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A Literature Review on Event Detection Based Video Summarization

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ABSTRACT

Video summaries provide condensed and succinct representation of the content of a video stream through a combination of still images, video segments, graphical representation and textual descriptors. The translation of low level content in video sequences into high level semantic concepts is a research topic that has received much interest in recent years. We propose fully automatic and computationally efficient framework for analysis and summarization of soccer videos using event based features. The processing framework includes some novel low-level soccer video processing algorithms, such as dominant color detection, robust shot boundary detection, and shot classification as well as some higher level algorithm such as corner event detection, referee detection and penalty box detection. Here we have presented the algorithm for parsing the structure of produced soccer programs. We have used different methods such as morphological image processing method which is used for extracting the interested area, which is in our case corner of the ground, segmentation for detecting the corner vertical pillars, which are extracted through Canny Edge Detection method. Different mathematical model such as HMM and Hough transformation are used for the purpose of getting efficient and accurate result.

KEYWORDS:

1. Introduction

1.1 Objective and Scope

Video summarization is one of the most important topics, which potentially enabling faster browsing of large video collection and also more efficient content indexing and access.

Essentially, this research area consists of automatically generating a sort summary of a video, which can either be a static summary or a dynamic summary.

Static video summaries are composed of a set of key frames extracted from the original video. While dynamic video summaries are composed of a set of shots and are produced taking into account the similarity or domain-specific relationship among all video shots.

The objective of this research is performing video summarization method based event detection where event can be anything.

Here I have reviewed various papers on video summarization based event detection techniques, specifically for soccer videos. The various research papers have shown the power of video summarization for soccer video event detection.

2. Literature Review

2.1 Video Summarization

- Video summarization refers to creating a summary of a digital video, which must satisfy the following three principles: (1) the video summary must contain high priority entities and events from the video, (2) the summary itself should exhibit reasonable degrees of continuity, and (3) the summary should be free of repetition.
- In general, a summary of a video must satisfy the following three principles.
- The video summary must contain high priority entities and events from the video. For example, a summary of a soccer game must show goals, spectacular goal attempts, as well as any other notable events such as the ejection of a player from the game, any fistfights or scuffles and so on.

2.2 Video Event

- Understanding video events is a research topic that has received much interest in recent years.
- Video events are those high level semantics concepts that the human perceive when observing a video sequence.
- Video event understanding attempts to offer solution to the problem of reconciling this human perception of events with computer perception.
- The major challenge in this research area is translating low level input into a semantically meaningful event description.

2.3 Event based video summarization

- If the application domain of the summarization algorithm is restricted to event-based content, it becomes possible to enhance summarization algorithms by exploiting domain-specific knowledge about events.
- Summarization of sports video has been the main application for such approaches. Sports programs lend themselves well for automatic summarization for following of reasons.
- The interesting segments of a program occupy a small portion of the whole content.
- Compact representations of sports programs have a large potential audience.
- Often there are clear markers, such as cheering crowds, stopped games, and replays,that signify important events .
- Sports video follows production rules.
- During any excitement event camera will move over different parts of the ground. Semantic vents are the collection of a temporally ordered set of different views.
- So by analyzing temporal sequence of the views, events can be detected.
- Figure 2.3 shows general procedure of event based video summarization. Different approaches for event detection are discussed below.

2.4 Related Work

1. [Arthur G. Money, Harry Agius * 2007- Brunel University, School of information Systems, Computing and Mathematics, St. John's, Uxbridge, Middlesex UB8 3PH, UK] "Video Summarization : A conceptual framework and survey of the state of art"

Functional Description: In the mentioned research paper the author has mentioned in detail about what video summarization is all about. The author has explained the difference between video summaries and video summarization techniques. Various video summarization techniques such as internal summarization, external summarization, and hybrid summarization are mentioned in brief. The paper also provide the comparisons between all three summarization techniques and summaries of all three techniques with its advantages and disadvantages.

2. [Gal Lavee, Ehud Rivlin, and Michael Rudzsky] "Understanding Video Event: A Survey of Methods for Automatic Interpretation of Semantic Occurrences in Video"

Functional Description: This paper includes smart surveillance system, semantic video database indexing, and interactive systems. The paper identify between 2 main components of event understanding process. ABSTRACTION AND EVENT MODELLING. The paper explains different techniques such as event modeling, pattern-recognition methods for Event Recognition, state event models (finite-state machines, Bayesian

Networks, Hidden Markov models, Dynamic BNs, conditional random fields), semantic event models (grammars, Petri nets, constraint satisfaction, logic approaches).

3. [Ahmed Ekin, A. Murat Tekalp, Fellow, IEEE, and Rajiv Mehrotra] "Automatic Soccer Video Analysis and Summarization"

Functional Description: This paper proposes the novel soccer video processing framework that satisfies these requirements. It provides difference between two methods cinematic and object based feature. It provides algorithm for robust dominant color region detection, shot boundary detection, shot classification, slow motion replay detection, goal detection, referee detection, penalty box detection, . This paper introduces new framework for summarization of soccer video. The proposed framework allows real-time event detection by cinematic features and further filtering of slow motion replays by object based features for semantic labeling.

4. [Mohamed Y. Eldib, Bassam S. Abou Zaid, Hossam M. Zawbaa, Mohamed El-Zahar, Motaz El-Saban – Information Technology department, Faculty of Computers and Information, Cairo University, Cairo, Egypt] "Soccer Video Summarization Using Enhanced Logo Detection"

Functional Description: They propose an automatic soccer video summarization engine which relies on an improvement algorithm for the detection of replay shots which delineate interesting events. Video shots are first detected using dominant colors and histogram intersection methods.

5. [Lexing Xie, Shih-Fu Chang- Department of Electrical Engineering Columbia University, New York, NY, Ajay Divakaran, Huifang Sun Mitsubishi Electric Research Lab Murray Hill, NJ] "Structure Analysis Of Soccer Video With Hidden Markov Models"

Functional Description: In this paper, we present algorithms for parsing the structure of produced soccer programs. The problem is important in the context of a personalized video streaming and browsing system. While prior work focuses on the detection of special events such as goals or corner kicks, this paper is concerned with generic structural elements of the game.

6. [Gu Xu, Yu-Fei Ma, Hong-Jiang Zhang, Shiqiang Yang- Dept of computer science, Tsinghua University, Beijing, China(100084), Microsoft research Asia, 5/F Sigma center, 49 Zhichun Road, China(100080)] "A HMM BASED SEMANTIC ANALYSIS FRAMEWORK FOR THE SPORTS GAME EVENT DETECTION"

7. [Kamesh Namudari- department of electrical engineering university of North Texas] "Automatic extraction of highlights from a cricket video using MPEG-7 descriptors"

Functional Description: In this paper, an approach to summarize a cricket game video by using highlights extraction process is presented. The video is first segmented into number of shots. Key frames are then extracted from each shot low level features are extracted from the key frames. Features are used to extract the view or states. The states and their transition in the cricket game are represented by Hidden Markov model, based on which the game highlights are extracted.

Conclusion: The highlight extraction process consists of 3 steps. 1. shot boundary detection and key frames extraction 2. Shot classification 3. Extraction. The HMM has been proved to be a viable representation model for highlight extraction. By considering more low level features , classification of the views can be done more accurately.

3. Conclusion

This presents the conceptual framework for video summarization which encompasses the rich range of techniques i.e. internal, external, hybrid and summaries of these the techniques. It also presents the view of the domain of video event understanding. It provides grouping of number of problems, approaches to their solutions, and components of these approaches in a meaningful way. Video events are categorized into video abstraction and event modeling. For the purpose of soccer video summarization based event detection various methods such as HMM model, Hough Transform, Enhanced Logo detection, etc are used. Logo detection method provides result with almost 96.3% precision. The HMM model provides detection of events such as play and break with 83.5% classification accuracy and good boundary timing. The efficiency, effectiveness, and the robustness of the proposed framework are demonstrated over a large dataset, consisting of more than 13 hours of soccer video, captured at different countries and conditions.

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