation has taken based on the player moments. Using prediction on bases of KF technique each player as a team has tracked inside the half of the court. This has given an estimated result on self developed videos as compared with broadcasted videos.

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