Wavelet-Kompression und Multiskalenanalyse

Vortrag zum Thema ‘Mathematik in Computerspielen’

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22. Mai 2018

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Motivation

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Gliederung

1. Multiskalenanalyse
2. 2D Haar-Wavelets
3. Algorithmen
4. Anwendungen

Multiskalenanalyse

am Beispiel der eindimensionalen Haar-Wavelets

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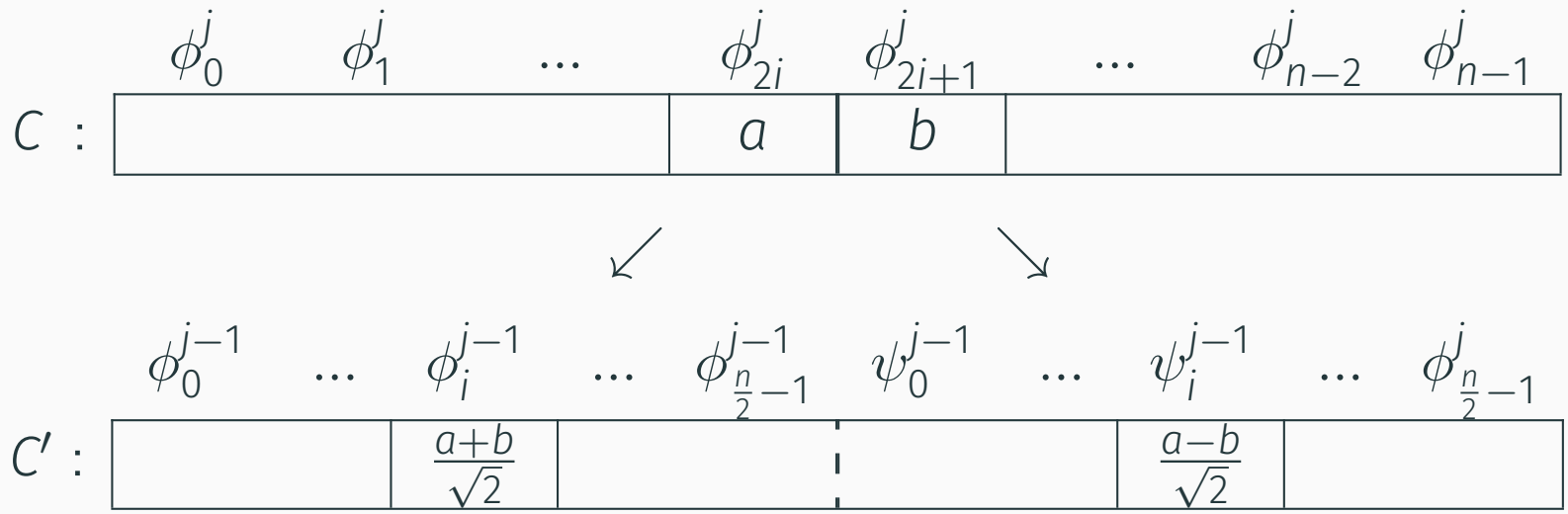
2D Haar-Wavelets

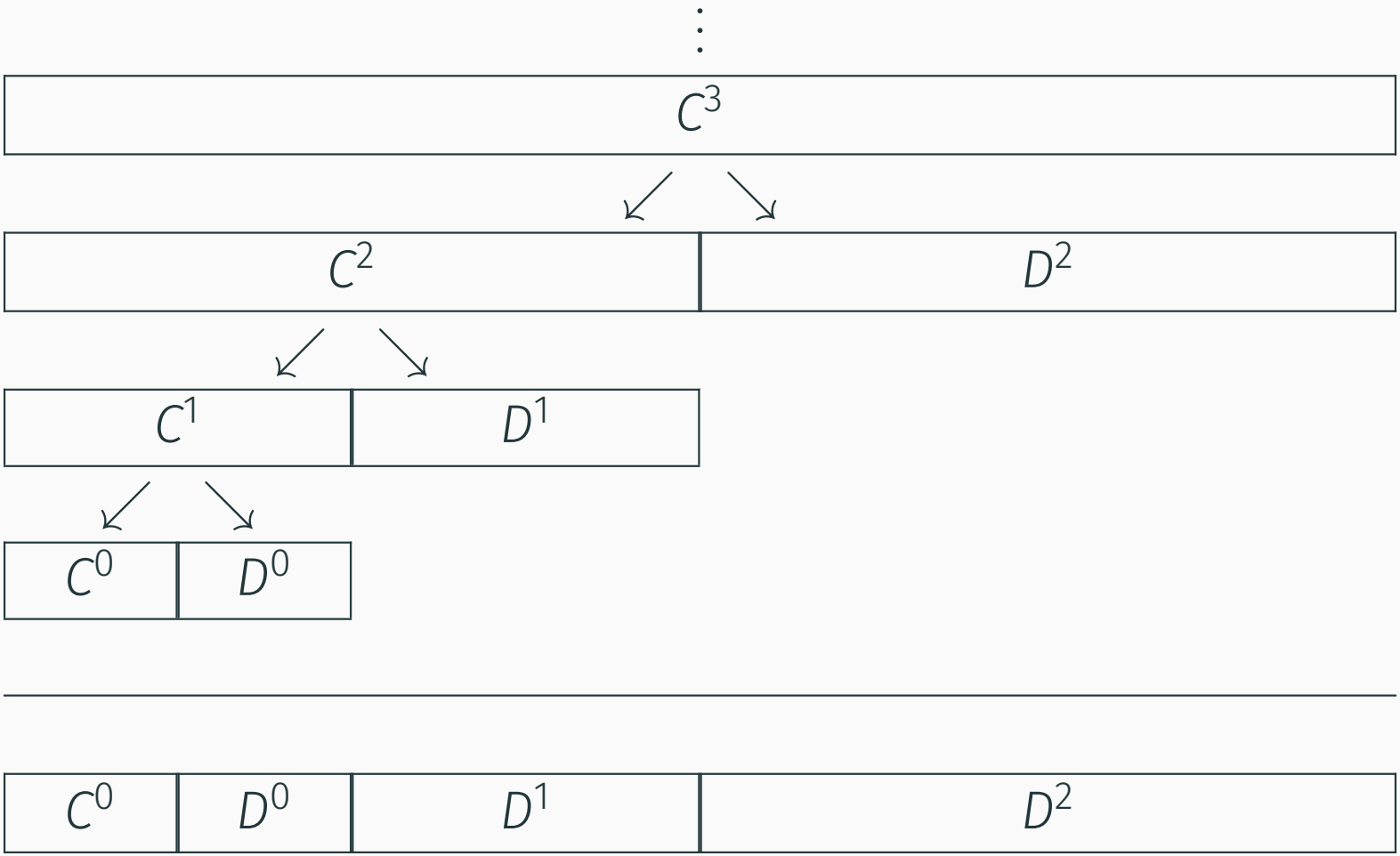
Bild-Kompression

Algorithmen

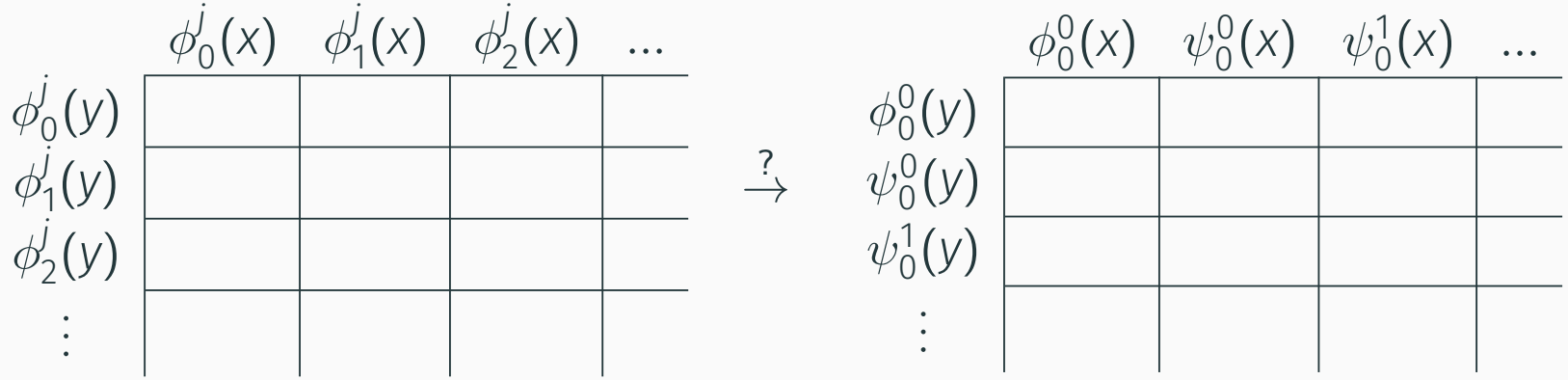
1D Haar-Wavelet-Transformation I



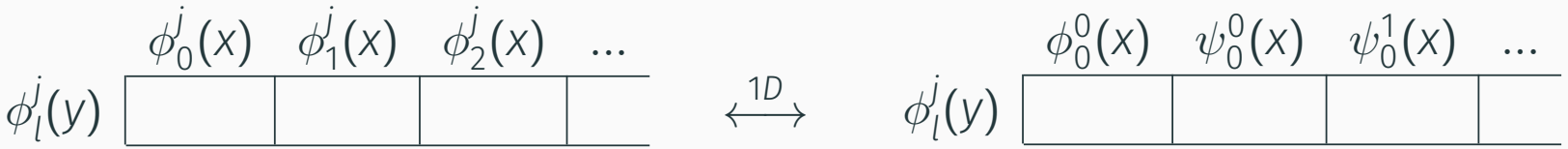
1D Haar-Wavelet-Transformation II

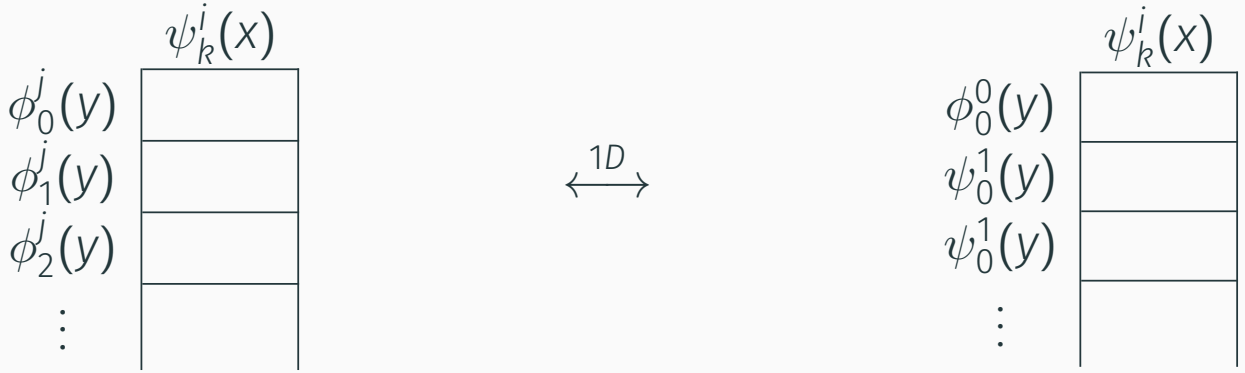


2D Standard-Haar-Wavelet-Transformation I

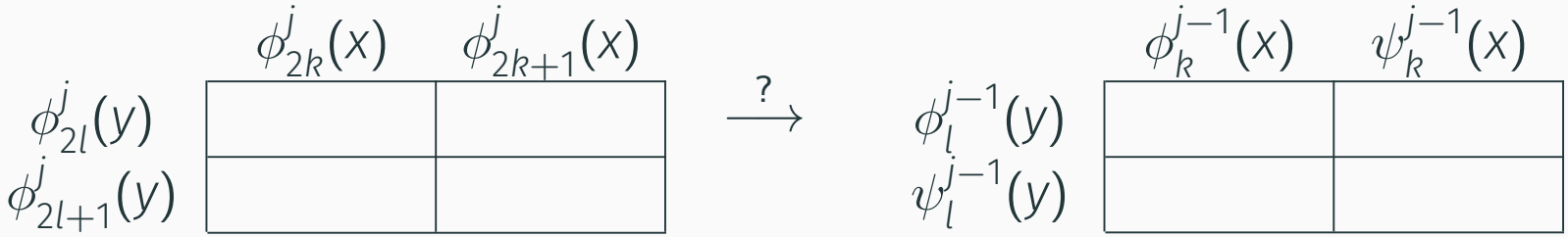


2D Standard-Haar-Wavelet-Transformation II





2D Nicht-Standard-Haar-Wavelet-Transformation I



2D Nicht-Standard-Haar-Wavelet-Transformation II

	$\phi^j_{2k}(x)$	$\phi^j_{2k+1}(x)$
$\phi^j_{2l}(y)$	a	b
$\phi^j_{2l+1}(y)$	c	d

$\xrightarrow{\text{1D}}$ Schritt $\xrightarrow{}$

	$\phi^{j-1}_k(x)$	$\psi^{j-1}_k(x)$
$\phi^j_{2l}(y)$	$\frac{a+b}{\sqrt{2}}$	$\frac{a-b}{\sqrt{2}}$
$\phi^j_{2l+1}(y)$	$\frac{c+d}{\sqrt{2}}$	$\frac{c-d}{\sqrt{2}}$

$\downarrow$1D Schritt$\downarrow$

	$\phi^{j-1}_k(x)$	$\psi^{j-1}_k(x)$
$\phi^{j-1}_l(y)$	$\frac{a+b+c+d}{2}$	$\frac{a-b+c-d}{2}$
$\psi^{j-1}_l(y)$	$\frac{a+b-c+d}{2}$	$\frac{a-b-c+d}{2}$

2D Nicht-Standard-Haar-Wavelet-Transformation III

	$\phi_0^j(x)$	$\phi_1^j(x)$	...	$\phi_{2k}^j(x)$	$\phi_{2k+1}^j(x)$	...
$\phi_0^j(y)$						
$\phi_1^j(y)$						
⋮						
$\phi_{2l}^j(y)$				a	b	
$\phi_{2l+1}^j(y)$				c	d	
⋮						

1D Zeilen ↓ 1D Spalten

	$\phi_0^{j-1}(x)$	...	$\phi_k^{j-1}(x)$	...	$\phi_{\frac{n}{2}-1}^{j-1}(x)$	$\psi_0^{j-1}(x)$	...	$\psi_k^{j-1}(x)$	...
$\phi_0^{j-1}(y)$									
⋮									
$\phi_l^{j-1}(y)$			$\frac{a+b+c+d}{2}$					$\frac{a-b+c-d}{2}$	
⋮									
$\phi_{\frac{n}{2}-1}^{j-1}(y)$									
$\psi_0^{j-1}(y)$									
⋮									
$\psi_l^{j-1}(y)$			$\frac{a+b-c+d}{2}$					$\frac{a-b-c+d}{2}$	
⋮									

Anwendungen

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Vielen Dank!