Have you seen your capillary vessels?

Photoacoustic Data Restoration

NII

どんな研究？

We are participating in AMED to realize early diagnosis of diseases and ultra-precise examinations, and are working on the advancement of photo-acoustic imaging for non-invasive, non-destructive, real-time 3D visualization of the inside of living bodies and objects. In this research, we proposed a computer vision technique for obtaining clear images in order to understand capillary vessel conditions closely related to diseases.

何がわかる？

- Explored the reliability variance in PA data.
- Proposed a restoration framework.
- Reconstruct high quality PA for further application.

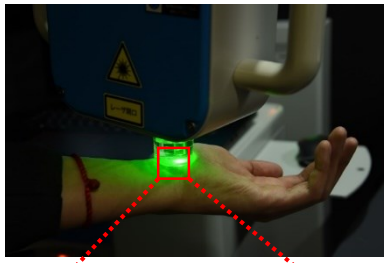
3 GOOD HEALTH AND WELL-BEING

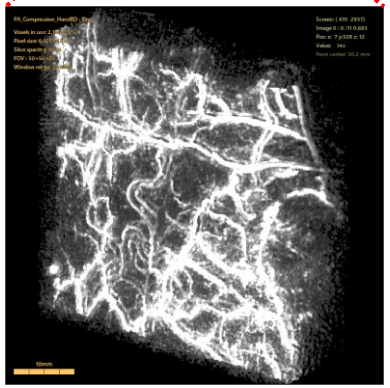
研究内容

PA scanning
time-consuming
complex noise

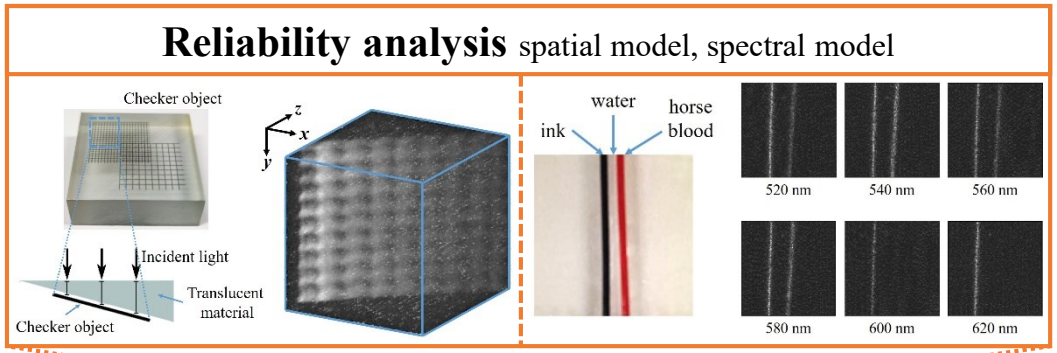
Imaging ↓ PA effect

Org data
degradation
low-quality
difficult to diagnosis

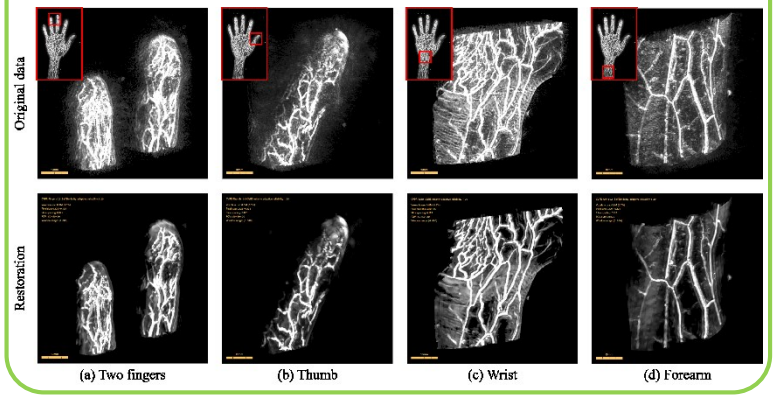




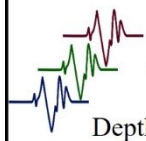
Reliability analysis spatial model, spectral model



Other visualization



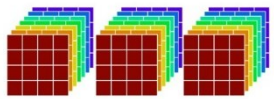
Observation: $\mathcal{O} = \mathcal{D}(\mathcal{P}) + \mathcal{N}$



$\mathcal{T}$ → Coeff.

Sparsity in transform domain

$$\|\mathcal{O} - \mathcal{D}(\mathcal{P})\|_F^2 + \|\mathcal{T}(\mathcal{P})\|_1$$

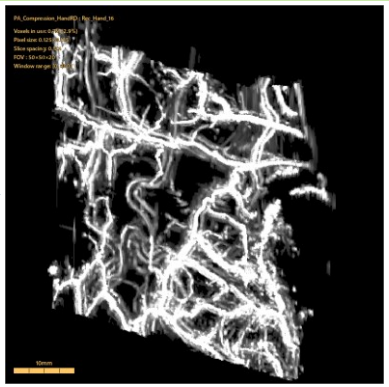


Self-similarity in 4D space

$$\|\mathbf{X}_l - \mathbf{Y}_l\|_F^2 + rank(\mathbf{Y}_l)$$

Restoration
correlation in 4D space
data constraints
regularization

Algorithm
ADMM
SVD



Rec result
clean, noise-free
high-quality
easy for diagnosis

Further medical check