An Intuitive and Efficient Access Interface to Real-Time Incoming Video Based on Automatic Indexing

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Relation to Other Papers

- Video automatically indexed
- Broken into keyframes, associated with audio and video
- Interfaces for viewing
- No query capabilities

Video Stream Pool

- **Capture real-time incoming video in storage (VSP)**
- Also analyze it: event detection
- **Events: scene changes, camera operations, object motion, audio events**
  - Types of events are application-specific
- **Capturing module: irregularly samples frames with audio based on event triggers**
  - (Not full motion capture)
- **Higher-level semantic extraction: based on domain-specific knowledge (e.g., commercial)**
  - Divide video into longer units of meaning than shots

Mini-Video

- Smooth motion not necessary for browsing

- **Mini-video: Replayable compact video representation**
- Capture key frames at event trigger times
- Audio segment delimited by two consecutive events
  - Associated with first event's key frame
- Event type and time index linked to key frame
- Event types: scene changes, camera operations, object motion, audio events
- Example: sample key images at scene changes and constant time intervals

Mini-video

- **Low storage requirements (10% of MPEG-1)**
  - Could use lower spatial (reducing image size, lower quality intraframe compression) or temporal resolution (sample at longer intervals
- **Advantages:**
  - Synchronization between image and audio
  - Preserves rhythm of scene changes: cuts/scene changes are reflected in teh mini-video

Prototype System

- Key frames extracted at scene changes and at 1 second intervals theireafter
- Scene changes: detected on 64x48 images
- Accuracy: 91% for TV news (includes failure to detect and incorrect detection)
- Use domain-specific interpreter to detect commercials
- Key frames (320x240) compressed with JPEG
- Indexes include scene-change info, broadcast time
- Eliminate data older than 24 hours

Browsing interfaces

- **24-hour overview:**
- Thumbnails of representative images in chronological order (selected at 10 minute intervals, avoiding commercials)
- Click on thumbnail images to pop up monitor window

- **Monitor:**
- Displays mini-video
- VCR-like interface

- **Content overview:**
- Detailed view of key frames (one per shot)