







Photos80 billion images410,000Home Video1.4 billion tapes300,000X-Rays2 billion images17,200Home Video200112,200	ITEM	AMOUNT	TERABYTES
Home Video1.4 billion tapes300,000X-Rays2 billion images17,200Value Video10,2760	Photos	80 billion images	410,000
X-Rays 2 billion images 17,200	Home Video	1.4 billion tapes	300,000
	X-Rays	2 billion images	17,200
Hard disks 200 million installed 13,760	Hard disks	200 million installe	ed 13,760

ITEM	AMOUNT	TERABYTES	
Books	968,735	8	
Newspapers	22,643	25	
Journals	40,000	2	
Magazines	80,000	10	
Newsletters	40,000	0.2	
Office Docume	nts 7.5E9	195	
Cinema	4,000	16	
Music CDs	90,000	6	
Data CDs	1,000	3	
DVD-video	5,000	22	
TOTAL		285	

Information: Film					
ITEM	UNITS	DIGITAL	TOTAL		
		CONVERSION	PETABYTES		
Photograph	ny 82E9	5Mb/photo	410		
Motion Pic	tures 4,000	4Gb/movie	0.016		
X-Rays	2.16E9	8Mb/radiograph	17.2		
ALL FILM *Peta	I TOTAL = 10 <sup>15</sup>		427.216		
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# MPEG Family of Standards MPEG-1(1992): for the storage and retrieval of moving pictures and audio on storage media. MPEG-2 (1995): for digital television, the response for the satellite broadcasting and cable television industries in their transition from analog to digital formats.







Feature Extraction       standardization ////////////////////////////////////	MPI	EG-7 ISO 1:	5938	
MPEG-7 Description         Search Engine           Feature Extraction: Content analysis (D, Ds) Feature extraction (D, Ds) Feature extraction (D, Ds) Authoring (Ds)         MPEG-7 Descriptors Schemes (Ds) Descriptors (Ds) Language (DDL)         Search Engine: Searching & Iltering Classification Manipulation Summarization Indexing	10	standardization		
Extension         MIECD-70-2000         Sanch Enging           Control analysis (D, Db)         Descriptions(Db)         Sanching 4 throng           Feature extraction (D, Db)         Descriptions (Db)         Classification           Annotation tools (Db)         Language (DDL)         Manipulation           Authoring (Db)         Summarization indexing	Feature Extraction	MPEG-7 Description	Search Engine	
	Feature Extraction: Content analysis (D, DS) Feature extraction (D, DS) Annotation tools (DS) Authoring (DS)	<u>MPEG-7 Scope:</u> Description Schemes (DSs) Descriptors (Ds) Language (DDL)	<u>Search Engine:</u> Searching & filtering Classification Manipulation Summarization Indexing	

















## MPEG-7 Terminology: Data

- Audio-visual information described using MPEG-7 without regard to storage, coding, display, transmission, medium or technology
- Intended to be sufficiently broad to encompass graphics, still images, video, film, music, speech, sounds, text, ...





#### Feature Examples

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- Color of an image
- · Pitch of a speech segment
- · Rhythm of an audio segment
- · Camera motion in a video
- Style of a video
- Title of a movie

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Actors in a movie

MPEG-7 Terminology: Descriptor (D)
Representation of a Feature
Defines syntax and semantics of the Feature representation
Allows evaluation of corresponding feature by means of the Descriptor Value
Several Descriptors may represent a single feature by addressing different relevant requirements

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# Color Quantization With 8 bits per pixel and color look up table we can display at most 256 distinct colors at a time. To do that we need to choose an appropriate set of representative colors and map the image into these colors

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### Non-Homogenous Texture Descriptor (Edge histograms)

- Represents the spatial distribution of five types of edges
  - vertical, horizontal, 45°, 135°, and non-directional
- Divide the image into 16 (4x4) blocks
- Generate a 5-bin histogram for each block
   80 dimensional feature vector
  - 240 bits
- Local features combined with 1 global and 13 (4+4+5) sets of semi-global edge-histogram bins for search.
  - 150 dimensions
- Weighted L<sub>1</sub> metric for comparison





















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# **3D Shape Descriptor**

- · Based on Shape spectrum
- · An extension of Shape Index (A local measure of 3D Shape to 3D meshes)
- · Captures information about local convexity
- Computes the histogram of the shape index over the whole 3D surface





















Quantitative evaluation of descripted	ors
<ul> <li>Consider a query q with ground-truth size NG(q).</li> <li>NG(q) usually varies between 3 and 32.</li> <li>Rank(g) = rank of ground-truth g as returned by the query.</li> <li>K(q) defines the bound on relevant ranks.</li> <li>Retrieval with rank larger than K(q) is a miss.</li> <li>f(g) = Rank(g) if Rank(g) ≤ K(q) <ol> <li>1.25*K(q) otherwise</li> </ol> </li> <li>Average Rank of q = AVR(q) = (1/NG(q)) * ∑f(g)</li> <li>Modified Retrieval Rank of q = MRR(q) = AVR(q) - 0.5*[1+NG(q)]</li> <li>Normalized MRR of q = NMRR(q) = MRR(q)/[1.25*K(q) - 0.5*(1+NG(q))]</li> <li>Average Normalized Retrieval Rate = AVNRR = NMRR(q) averaged over all queries.</li> </ul>	
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