Focusing EIT reconstructions using two electrode planes

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Background

EIT with a single electrode plane
Background

EIT with a single electrode plane

→

EIT with multiple electrode planes

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2017/06/22
Background

EIT with a single electrode plane

EIT with multiple electrode planes
Background

EIT with a single electrode plane

EIT with multiple electrode planes
Single vs multiple electrode planes

Single plane: $1 \times 32$
- Off-plane sensitivity
- Well understood

Multiple planes: $2 \times 16$
+ Better off-plane sensitivity
- Less well studied (plane separation, stim patterns, . . .)

Each vertical pixel is calculated with respect to the on-plane value, and shown by the contours (indicating 95%, 90%, 75%, 50% and 25% of the maximum).
Goal: better in-plane imaging

Can we use $2 \times 16$ placement to give better single slice measurements?
Goal: better in-plane imaging

Can we use $2 \times 16$ placement to give better single slice measurements?

Use this to study (heterogeneous) horse lungs:
- gravity-related pressure changes
- abdomen (with lots of gas) diagonally under lungs
- equine asthma $\rightarrow$ inhomogeneous lung changes
Methods: Data collection

- 1×32 belt
- 2×16 belt

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Methods: Electrodes

- Electrode belt: 1×32 or 2×16
- EIT system: Swisstim BBVet (32 elec at 50 frames/s)
- Stim/meas pattern: 1×32 (skip 4)

- Stim/meas pattern: 2×16 (skip 4 “square” pattern)
Methods: 3D Reconstruction

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Cross-sectional images

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Simulation images

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Vertical resolution vs. Plane separation (s)

1×32
s = 0.0

2×16
s = 0.1
s = 0.2
s = 0.3

NF=0.5

NF=2.0

50%
75%

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- Appears to have improved slice width
- "Drop-in" replacement for $1 \times 32$ Reconstruction Matrix
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  - How to choose reconstruction parameters ($\lambda$)
  - Effect of electrode errors
  - Efficient algorithm calculation
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  - Move abdominal gas (out-of-plane)
  - Evaluate effect on EIT images
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- Need a better term: “stimulation & measurement patterns”