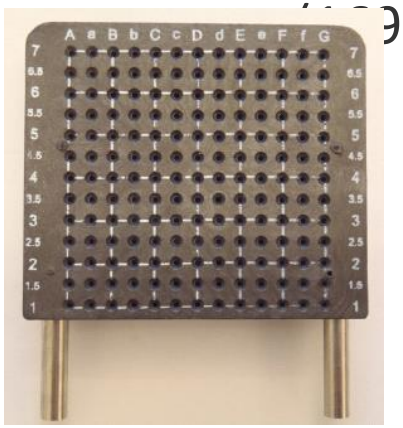
Effects of Imaging Parameters

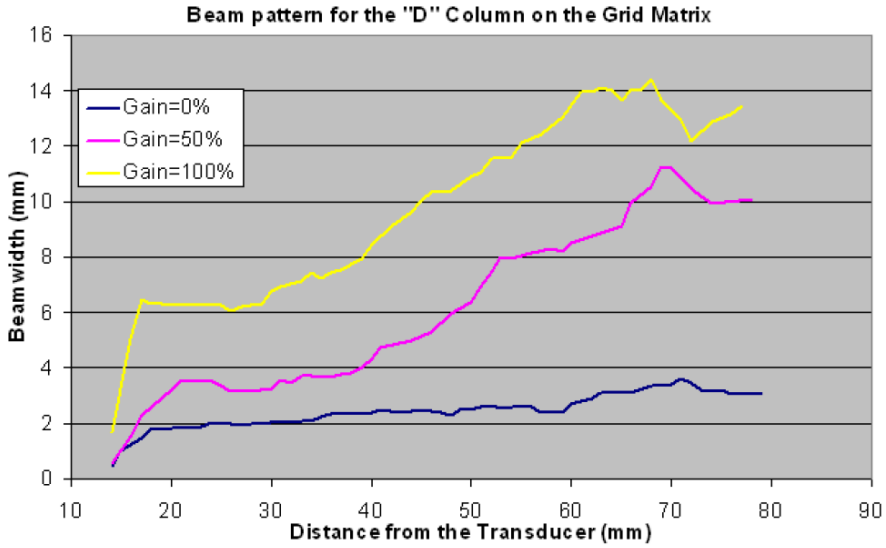
- 27 combinations of US imaging parameters were examined

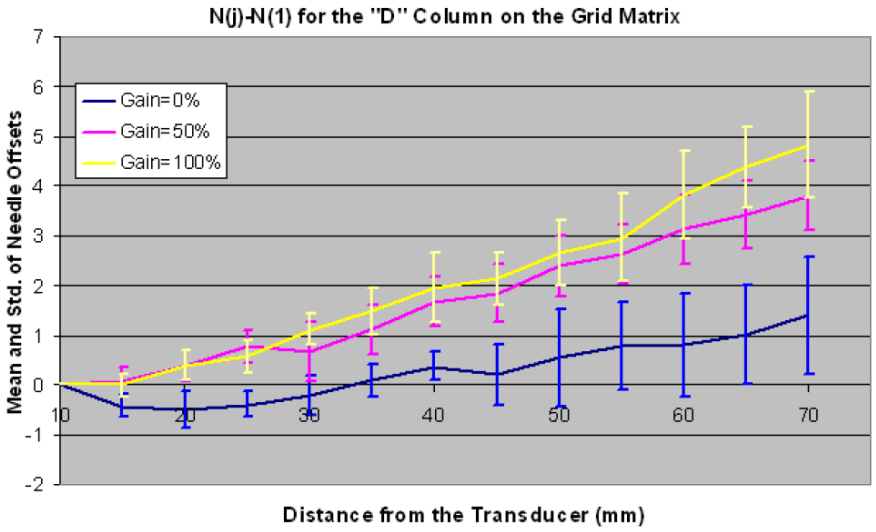
Experiments	Frequency (MHz)	Gain (%)	Dyn. Range (dB)	Power
Beam Profiling	6	0, 50, 100	50	-4
Needle Insertion	6	0, 50, 100	15, 50, 100	0, -4, -7

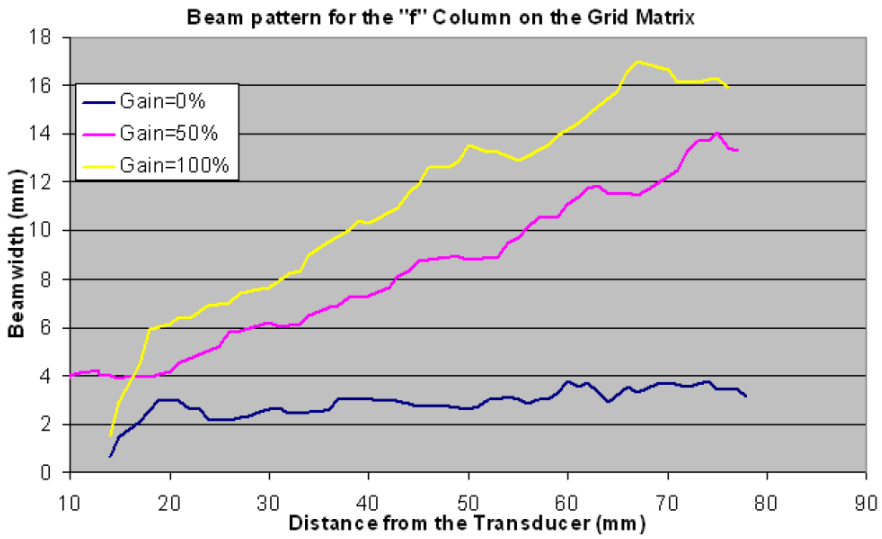
- For each combination, all the lateral and axial positions of the grid template were considered (positions)

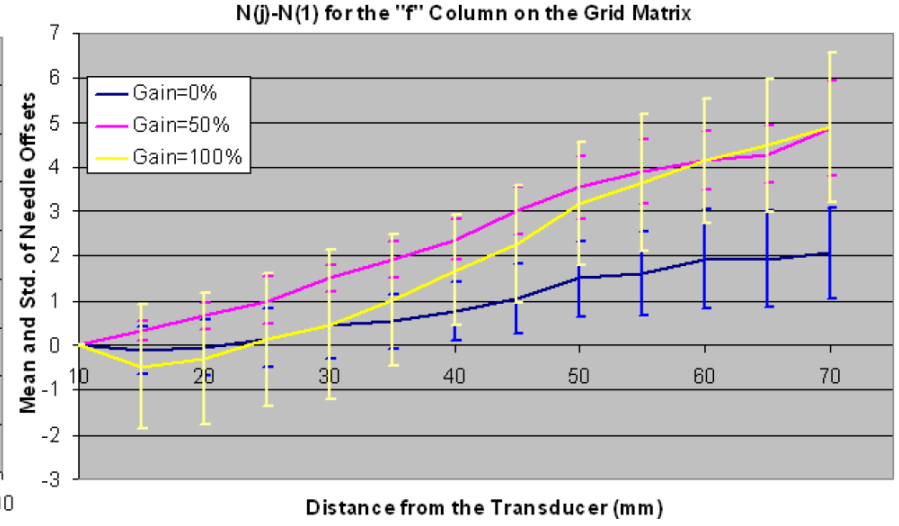


Beam Profile Vs. Needle Tip Profile

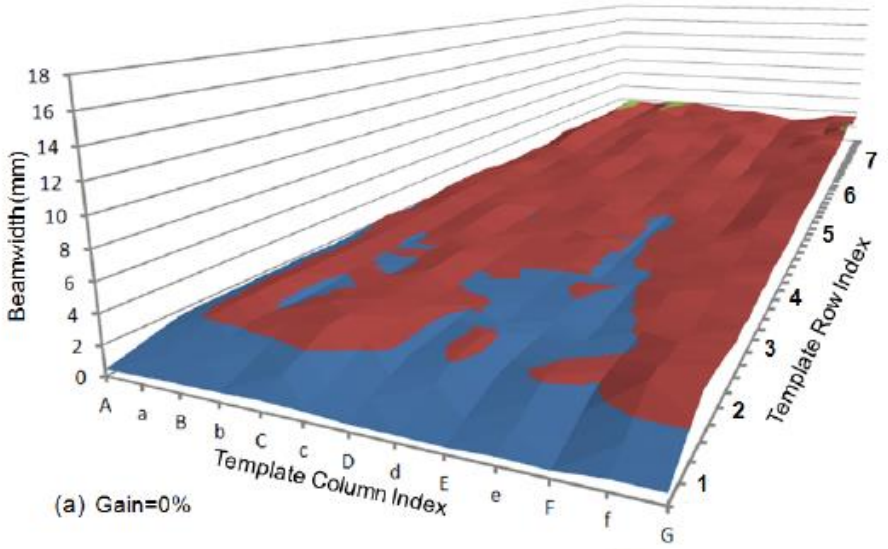




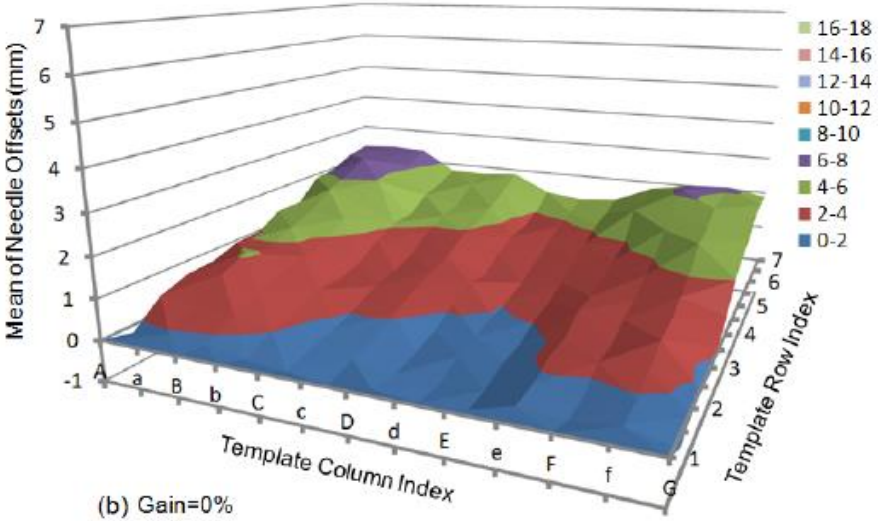




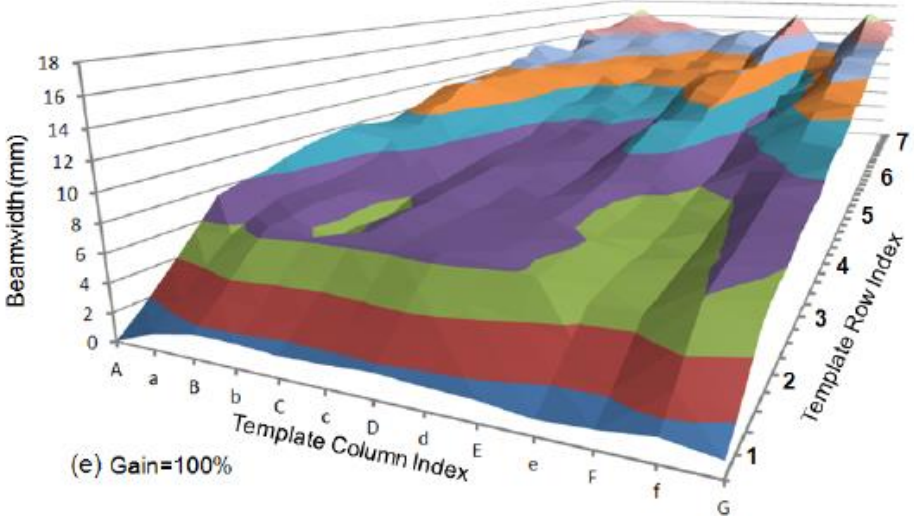
Beam Profile Vs. Needle Tip Profile



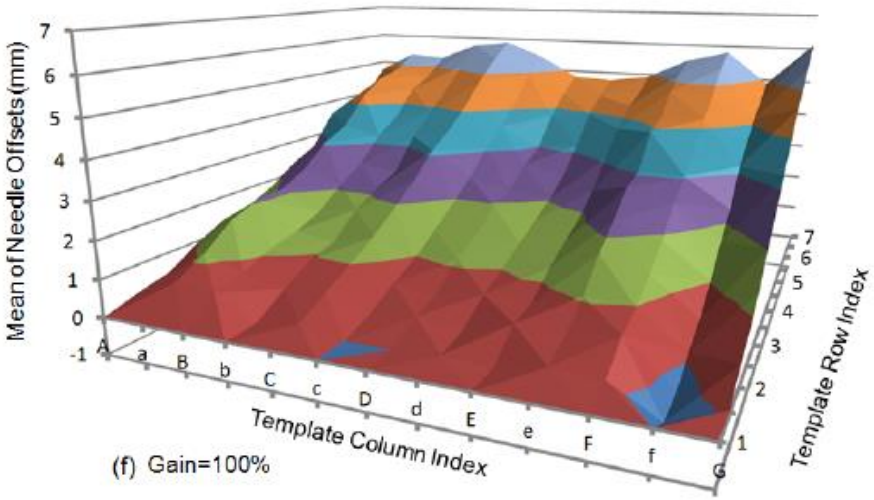
(a) Gain=0%



(b) Gain=0%



(e) Gain=100%



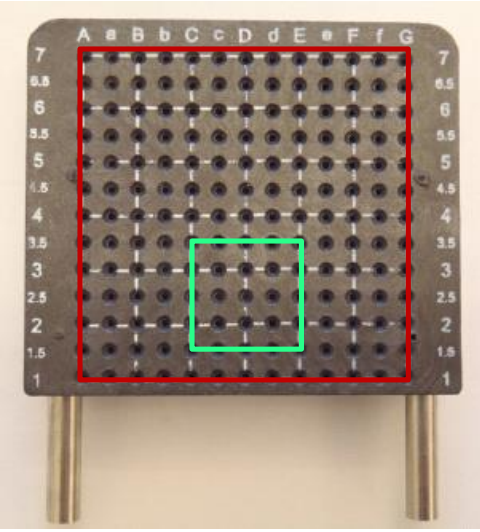
(f) Gain=100%

Contributions

- Designed a beam profiling phantom compatible with commercial steppers
- Generated beam profiles for all axial and lateral positions
- Measured needle tip localization error over all lateral and axial positions
- Examined the effects of US imaging parameters on needle tip localization error
- Identified the best region within the US image slices with highest accuracy in object localizations

Future Works

- Measure the beamwdiths of a linear and curvilinear transducers
- Examine the needle tip error by targeting needles in animal tissues
- Automate the beamwidth segmentation process
- Eliminate artifacts by changing the beam forming algorithm
- **Incorporate the US beam profiles and localization errors into important surgical navigation systems**



Thank You!

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