

Cache-optimierte QR-Zerlegung

Bachelor Kolloquium

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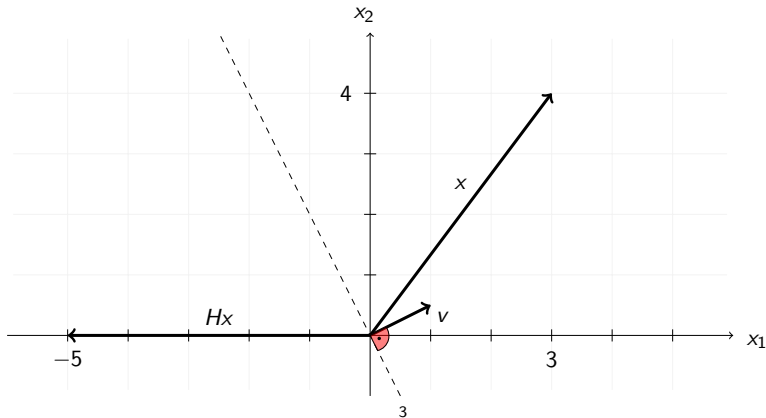
12. August 2018

QR-Zerlegung

► $A = QR$

Householder-Transformation

$$H = I - 2 \frac{vv^T}{v^T v}$$



Householder-Transformation

- ▶ Householder Vektor berechnen

$$Hx = \alpha e_1$$

$$\alpha = -1 \cdot \text{sign}(x_1) \|x\|_2$$

$$\tau = \frac{\alpha - x_1}{\alpha}$$

$$v = \frac{x - \alpha e_1}{x_1 - \alpha}$$

- ▶ Householder-Transformation anwenden

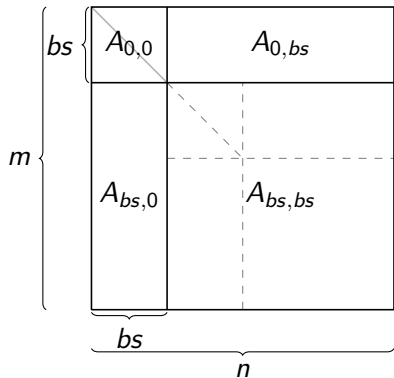
$$HA = (I - \tau vv^T)A = A - \tau(vv^T)A = A - \tau v(v^T A)$$

QR-Zerlegung mittels Householder

► $A = QR$

Geblockte QR-Zerlegung

► Matrix A



Householder-Transformationen anwenden

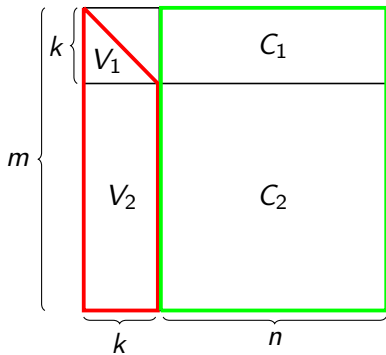
- ▶ Ansatz

$$H_1 H_2 \dots H_k = I - VTV^T \quad \text{mit} \quad H_i = I - \tau_i v_i v_i^T$$

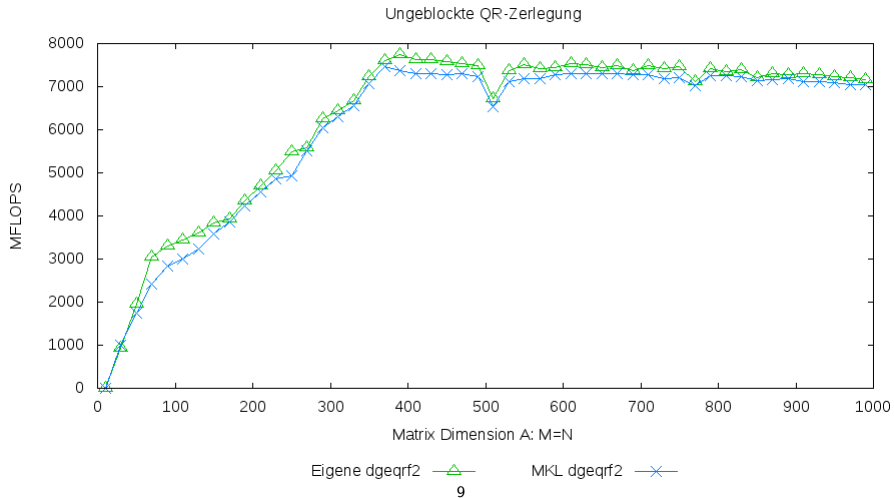
- ▶ Berechnung vom T

Householder-Transformationen anwenden

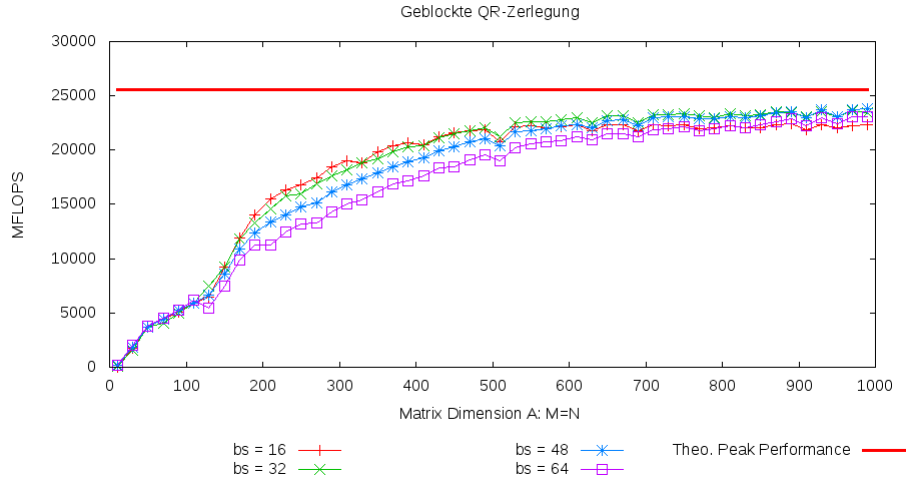
$$C \leftarrow HC = C - VTV^T C$$



Ungeblockte QR



Geblockte QR - Blocksizes



Geblockte QR - Blocksizes

