

ASSIGNMENT 2: Backward Propagation Technique

Checkout: Friday, February 1
Due: Tuesday, February 5, 6pm

Name: _____

Objective: The main objective of this programming assignment is to experience image formation by backward propagation for a simplified 2D case instead of the full-scale 3D *plan-to-plane model*.

The *receiver aperture* is organized in the form of a centered linear receiver array with a span of 60λ (from $x = -30\lambda$ to $x = +30\lambda$). This receiver array is located at the *plane* $y = y_o = -60\lambda$. With quarter-wavelength spacing ($\lambda/4$) spacing, there are 241 wavefield data samples in total over the 60λ -long aperture. The 241-point samples of the complex wavefield are provided.

- (A) Perform image reconstruction of the $60\lambda \times 60\lambda$ 2D source region. The source region is a square area centered at $(0, 0)$ and bounded by $x = \pm 30\lambda$ and $y = \pm 30\lambda$. For consistency, use quarter-wavelength spacing as the sample spacing in both directions.
- (B) Repeat the exercise with only the phase information of the wavefield samples.
- (C) Repeat the exercise with only the phase information of the wavefield samples and phase-only integration kernel (Green's function) for image reconstruction.
- (D) Plot the magnitude distribution of your reconstructed images.

Report format:

1. Cover page.
2. Figures
3. Summary: (comments based on your observations)
4. Appendix: (computer code)