Exciting Media

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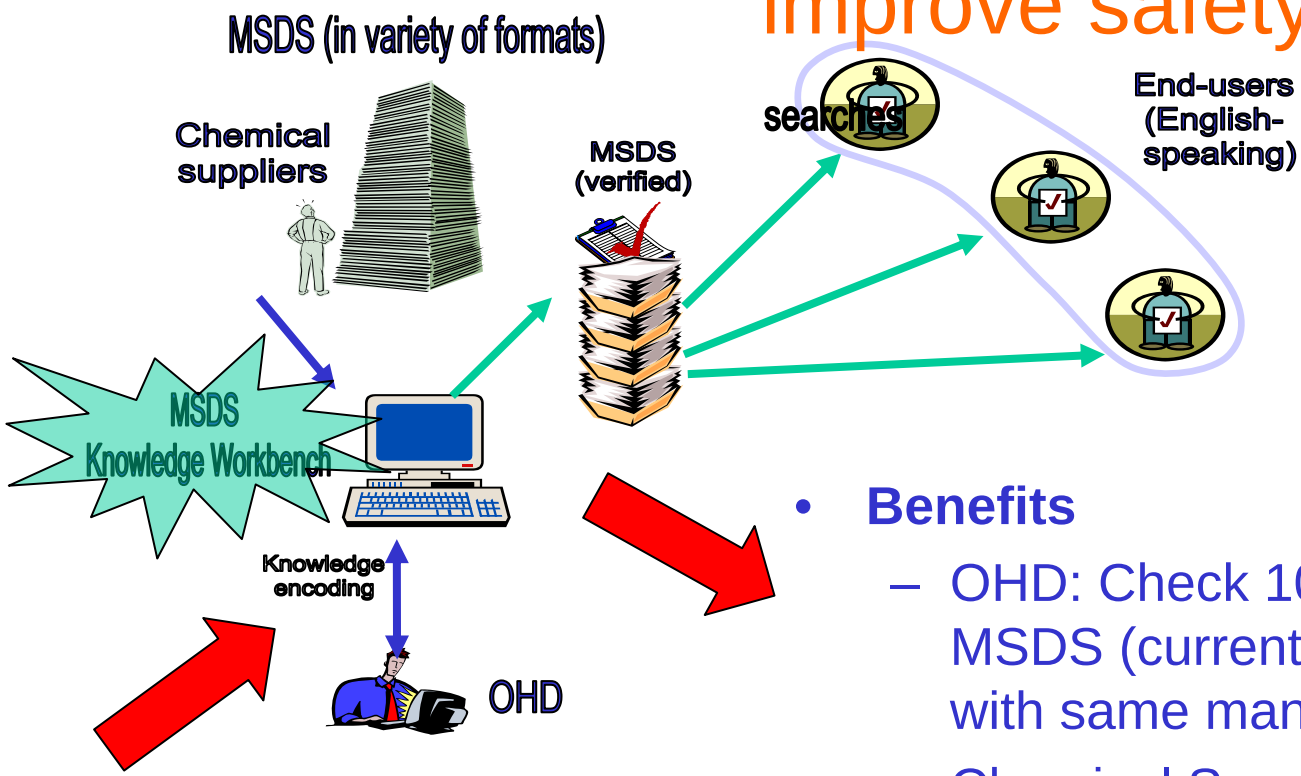
Plan

- **I will discuss some made-in-Singapore innovations on the handling and processing of native media**
  - New things that you can do with texts
  - New things that you can do with images
  - New things that you can do with audio
  - New things that you can do with video

New things that you can do with texts

Intelligent information extraction, improve safety



- **Extract chemical safety information from Materials Safety Data Sheets (MSDS)**
- **Check for conformance to standards**

- **Benefits**
  - OHD: Check 100% of MSDS (currently < 10%) with same manpower
  - Chemical Suppliers: Savings in distribution of MSDS as it is online
  - End users of chemicals : Better quality MSDS, improved safety

How is it done?
What's needed to get it done?

LEG
Virus
Tissue
RNA
Protein
Polynucleotide
Peptide
OtherOrganicCompound
OtherName
OtherArtificialSource
Organism
Nucleotide
MultiCell
MonoCell
Lipid
Inorganic
DNA
CellType
CellLine
CellComponent
Carbohydrate
BodyPart
Atom
AminoAcidMonomer

Erythropoietin stimulates transcription of the TAL1/SCL gene and phosphorylation of its protein products.

Activation of the TAL1 (or SCL) gene, originally identified through its involvement by a recurrent chromosomal translocation, is the most frequent molecular lesion recognized in T-cell acute lymphoblastic leukemia. The protein products of this gene contain the basic-helix- loop-helix motif characteristic of a large family of transcription factors that bind to the canonical DNA sequence CANNTG as protein heterodimers. TAL1 expression by erythroid cells in vivo and in chemical-induced erythroleukemia cell lines in vivo s
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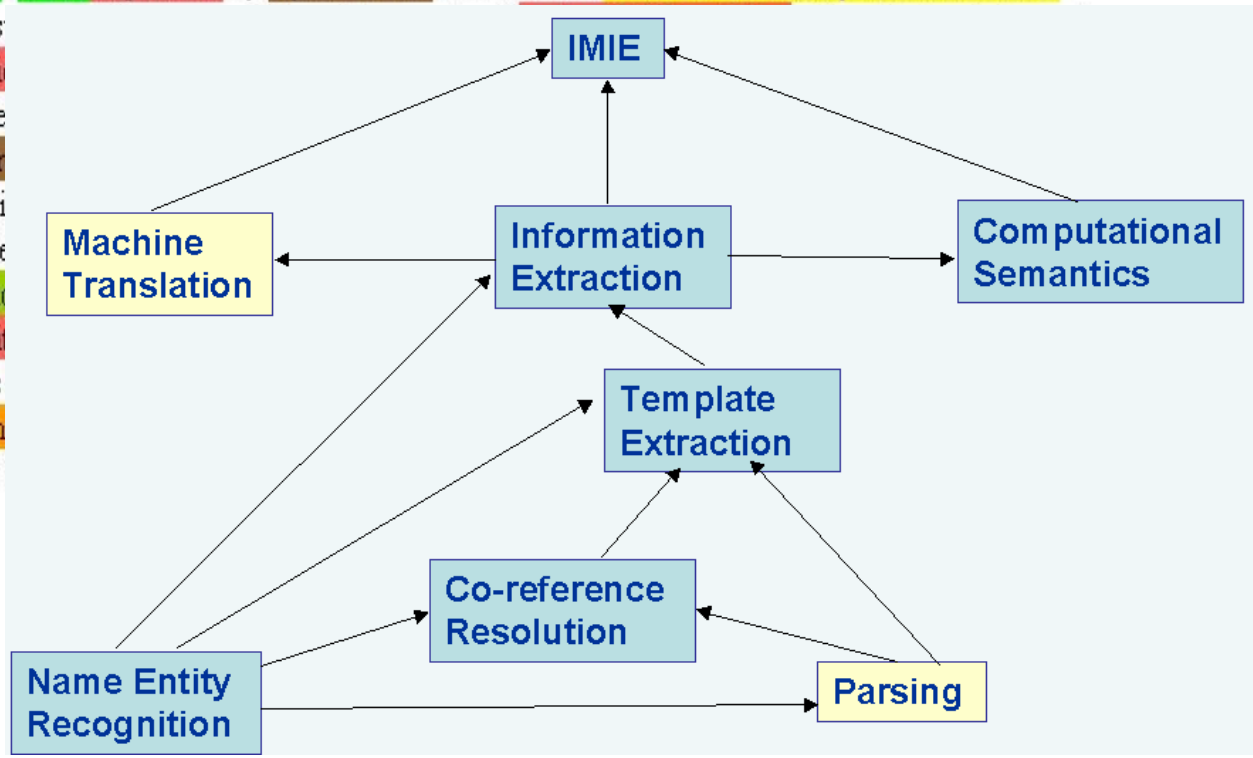
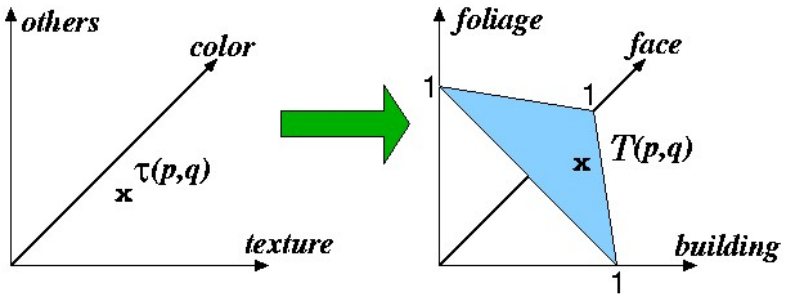


New things that you can do with images

Make computers easier to use



- **Abstraction of image content allows interpretation & matching in semantic space**
- **Visual query language allows specification of what and where**

Search photos by visual keywords

How is it done?
What's needed to get it done?

- **Trained visual keywords for semantic detection and summarisation**

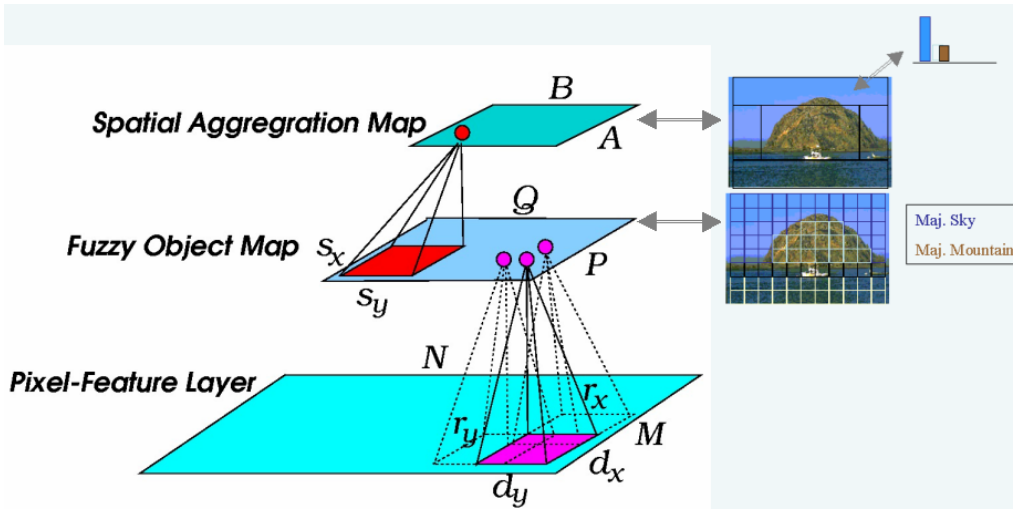
- **Automatic indexing using such keywords**

Faces :

Crowd :

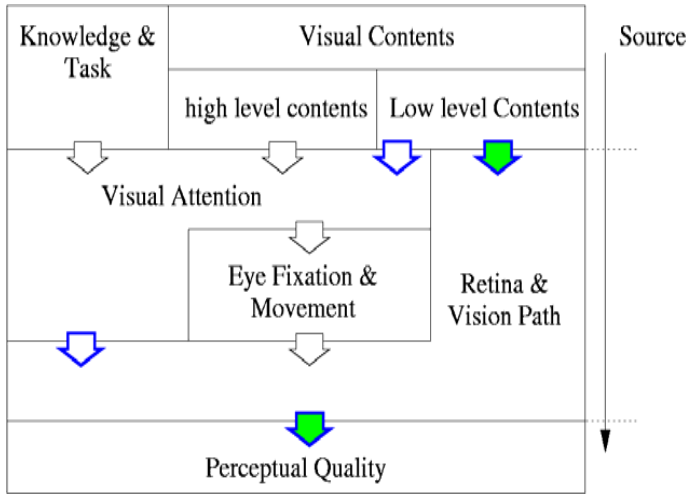
Buildings :

Foliage :



Let machines perceive as we do

- **Perceptual visual quality according to characteristics of human vision**



- **Adoption in video coding results in efficiency & quality improvement (other systems make compromise betw. the two)**

Higher PSNR!

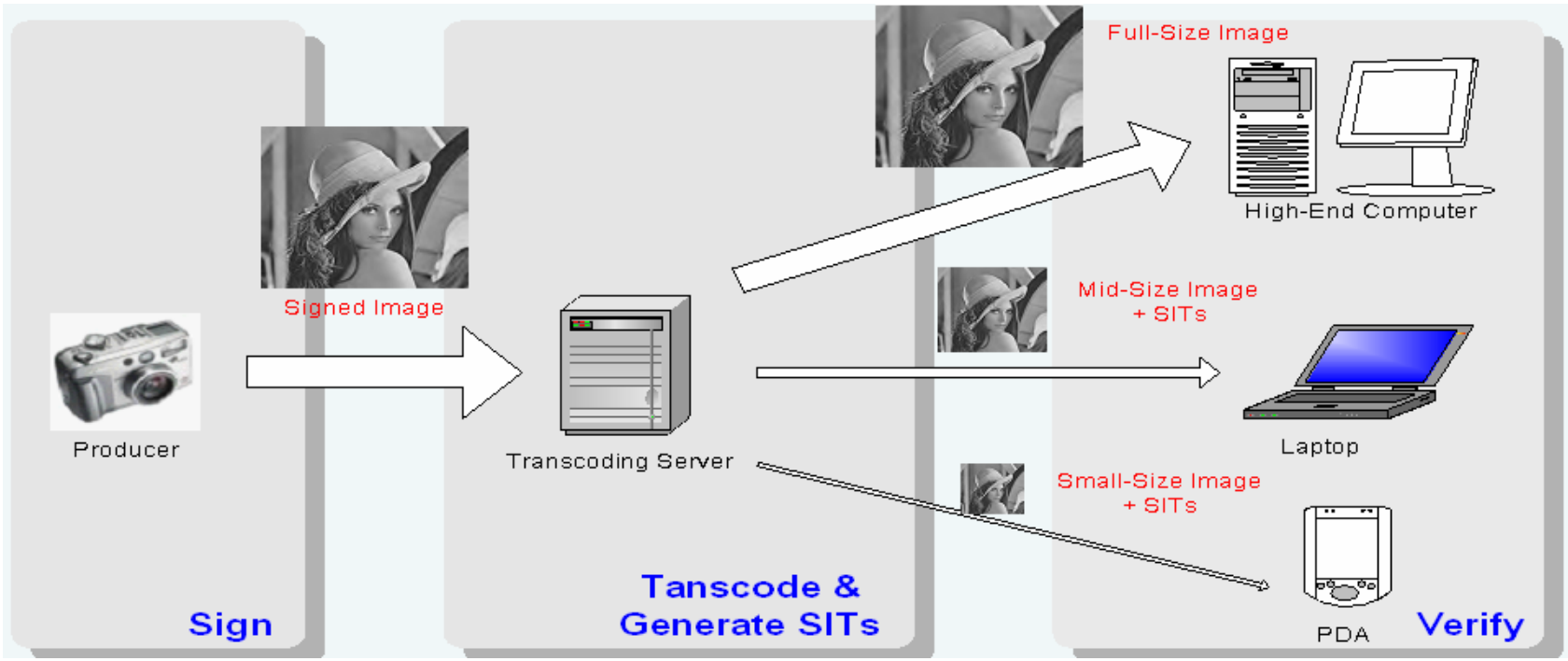
New perceptual metric perceives correctly.

	Comparison with MOS (Mean Opinion Score)	
	Pearson Correlation	Spearman Correlation
PSNR metric	0.66	0.69
New metric	0.83	0.81

Better accuracy **Better consistency**

Protect authenticity and integrity of data in a robust way

- **Third Party Publication: Sign Once, Verify Many Ways**



New things that you can do with audio

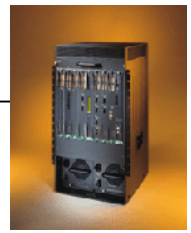
Let machines listen as we do

PSTN

Automatic speech recognition

Business Logic

Text-to-speech



voice → Speech enhancement, Noise reduction → Multilingual voice mining, Speech & dialogue processing → Text categorization, Natural language processing → Semantic outputs

To build a mobile audio industry

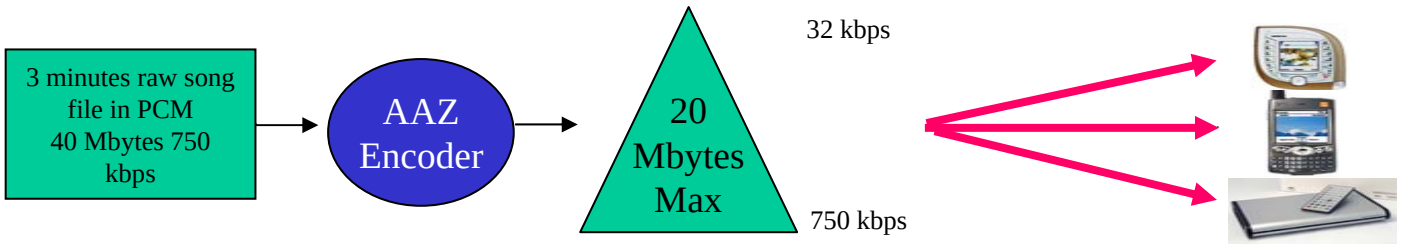
… analogous to the graphics industry

Sound Technologies

	Naturalness	Ease of Use	Memory & Bandwidth	Ease of new development	Ease of repurposing	Render time flexibility
Recordings	Excellent	Excellent	Poor	Studio recording is expensive	Poor	Poor
Current Sound Models	Very good for a limited few, otherwise poor	Medium	Medium	Expensive, laborious human effort	Medium	Medium
New Sound Models	Very good in general	Very good	Excellent	Easy with the right tools	Excellent	Excellent

- **Synthesis-directed analysis of sounds**
  - how would you model a lion's roar?
- **Algorithms for synthetic sound generation**
- **Tools for sound model automation and support**
- **Cross-platform audio synthesis engine with a small footprint and low compute requirements**

Advanced Audio Zip
Scaleable-to-Lossless Audio Codec



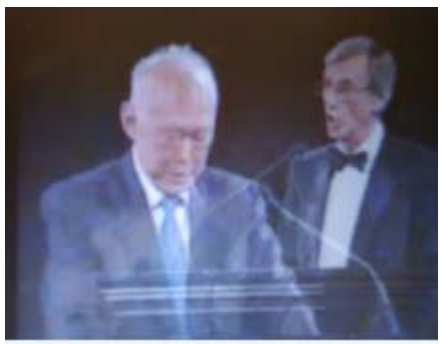
State-of-the-Art	AAZ
Encode ONE bit-rate, decode ONE bit-rate	**Encode once, decode ANY bit-rate**
Dead zones in quality due to unstable QoS resulting in mismatch bit-rates	**Variable bit-rates, fine-grain bit-layering quality on demand. No Dead zones.**

AAZ has been adopted by ISO as an MPEG4 international standard

New things that you can do with video

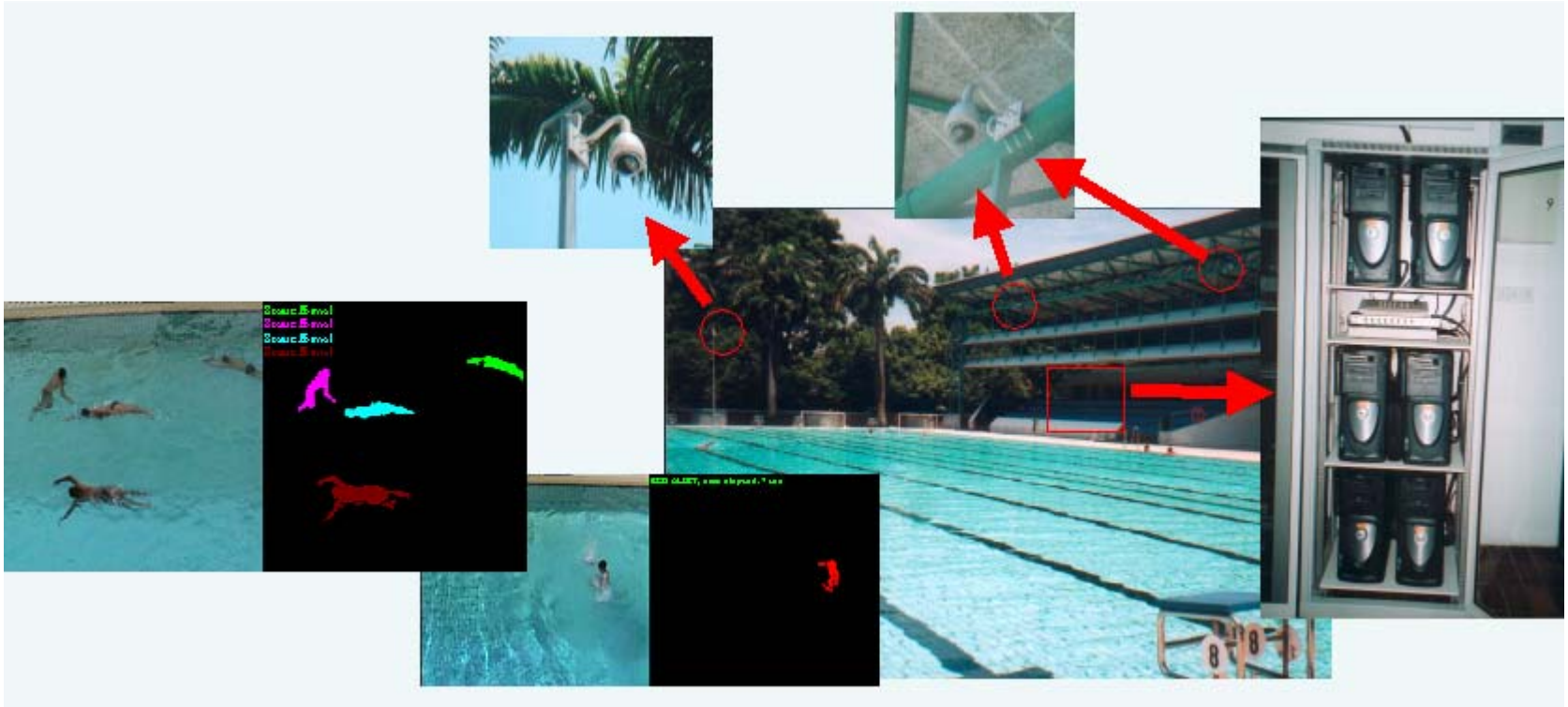
Make home videos more fun: www.muvee.com

- **Select video frames**
- **Cut to music**
- **Decide on transitions**



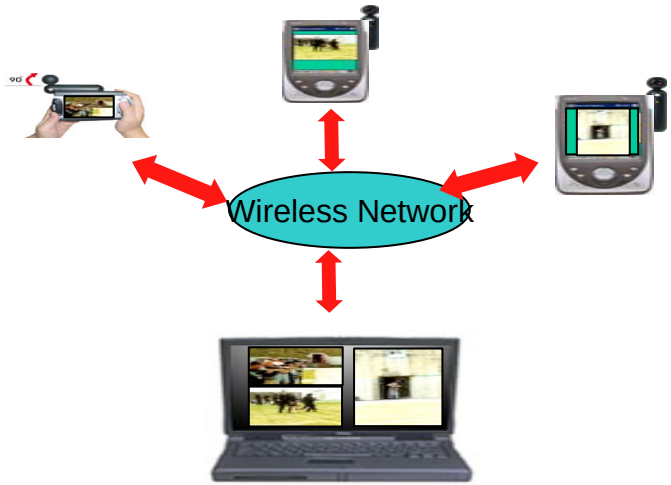
Turn home video into high quality MTV automatically

Prevent drowning, save lives



- **Drowning Early Warning System**
- **tracks people in dynamic aquatic conditions**
- **intelligently detect water crises situations**

Watch video any where, any time, on any device!



And improve quality at the same time!

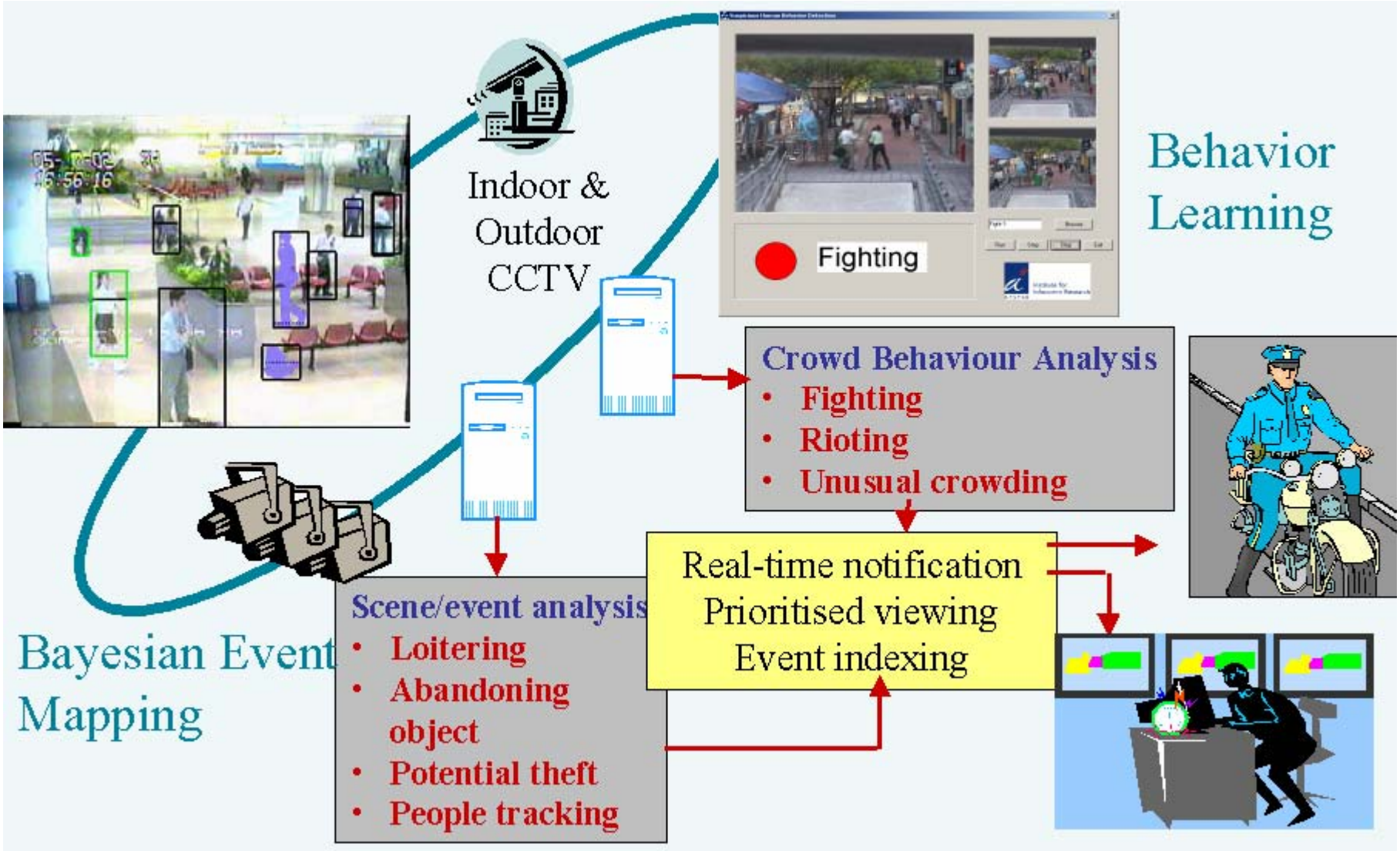
How is it done?
What's needed to get it done?

- **Efficient implementation of MPEG-4 coding algo**
  - Fast hexagonal-search motion estimation algo
  - Fast block matching using partial distortion comparison
  - Fast DCT/Quantization algo
  - Adv-detection of zero-DCT-coefficients (ADZDC technique)
- **From 1 fps to 20 fps**

- **Adaptive rate/error control algorithms**
  - Adaptive to available channel bandwidth
  - Adaptive to available computational resources
  - Adaptive to bit error rate

More intelligent CCTV, improve homeland security

NUS National University of Singapore

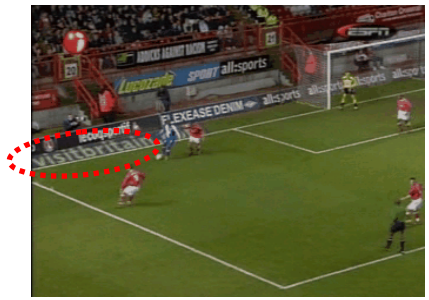


Improve sophistication of our media industry

Existing pains

"Intrusive" ads
•pops out during play!

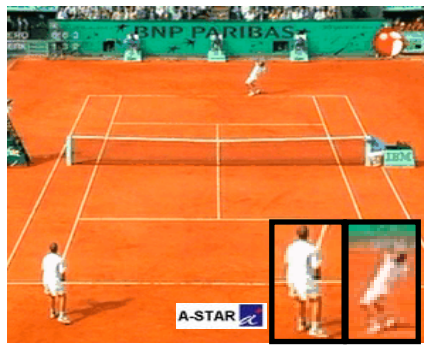
Tennis TV
•manual



Tagged to camera h/w
•costly
•done *once* at source

Non-intrusive virtual contents insertion

Non-intrusive insertions
•detects non-play segment
•non-interfering insertion



Enhanced tennis TV
•auto-tracking
•super-resolution

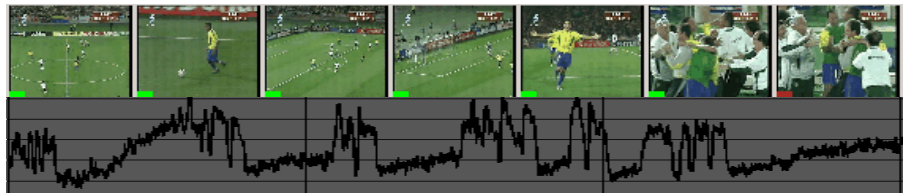
Software detection:
•performed any-time
•demographic Ads
•cheap

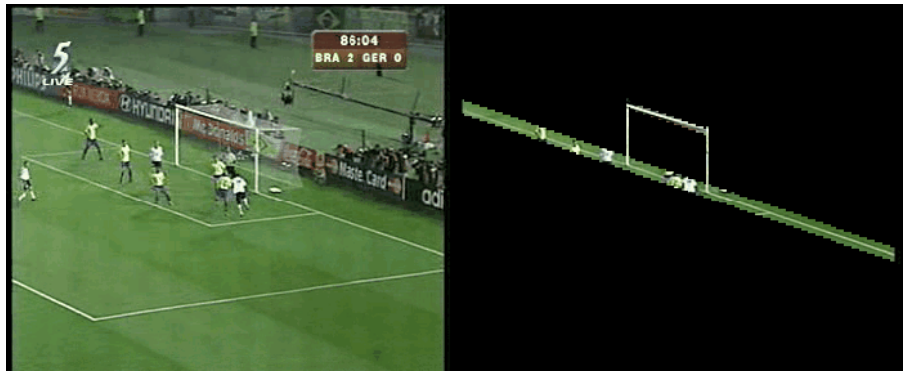
Super Resolution: How is it done?

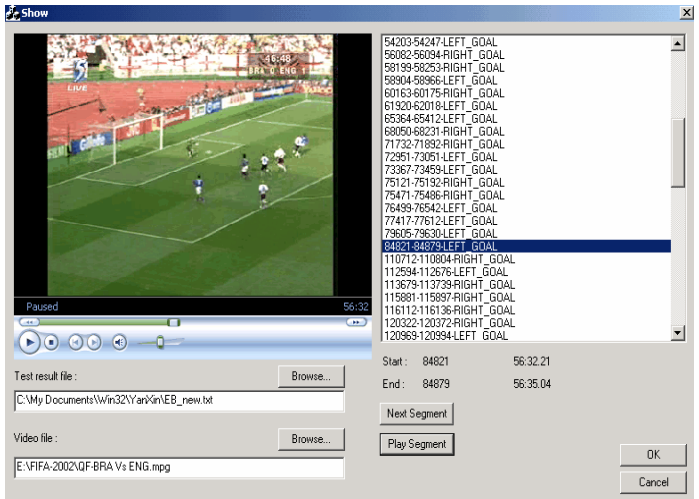
- **Robust Scene Modeling and Camera calibration**
  - Given a 2D court model of 3D scene that camera is capturing, identify 3D object positions robustly and accurately
- **Super-Resolution Image Reconstruction from Video**
  - Given a low resolution image sequence of an object far away from the camera, reconstruct a larger resolution image sequence
  - This is essentially an ill-posed problem, but we can apply domain info such as motion, pose, etc, to seek a good solution
- **Robust Object and Landmark Detection**
  - Real-time
  - Geometric invariance
- **Deployment and Application Constrains**
  - Real-time

Highlight Detection: How is it done?

- **Audio**
  - Detect raised pitch in commentator
- **Visual**
  - Detect goal-mouth appearances
- **Results**
  - 5-15% of original video length
  - 100% goal detected
- **Application**
  - Set-top-box / digital video recorder (client-side)
  - News summary (broadcast server-side)

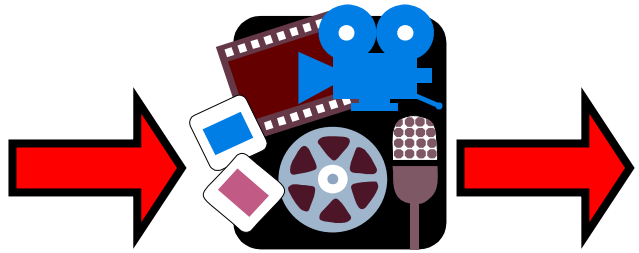






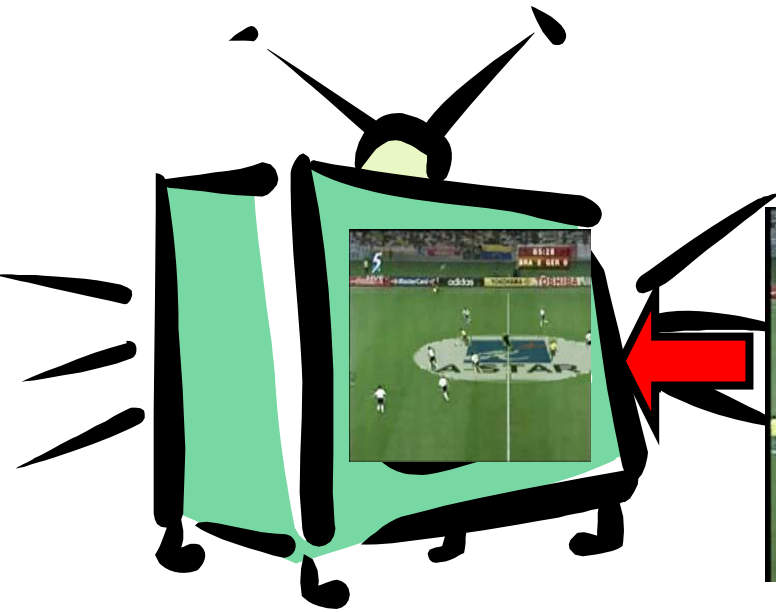
Virtual Content Insertion: How is it done?

Sporting Events

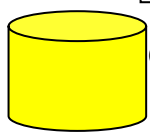


Live Broadcast / Repeat Telecast

Receive / Decode / Process



Determine
(1) WHEN is a good time to insert content
(2) WHERE is a Good place to insert content



Content DB (eg, Ads)

Acknowledgements

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