Temporal Reconstructions in EIT

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Temporal Filtering Approaches

EIT has relatively low spatial resolution, but has high temporal resolution[1]. The measurements which constitute an EIT frame are not taken simultaneously. Approaches to interpret such data haven’t been systematically compared.

Results and Discussion

Given EIT image reconstruction (\(\hat{m}\) image, \(d\) data, \(J\) Jacobian, \(\Sigma_n\) noise covariance, \(\Sigma_m\) image prior)

\[
\hat{m} = \Sigma_m T^T J^T (J T \Sigma_m T^T J + \Sigma_n) F d
\]

where \(T\), \(F\) are temporal and interpolation filters. Proposed approaches are:

- **Temporal ignorance** (not shown). Assuming temporal effects are negligible. (\(T = F = I\))
- **Temporal reconstruction** [2]: prior has temporal and spatial model (\(T\): temporal covariance, \(F = I\))
- **Temporal interpolation** [3]: interpolated measurements, classic reconstruction (\(F\): filter, \(T = I\))
- **Kalman filtering** [4] (not shown).

Fig. 2: Simulation and Reconstruction images (on circular domain, half shown). Left: Simulation matrix, with an object moving from top (blue) to bottom (red) during three acquisition frames; the first acquisition of each frame is marked white; A: Reconstruction of a frame of data with the object still at 90° (reference image); B: Temporal ignorance; C: Linear temporal interpolation; D: Temporal reconstruction [2].