Baseball Game Highlight & Event Detection

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Outline

- 1. Goal
- 2. Previous methods
- 3. My flowchart
- 4. My methods
- 5. Experimental result
- 6. Conclusion & Future work
- 7. Reference

1. Goal

- 1. Why I want to do this?

  Ans: I'm a big baseball fan!!!

- 2. Why researchers do this?

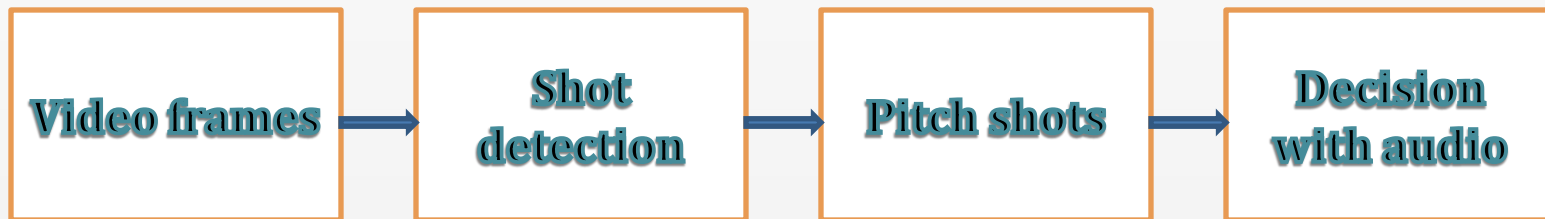 Ans: Automatically extracting highlights from   sport videos, and giving them semantic meaning!!!

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2. Previous Methods
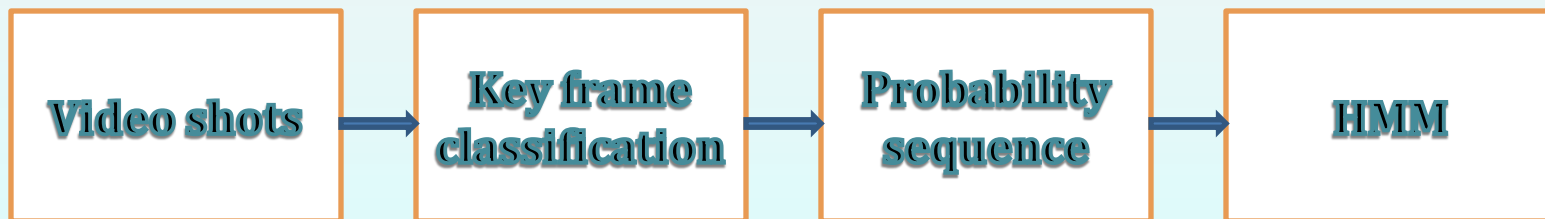
◈ 1. From audio data [Y. Rui, 2000]

  Excited speech, ball hit, cheering, applause

◈ 2. From video & image data [P. Chang, 2002]

  Motion, player, filed color, edge

◈ 3. Close caption & Score board

◈ 4. Hybrid data [C. Cheng, 2006]

  Multimodal fusion

◈ 5. Machine learning tools

  SVM, GMM, HMM

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3. My Flowchart

◈ Highlight:

| Video frames | → | Shot detection | → | Pitch shots | → | Decision with audio |

◈ Event:

| Video shots | → | Key frame classification | → | Probability sequence | → | HMM |

4. My Methods

- 1. Getting frames: KM player
- 2. Shot detection: Block histogram
- 3. Frame feature extraction
- 4. Audio feature extraction & classes
- 5. Frame type classification
- 6. Event detection

Frame feature extraction

◈ 1. Grass color , soil color (3x3,3x3,1,1,1)

◈ 2. Edge density (3x3)

◈ 3. Motion vector (4)

◈ 4. Player height (1)

◈ 5. Face color (1)

◈ 6. Totally 36 dimensions

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Frame feature extraction

(a)

(b)

(c)

(d)

Audio feature extraction & classes

◈ Features:

  MFCC(delta), pitch, E23, zero-crossing rate

◈ Tool: MIRToolbox

◈ Classes:

  Exciting speech, speech, ball hit, noise, cheering

◈ Machine learning: SVM

◈ Result: ……

Frame type classification

◈ Pitching shot:

No motion vectors, only boundary frames

◈ 9 frame types:

Pitching, Outfield, Field,

Fielding, Audience, Close-up,

Bad close-up, Base, Running

Outfield(1)

Field(3)

Audience(4)

Fielding(2)

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Close-up(5)

Bad Close-up(8)

Running(6)

Base(7)

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Event detection

- 1. Using SVM for frame type classification with "probability"
- 2. 5 shots, 7 key frames, a 9*35 sequence for event detection
- 3. Training 3 HMM for each type of event:

  Home run, Nice play, Run score hit

5. Experimental Result

◈ I haven't gather enough videos to generate some tables and P-R curve…… It's really hard to find a full game video!!!

◈ Now: 80% correctness of events

85% pitching frame

◈ Let us see some demos!!!

6. Conclusion & Future Work

◈ 1. More robust features

◈ 2. How to choose the suitable machine learning tools

◈ 3. How to deal with "high-dimensional features"

◈ 4. Generating a database

◈ 5. Better interface

7. Reference

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Thank you!!!

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