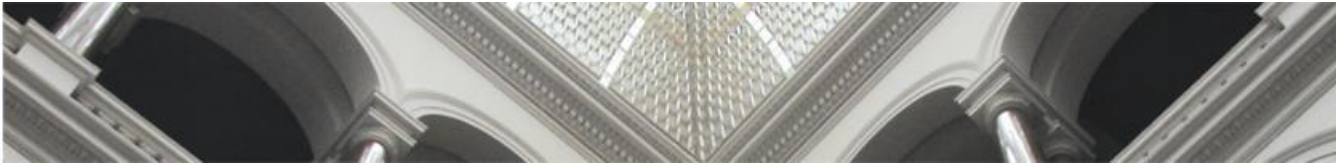




# Video Indexing and Summarization as a Tool for Privacy Protection

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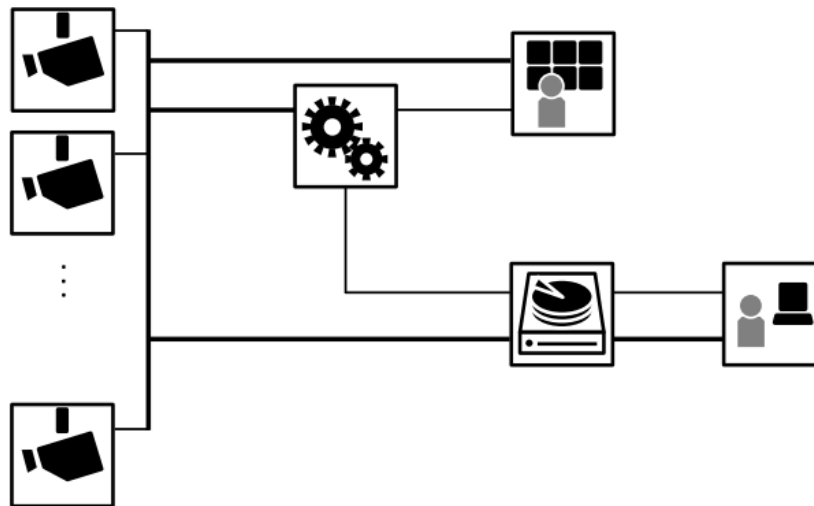
Communication Systems Group | DSP 2013



## Motivation

The rapid growth of video surveillance systems results in an increasing number of video feeds which should be watched and stored in a control room:

- proactive video-surveillance: automatic video analysis to alert CCTV operators
- crime investigation: video indexing and summarization



User is directed to the content of interest:

**This can be used to protect the privacy of people recorded at irrelevant point in time**



## What is Video Indexing and Summarization

Summarizing consist in producing a compact representation of a given content

- extract the semantic information
- represent it in a suitable form

Video data several features

- colors
- objects
- camera motion
- etc.

Video content

- scripted (movies, news...)
- unscripted (sport, **surveillance**...)



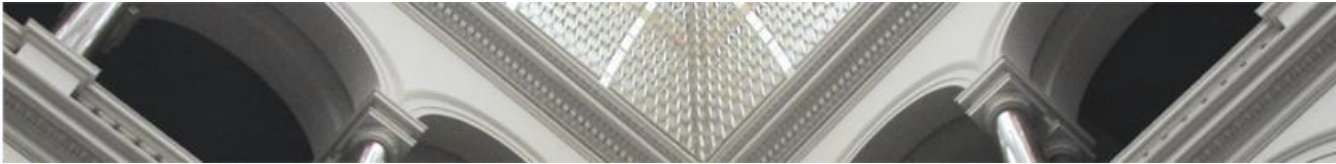
## Video Content Extraction

- **Feature based approaches**  
low-level features (number of foreground pixels, frame difference energy...)
- **Object based approaches**  
persons, cars, animals....
- **Event based approaches**  
mugging, lost-baggage....

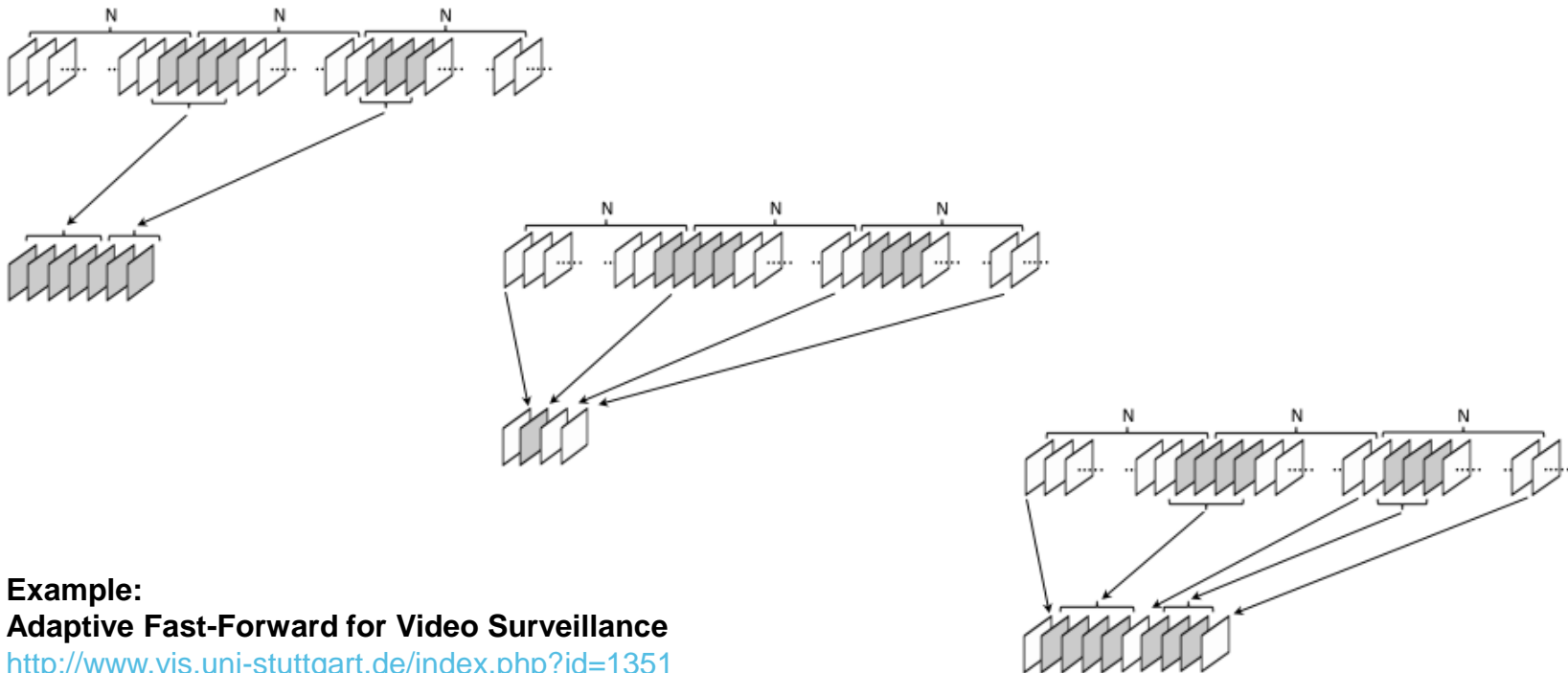


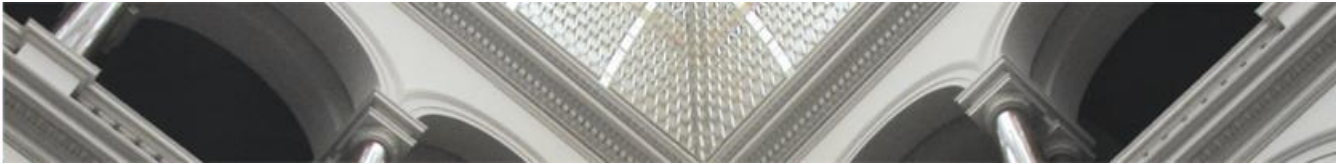
## Video Content Representation

- **Key frames**  
relevant frames to depict the content of the whole sequence
- **Frame-true time compressed video**  
video editing, fast forwarding, adaptive fast-forwarding
- **Frame-free compressed video**  
displace video segments in space and time



## Frame-true Video Compression





## Frame-free Compressed Video

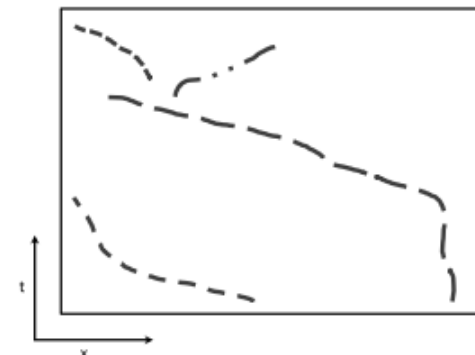
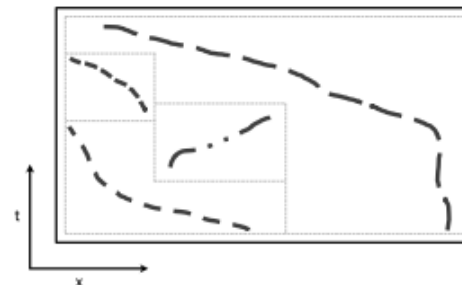
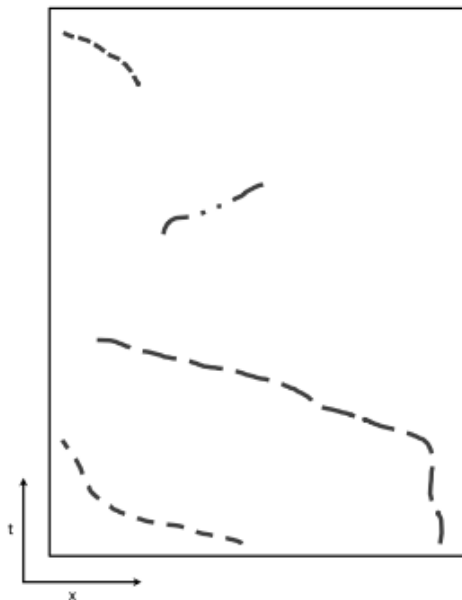
Example:

Video Synopsis and Indexing

<http://www.vision.huji.ac.il/video-synopsis/>

Video Condensation by Ribbon Carving

<http://vip.bu.edu/projects/video/video-condensation/>







## Video Content Representation

	Information Compactness	Context Representation	Information Access Flexibility	Indexation Failure Resilience
Key Frames	High	Low	High	Low
True-Frame Time Compression	Medium	High	Medium	Medium
Frame-Free Time Compression	High	Medium (might be confusing)	Low	Low





## Main Findings

The more elaborated the semantic queries, the higher the privacy protection

- events-based indexing -> highly dependent on video analytics
- object-based -> offer strong links to privacy protection activities, but are difficult to exploit
- features-based indexing -> lower semantic possibilities
- lack on experimentation on the combination of several levels of analysis  
(an approach based on this principle will be presented by our group at the AVSS 2013)

Representation depends on the application context (relations between objects needed?)



# Ευχαριστώ