

A multimédia technológiák alapjai

JPEG 2000



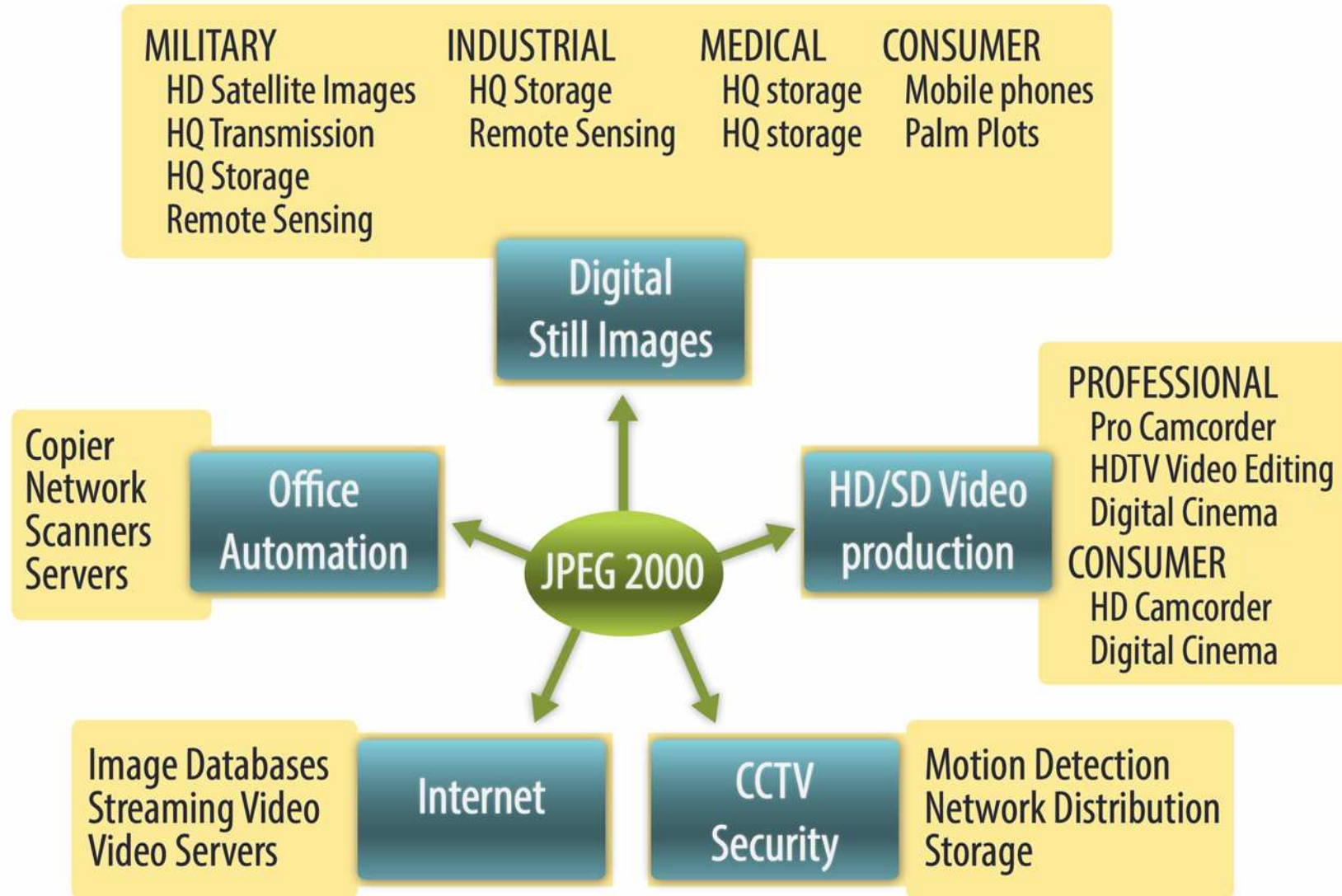
JPEG 2000 Image Compression

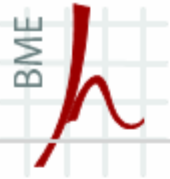
- Defines a new image-coding scheme
- Using state-of-the-art compression techniques
- Based on wavelet technology
- Provides both lossless and lossy compression in a single compression architecture
- It's useful for many diverse applications,
- including Internet image distribution,
- and medical imaging.

(ref: <http://www.analog.com/library/analogDialogue/archives/38-09/jpeg2000.pdf>)



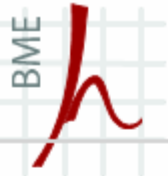
JPEG 2000 applications





JPEG VS JPEG 2000

JPEG	JPEG 2000
For natural imagery	For computer generated imagery
Discrete Cosine Transform	Discrete Wavelet Transform
File Extensions: .jpeg .jif .jpg .jpe	File extension: .jp2 .jpx .jpf .mj2
Lossy coding of continuous tone still images.	Lossless compression mode (identical to original image).
Currently applicable to most of applications	Currently NOT widely used

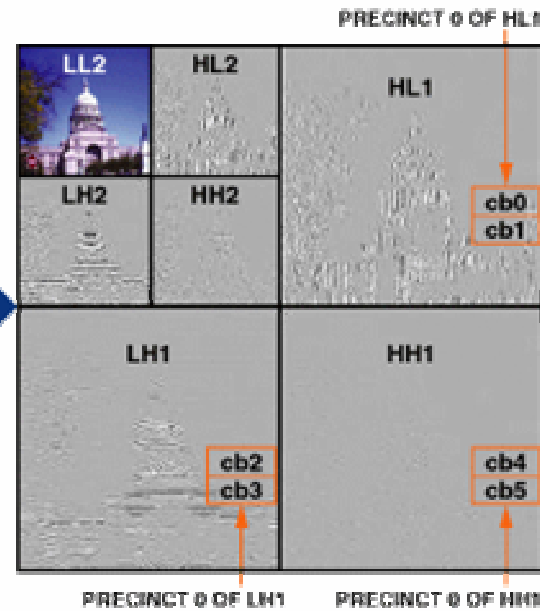


JPEG 2000 ENCODE

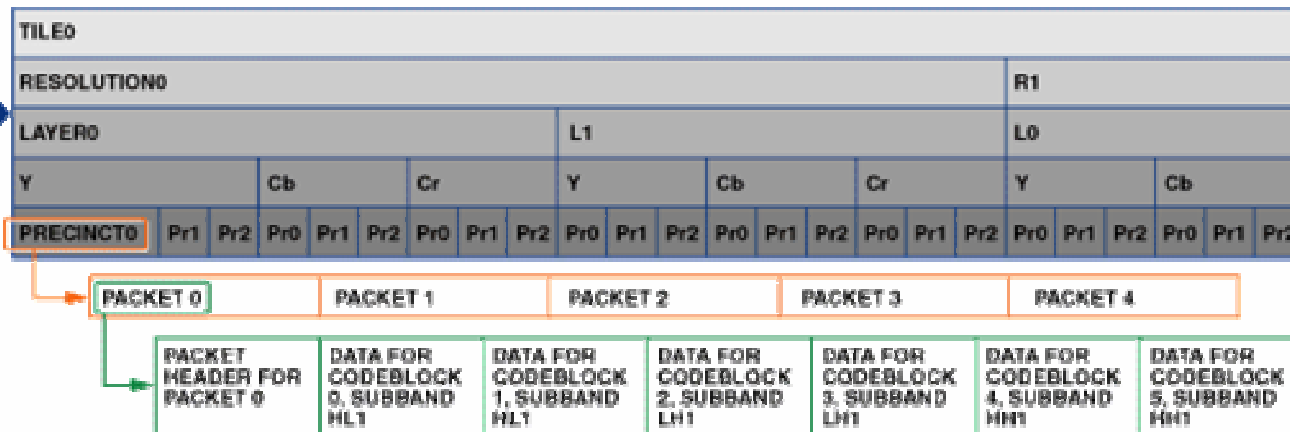
ORIGINAL TILE T0:

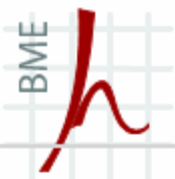


WAVELET TRANSFORM INTO SUBBANDS HL1, HH1, LH1, LL2, HL2, HH2, LH2



WAVELET COEFFICIENT DATA IS ARRANGED INTO THE JPEG 2000 CODESTREAM





JPEG VS JPEG 2000



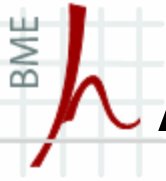
Original



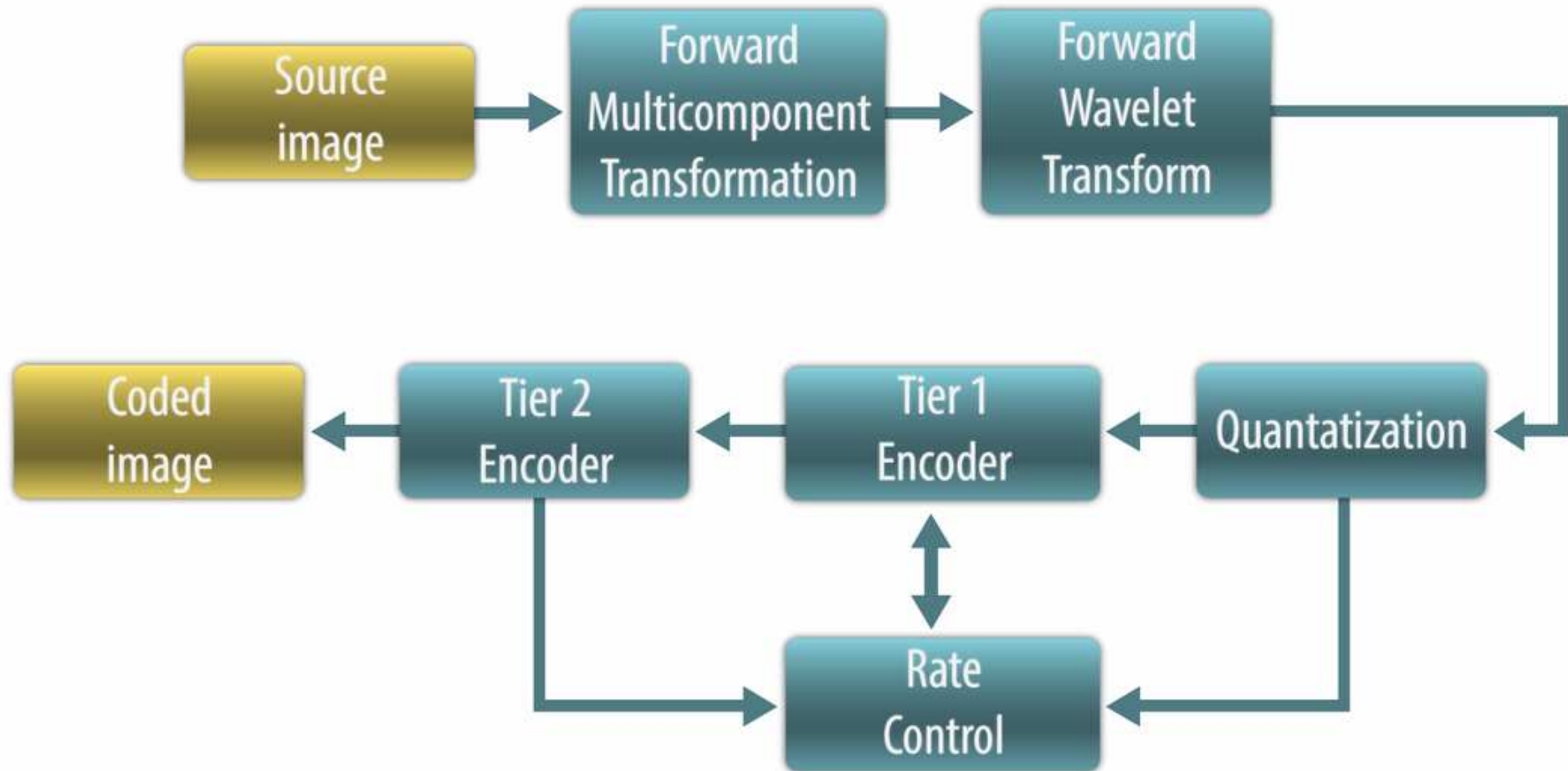
JPEG 1:64



JPEG2000 1:64



Architecture of the JPEG2000 Compressor





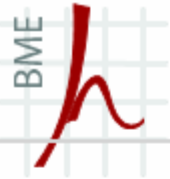
Wavelet Transform vs. Fourier Transform

Fourier transform:

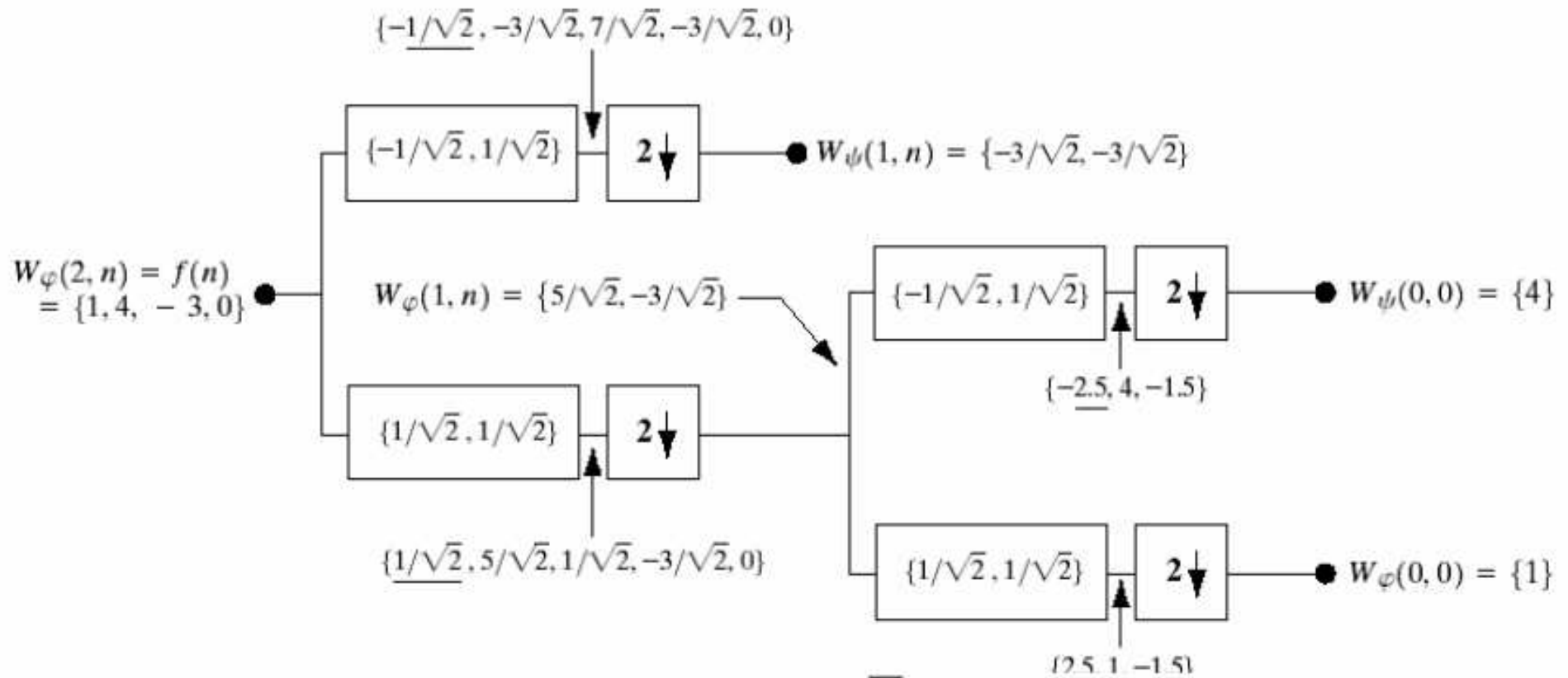
- Basis functions cover the entire signal range,
- varying in frequency only

Wavelet transform:

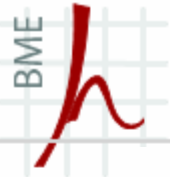
- Basis functions vary in frequency
- as well as spatial extend
- High frequency basis covers a smaller area
- Low frequency basis covers a larger area
- Non-uniform partition of frequency range
- and spatial range



Haar Wavelet – Analysis (illustration)



Computing a two-scale fast wavelet transform of sequence $\{1, 4, -3, 0\}$ using Haar scaling and wavelet vector

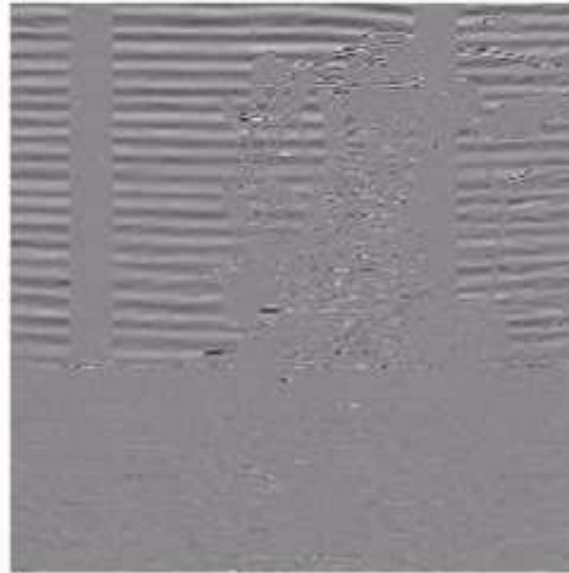


1 Stage Decomposition

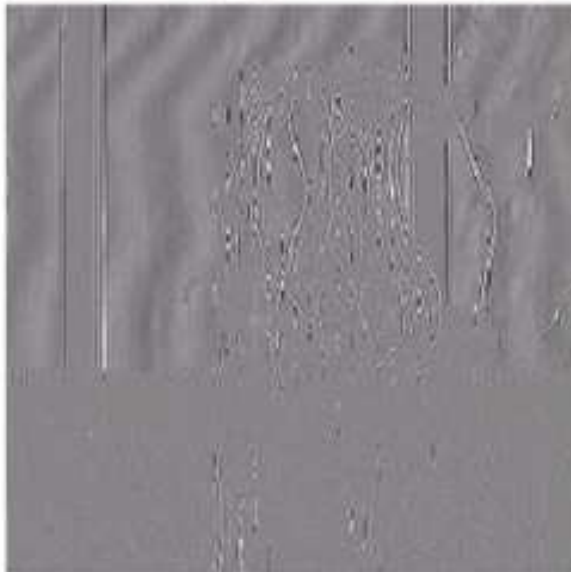
LL



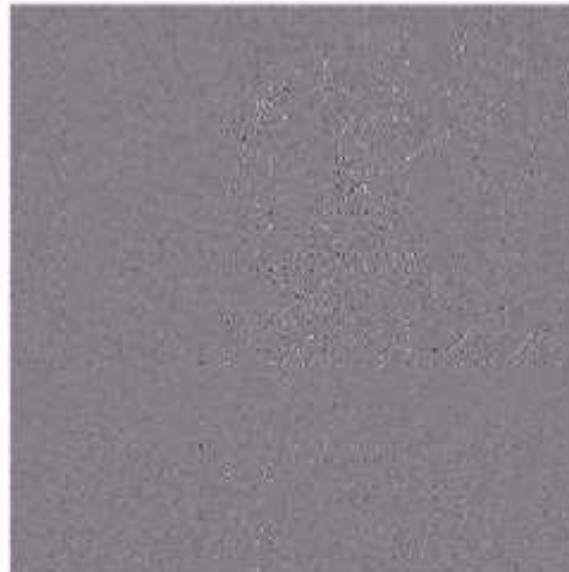
HL



LH



HH

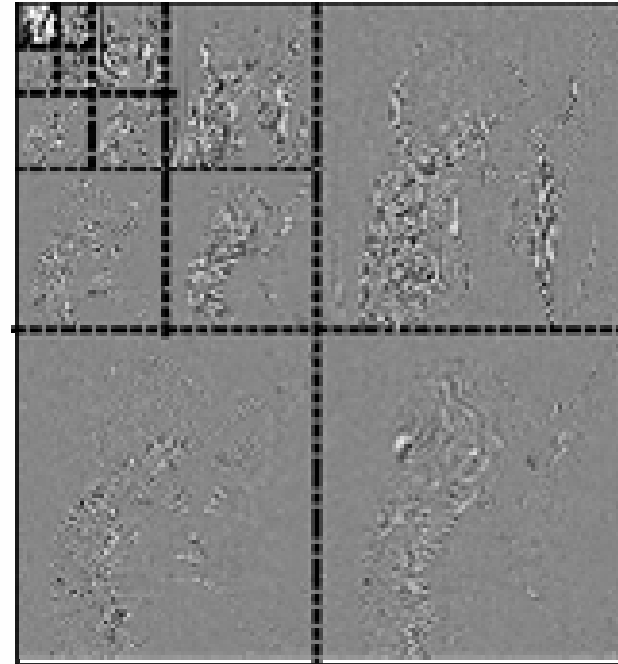




3D Hierarchy



ORIGINAL
128, 129, 125, 64, 65,



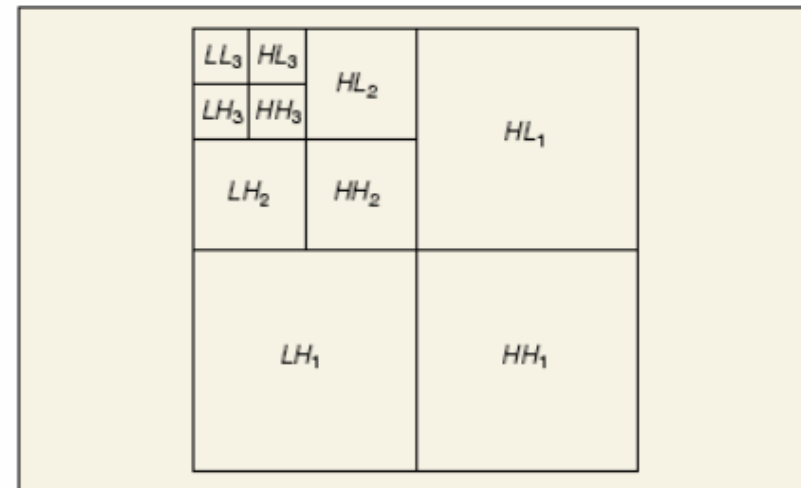
TRANSFORM COEFFICIENTS
4123, -12.4, 667, 4.5,



3D Hierarchy



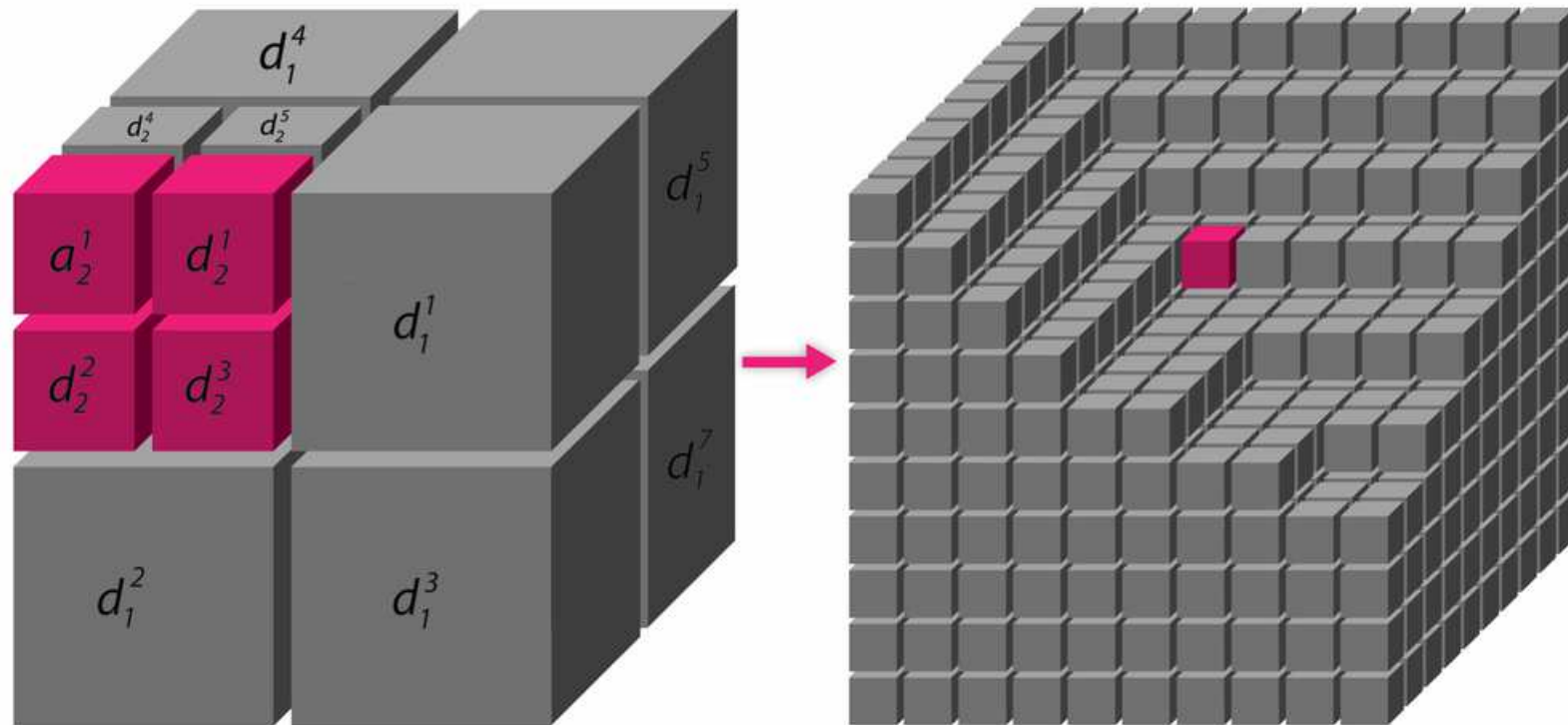
▲ 4. The subband labeling scheme for a one-level, 2-D wavelet transform.



▲ 6. The subband labeling scheme for a three-level, 2-D wavelet transform.



3D Hierarchy





3D Wavelet

