Rekonstruktor AO

$e = A\,x$ — řízení aktuátorů

e … výstup senzoru

A … poke matrix

$$\min_x \|Ax - e\|^2$$

$$\frac{\partial}{\partial \langle x|} \left(\langle x|A^+ - \langle e| \right)\left(A|x\rangle - |e\rangle \right) = 0$$

$$A^+ A\,|x\rangle = A^+ |e\rangle$$

$$|x\rangle = \underbrace{(A^+A)^{-1}A^+}\,|e\rangle$$

pseudoinv. $R = A^-$

regularizace (Tichonov.)

$$\min_x \|Ax - e\|^2 + \|x\|$$

$$A^+A\,|x\rangle - A^+|e\rangle + |x\rangle = 0$$

$$(A^+A + 1)\,|x\rangle = A^+|e\rangle$$

$$|x\rangle = \underbrace{(A^\dagger A + 1)^{-1} A^\dagger}_{R} |e\rangle$$

SVD: $A = U S V^\dagger$ ← diag.

$$R = (V S^\dagger U^\dagger U S V^\dagger + 1)^{-1} V S^\dagger U^\dagger$$

$$= (V S^\dagger S V^\dagger + 1)^{-1} V S^\dagger U^\dagger$$

$$= [V (S^\dagger S + 1) V^\dagger]^{-1} V S^\dagger U^\dagger$$

$$= V (S^\dagger S + 1)^{-1} V^\dagger V S^\dagger U^\dagger$$

$$= V \underbrace{(S^\dagger S + 1)^{-1} S^\dagger}_{\text{diag}\left(\frac{s_i}{s_i^2+1}\right)} U^\dagger$$

$$\text{diag}\left(\frac{s_i}{s_i^2+1}\right) \underbrace{U^\dagger |e\rangle}_{|e'\rangle} = \underbrace{V^\dagger |x\rangle}_{|x'\rangle}$$

$$\frac{s_i}{s_i^2+1} e_i' = x_i'$$

pícnos

Fourier slice theorem

Cvičení

spec. případ $\theta = \frac{\pi}{2}$

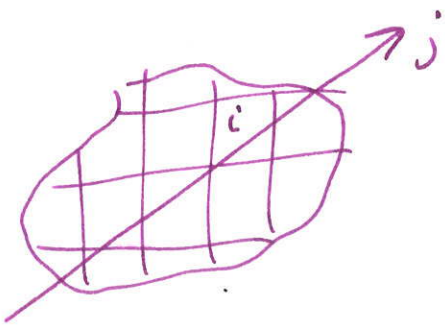
$$P_\theta(z) = \int g(z,y)\, dy$$

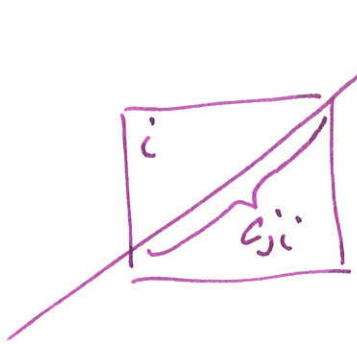
$$\mathcal{F}\{P_\theta(z)\} = \iint g(z,y)\, e^{-i 2\pi f z}\, dy \cdot dz$$

$$G(f_x, f_y) = \iint g(x,y)\, e^{-i 2\pi (f_x x + f_y y)}\, dx\, dy$$

$$G(f, 0) = \iint g(x,y)\, e^{-i 2\pi f x}\, dx\, dy$$

LIN problém





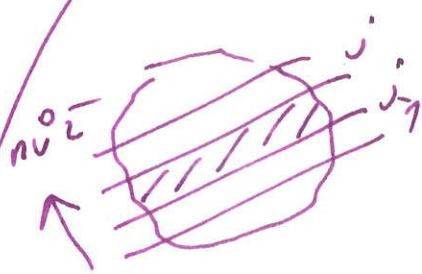
$$P_j = \sum_i c_{ji}\, g_i$$

sum

KL: $\sum_j d_j \log\left(\frac{P_j}{\sum_{j'} P_{j'}}\right)$

EM alg.

near-field



$I_j - I_{j-1}$

↓

projekce P_j