

BOWLING GAME EVENTS DETECTION BASED ON AUDIO-VISUAL CLUES

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ABSTRACT. *In this paper, an effective system consisting of four subsystems is proposed to bowling game video indexing by integrating the visual and the auditory information. The lane boundary information is extracted first to assist in all the events detection. For throwing clip event, the auditory temporal property is further employed to aid in the detection. A new bowl-positioning model is designed to derive the bowl trajectory, which solves the obstacle using the perspective projection model with the absence of related camera parameters. Also, a new, feasible and reliable approach to identifying the delivery time event through detecting the delivery prompt lights is proposed. A more reliable feature in the color information of the pin mark compared with the intensity edge is exploited to identify the bowling pin. Connecting all the pin mark positions called pin-mark curve can be generated such that the exact position for each pin can be determined with integrating the pin arrangement rule. The users can effectively query specific interesting events including a bowl-throwing clip, a bowl trajectory, delivery time and a bowling result via the proposed system. The experimental results indicate that our system can achieve satisfactory performance in events detection.*

Keywords: Bowling game indexing, Video event detection, Video content analysis

1. **Introduction.** With the popularity of the Internet, it is getting important to efficiently and effectively manage video data. Recently, many video content analysis techniques based on feature extraction have been proposed to achieve the purposes of abstraction, classification or retrieval. Among them, semantic classification of videos plays an important role in human-computer interaction. Users are more familiar with the semantic concept of a video, e.g., for video retrieval, users would prefer to query the desired video content by semantics, such as “hitting” in the baseball games, other than inputting numerical features or an example video. This enables users to search what they want more accurately. The aim of semantics derivation is to provide a friendly way for users to retrieve and browse video databases. Powerful video indexing mechanism is crucial for accessing video data efficiently and effectively.

Identifying interesting events in sports video based on image, video and audio analysis techniques have attracted increasing research attentions in recent years. Li and Sezan [1] proposed a general model to detect sport events in videos and accordingly generate the summary. They view a sport program as being composed of events such as “plays” interleaved with other “non-plays” in baseball games. Low-level features, e.g. color distribution, are used to detect events. For high-level semantics, both the rule-based and the