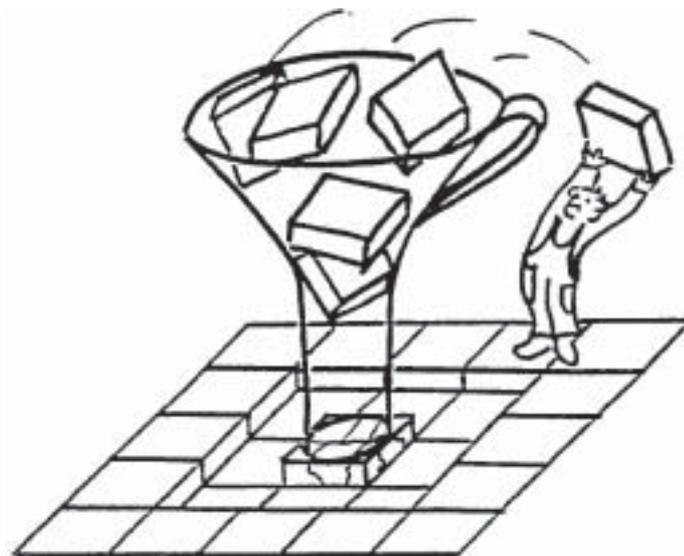




## Digitale Bildverarbeitung

1. Einführung
2. Digitalisierung
3. Technische Komponenten
4. Grauwertstatistik
5. Punktoperatoren
- 6. Lokale Operatoren**
7. Globale Operatoren
8. Merkmalsextraktion
9. Klassifikation
10. Codierung

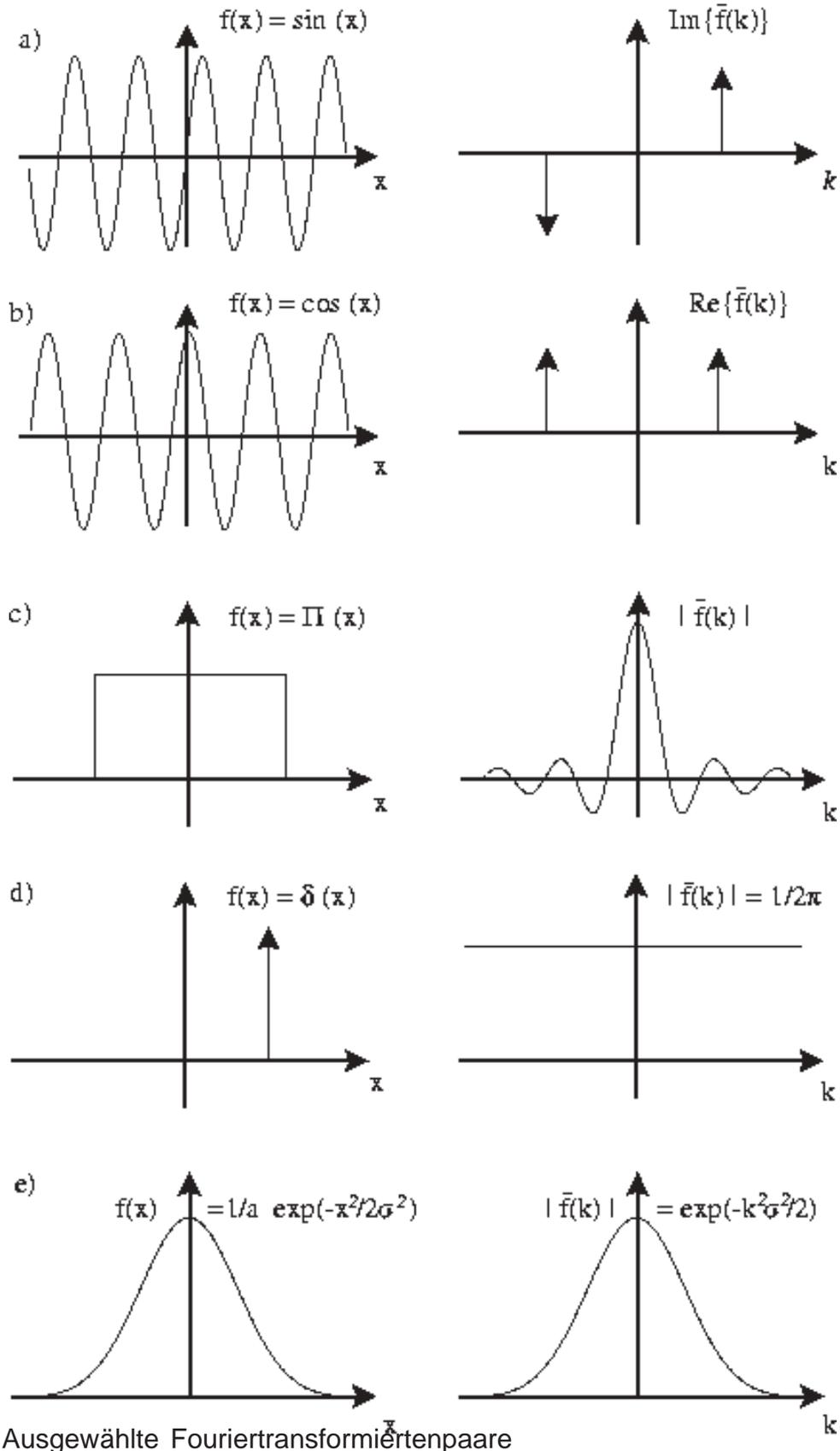


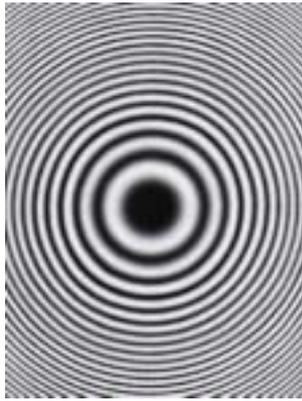


Ortsraum

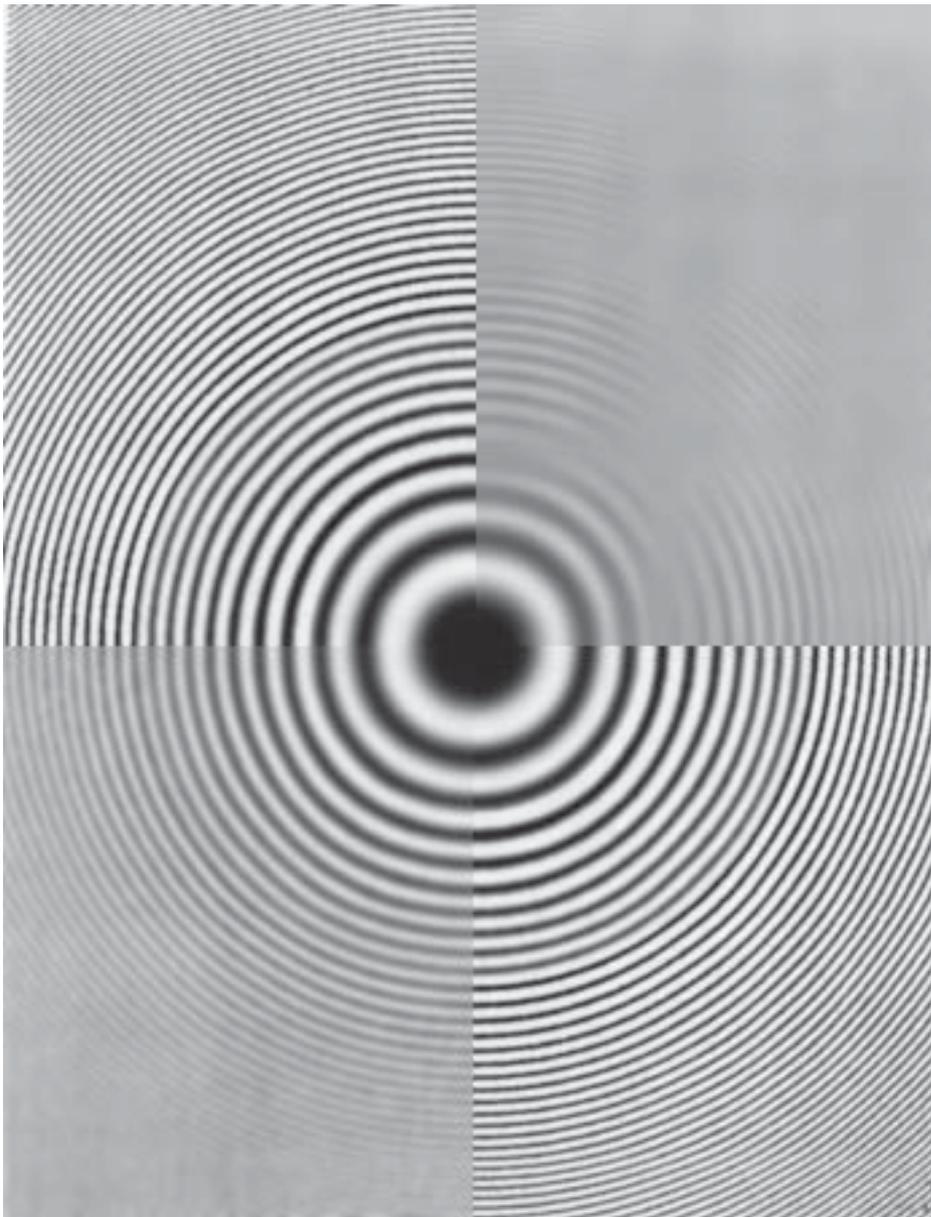


Fourierraum





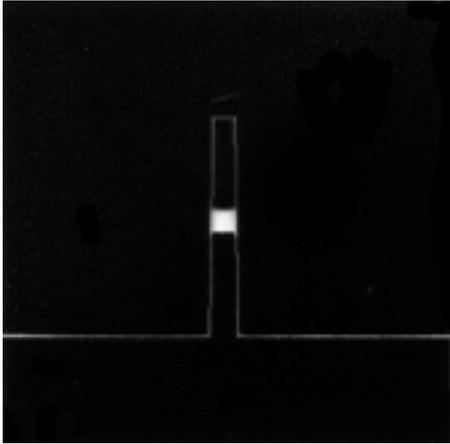
Testmuster: Zonenplatte



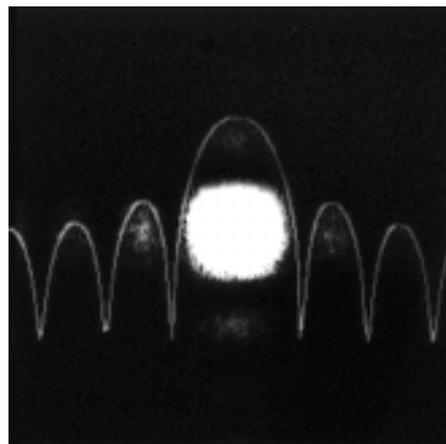
**Lokale Operatoren:**

Gaußfilter 9 x 9

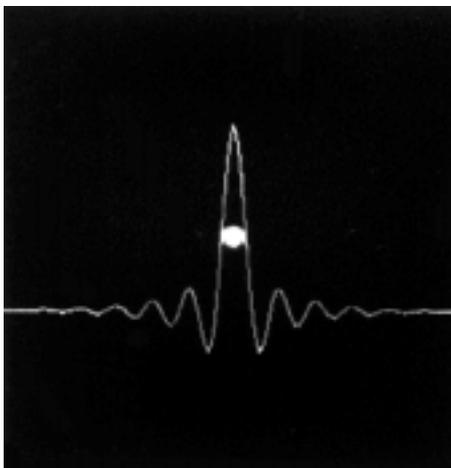
Mittelwertfilter 11 x 11



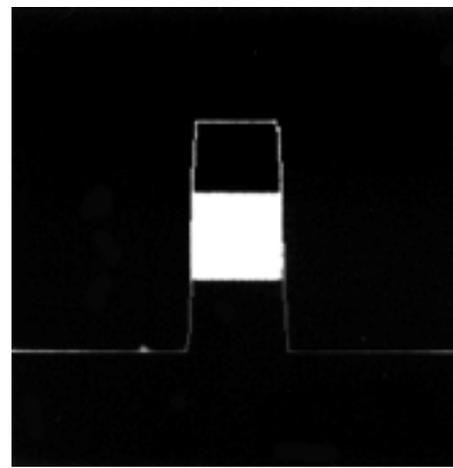
(A)



(B)



(C)

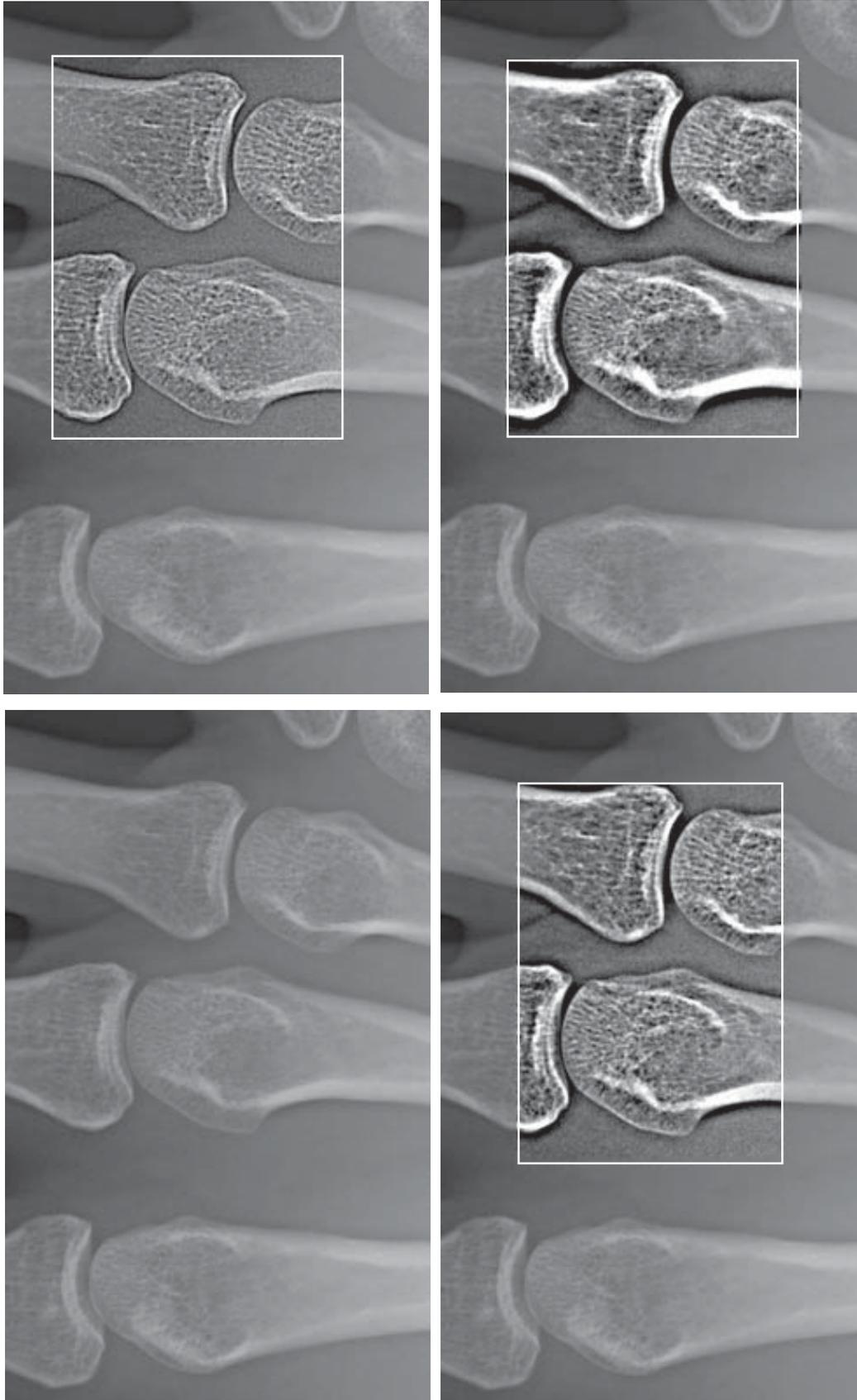


(D)

Transformation von Filterfunktionen mit Signalverlauf entlang der mittleren Zeile:  
 (A) Ortsbild des 7x7 Mittelwertfilters in einem Bildfeld 128x128 Bildpunkte,  
 (B) Powerspektrum dieses Mittelwertfilters  
 (C) und (D) Ortsbild und Amplitudenspektrum Tiefpaßfilter mit Grenzfrequenz von  $f_{gx} = f_{gy} = 0.1$

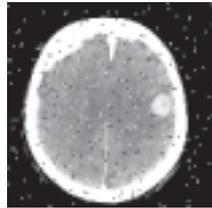
Koeffizienten für 9 x 9 Filter

0	0	0	0	-1	0	0	0	0
0	0	-2	-5	-6	-5	-2	0	0
0	-2	-6	8	24	8	-6	-2	0
0	-5	8	92	155	92	8	-5	0
-1	-6	24	155	248	155	24	-6	-1
0	-5	8	92	155	92	8	-5	0
0	-2	-6	8	24	8	-6	-2	0
0	0	-2	-5	-6	-5	-2	0	0
0	0	0	0	-1	0	0	0	0

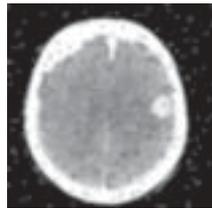


**Lokale Operatoren:**  
nichtlineare Operatoren  
Operator „Unschärf maskieren“

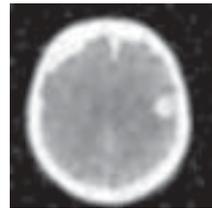
a) Original  
b) 3 x 3, Abweich. 2, 500%  
c) 7 x 7, Abweich. 2, 500%  
d) 15 x 15, Abweich. 2, 500%



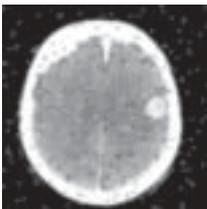
Original



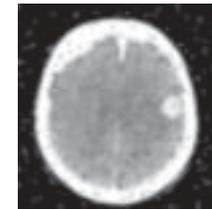
Mittelwert 3x3



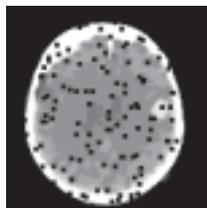
Mittelwert 5x5



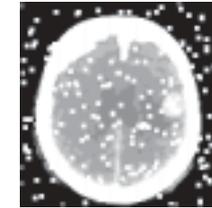
Gauss 3x3



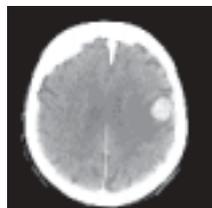
Gauss 5x5



Min-Op 3x3

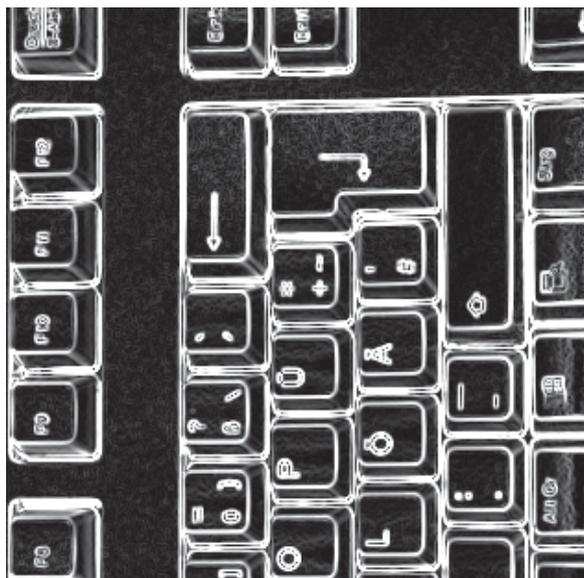


Max-Op 3x3



Median-Op 3x3

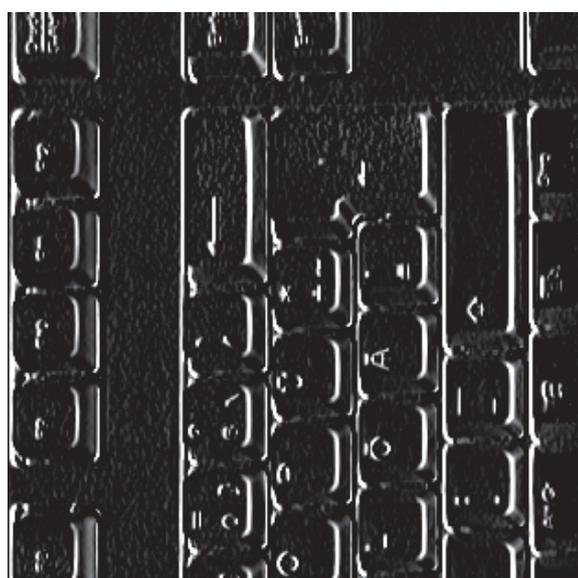
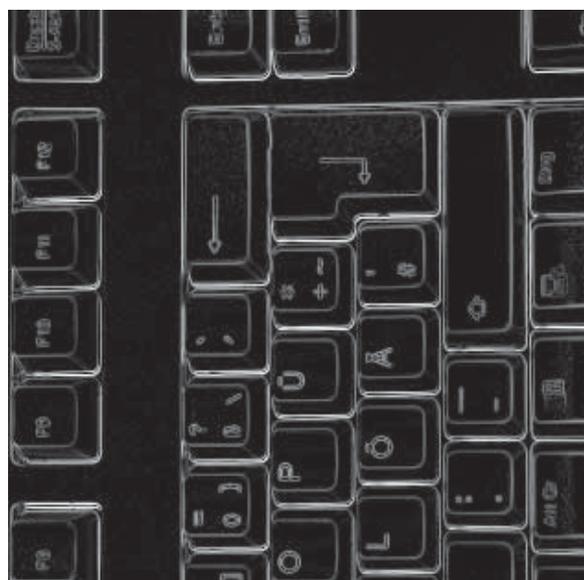
**Lokale Operatoren:**  
TP-Filter, Rangordnungsfiler

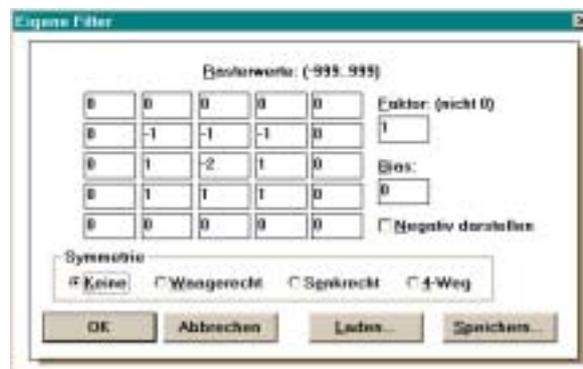
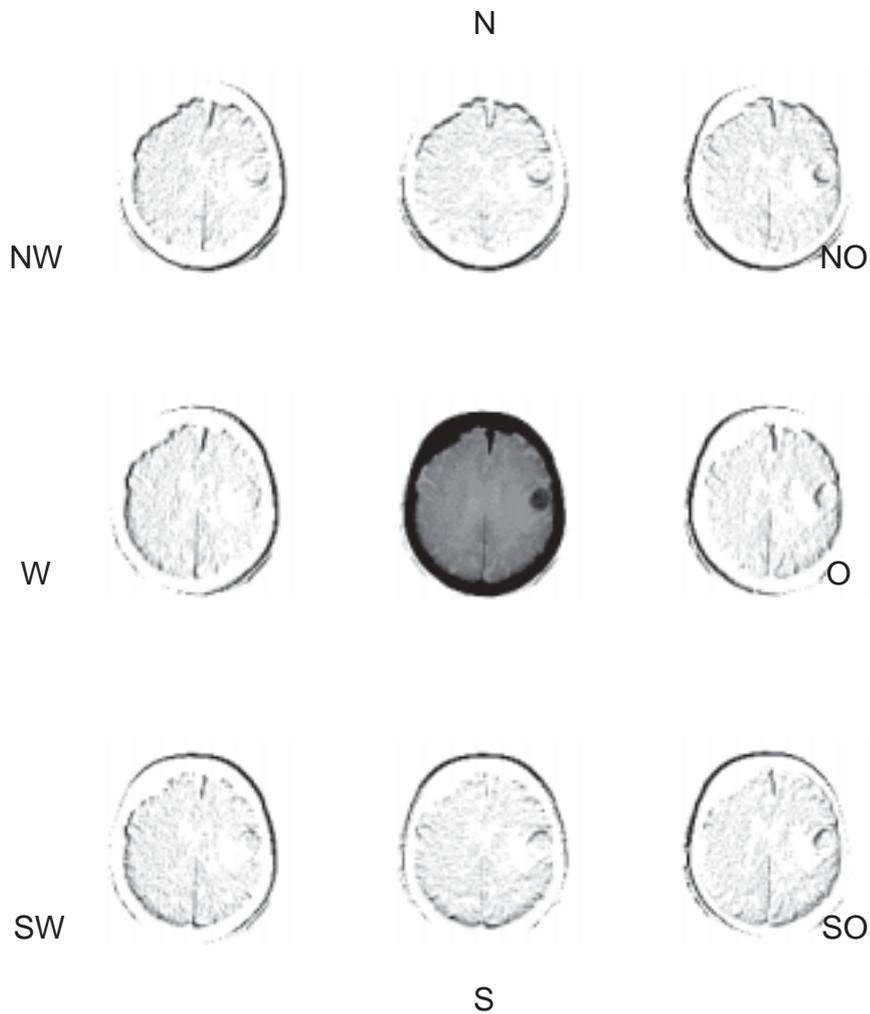


$$\begin{array}{|c|c|c|} \hline a & b & c \\ \hline d & e & \\ \hline \end{array}$$

**Lokale Operatoren:**  
 HP-Filter, Kantenextraktion

- a) Original
- b) Robertsgradient
- c) Sobelgradient
- d) Kantenfilter horizontal
- e) Kantenfilter vertikal





**Lokale Operatoren:**  
Kantenfilter mit Vorzugsrichtung