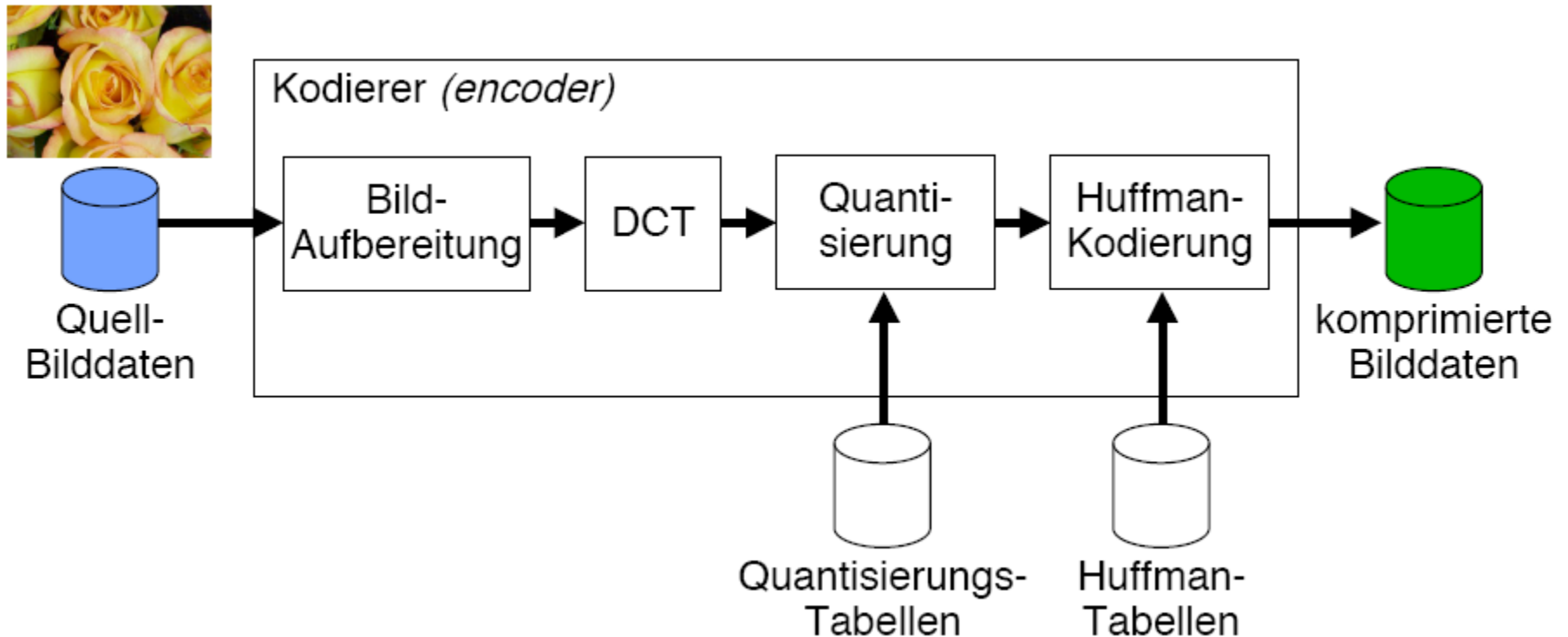


Übung zur Vorlesung  
**Digitale Medien**

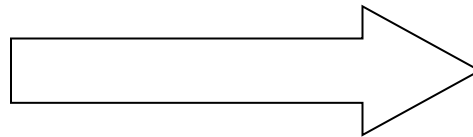
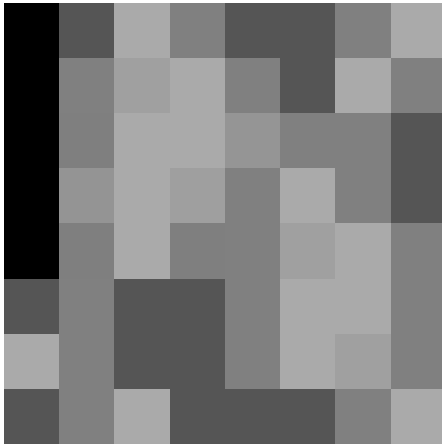
Doris Hausen  
Ludwig-Maximilians-Universität München  
Wintersemester 2011/2012

# JPEG Kompression (1)

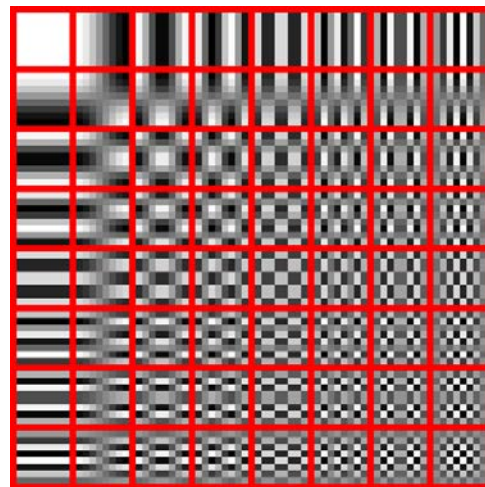


# JPEG Kompression (2)

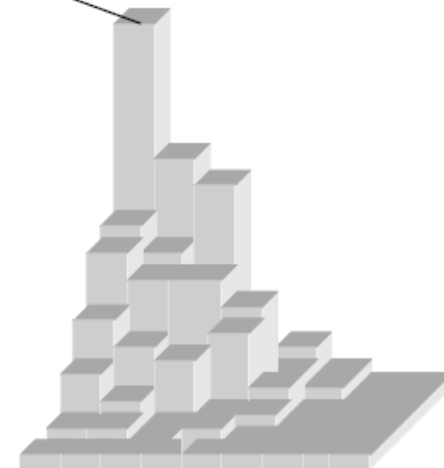
Konvertierung von 8x8 Bildblöcken in den Frequenzraum



Diskrete  
Cosinus  
Transformation



DC-Koeffizient  $F(0,0)$



# JPEG Kompression (3)

[http://pi4.informatik.uni-mannheim.de/pi4.data/content/animations/dct\\_2d/index.html](http://pi4.informatik.uni-mannheim.de/pi4.data/content/animations/dct_2d/index.html)

**2-Dim COSINE Transformation Visualizer**

Program Solution ?

**Image space**

**Target image**

191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191  
191 191 191 191 191 191 191 191

**Your approximation**

128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128  
128 128 128 128 128 128 128 128

**Difference**

63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63  
63 63 63 63 63 63 63 63

**Frequency space**

Table of coefficients U00-U07 [-2048,2048]

<b>U00</b> 0	U01 0	U02 0	U03 0	U04 0	U05 0	U06 0	U07 0
<b>U10</b> 0	U11 0	U12 0	U13 0	U14 0	U15 0	U16 0	U17 0
<b>U20</b> 0	U21 0	U22 0	U23 0	U24 0	U25 0	U26 0	U27 0
<b>U30</b> 0	U31 0	U32 0	U33 0	U34 0	U35 0	U36 0	U37 0
<b>U40</b> 0	U41 0	U42 0	U43 0	U44 0	U45 0	U46 0	U47 0
<b>U50</b> 0	U51 0	U52 0	U53 0	U54 0	U55 0	U56 0	U57 0
<b>U60</b> 0	U61 0	U62 0	U63 0	U64 0	U65 0	U66 0	U67 0
<b>U70</b> 0	U71 0	U72 0	U73 0	U74 0	U75 0	U76 0	U77 0

Reset coefficients

Try to solve in order

Example 1 (very easy) Customize input

Select quantization table

Do not quantize Show quantization table

Java Applet Window

# JPEG Kompression (4)

<http://www.sfu.ca/~cjenning/toybox/hjpeg/>

### JPEG and Hierarchical JPEG Demo

1. Choose a sample image:

2. Choose a chroma subsampling format:  
 None (4:4:4)    Quartered (4:2:0)





3. Choose a quality setting or...  
 Low  High  
 ...create custom quantization tables:





Luminance

Chrominance

16	12	14	14	18	24	49	72
11	12	13	17	22	35	64	92
10	14	16	22	37	55	78	95
16	19	24	29	56	64	87	98
24	26	40	51	68	81	103	112
40	58	57	87	109	104	121	100
51	60	69	80	103	113	120	103
61	55	56	62	77	92	101	99

Done

RGB / RGB-Output	
	
	

Cb / Cb-Output	
	
	

The first row of monitors shows the input image. The second row shows:

Zoom Level

x	y	
0	0	
R	G	B
122	117	89
Y	Cb	Cr
115	115	132

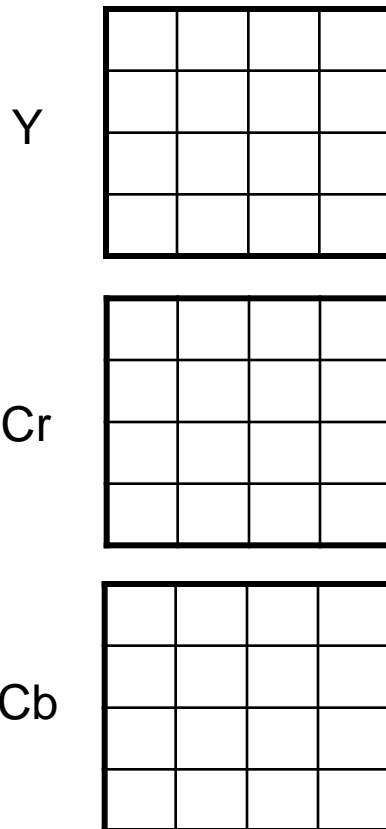
Data Values from Current 8 x 8 Data Block

132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132

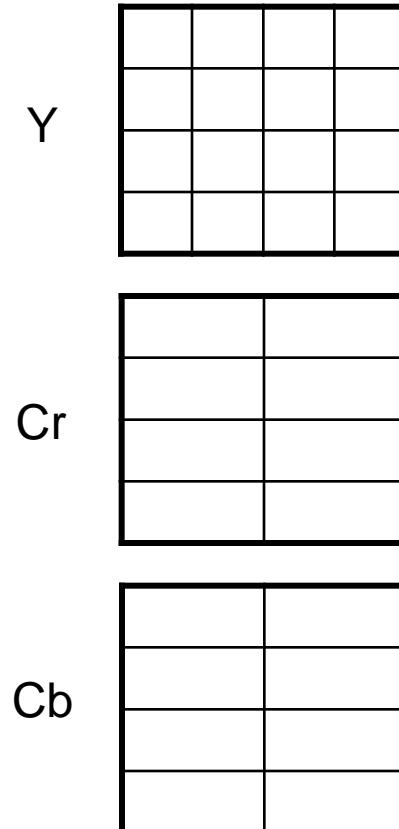
# Notation Subsampling

- Beide Chroma-Kanäle immer gleich abgetastet
- x: Anzahl der Luma-Samples, Vielfaches der NTSC-Abtastfrequenz 3.570 MHz; in der Regel „4“
- y: Anzahl der Cr/Cb-Chroma-Samples, horizontal
- z: Falls z=y: kein vertikales Subsampling der Chroma-Kanäle  
Falls z=0: vertikales Chroma-Subsampling 2:1 (zu den Luma-Samples)

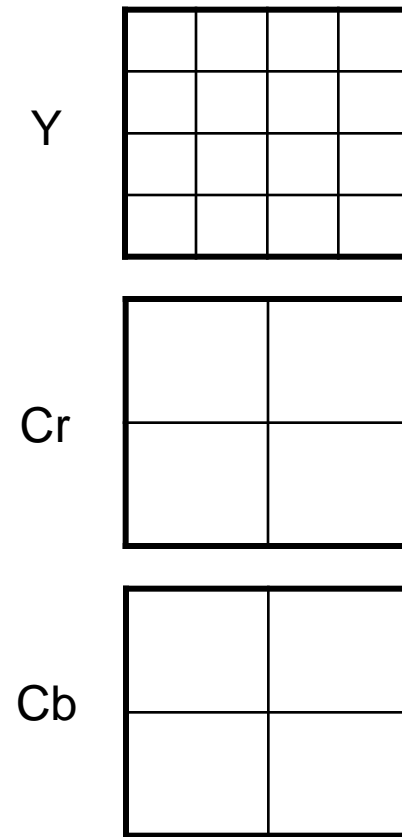
"4:4:4"



"4:2:2"



"4:2:0"



# JPEG Kompression (5)

<http://www.sfu.ca/~cjenning/toybox/hjpeg/>

### JPEG and Hierarchical JPEG Demo



1. Choose a sample image:



2. Choose a chroma subsampling format:  
 None (4:4:4)     Quartered (4:2:0)



3. Choose a quality setting or...  
 Low  High  
 ...create custom quantization tables:



16	12	14	14	18	24	49	72
11	12	13	17	22	35	64	92
10	14	16	22	37	55	78	95
16	19	24	29	56	64	87	98
24	26	40	51	68	81	103	112
40	58	57	87	109	104	121	100
51	60	69	80	103	113	120	103
61	55	56	62	77	92	101	99

Done

RGB / RGB-Output	
	

Y / Y-Output	
	

Cb / Cb-Output	
	

Cr / Cr-Output	
	

The first row of monitors shows the input image. The second row shows:

Zoom Level

x	y	
0	0	
R	G	B
122	117	89
Y	Cb	Cr
115	115	132

Data Values from Current 8 x 8 Data Block

132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132
132	132	132	132	132	132	132	132

# Bildmanipulation

Beispieldateien:

`/home/proj/mi_dm/img/newyork.jpg`

`/home/proj/mi_dm/img/winter.jpg`

oder `material9.zip`

