

## INTRODUCTION

- Conventional two-dimensional (2D) ultrasound imaging is relatively safe, economical, and fast yet operator dependent as it can only yield selective cross-sectional images of a complete three-dimensional (3D) anatomic volume.
- 3D ultrasound imaging can capture a region of interest more thoroughly.
- While 3D ultrasound imaging acquisition and reconstruction methods have been developed, the previous methods can be expensive.
- **GOAL: Present a low-cost 3D ultrasound volume acquisition and reconstruction method.**

## METHODS

- Two Inertial Measurement Unit (IMU) and two optical trackers were attached to an ultrasound transducer to collect the movement and the orientation of the transducer as shown.

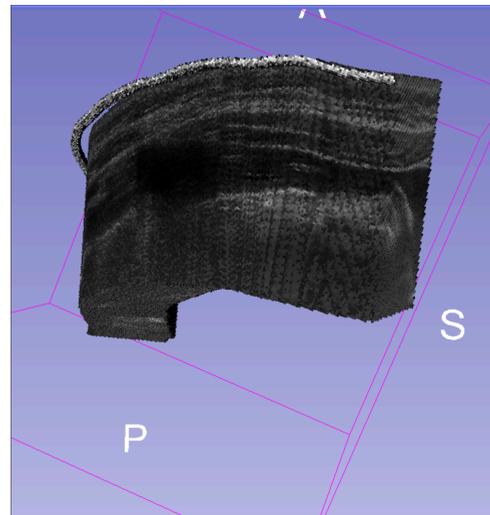


As the ultrasound transducer swiped a surface of interest, conventional 2D ultrasound images were acquired from an ultrasound scanner through a video grabber, each with associated orientation and position captured from the IMUs and the optical trackers.



- The Ellipsoid Fitting Method was used to correct the magnetic vector.
- The Gradient Descent Orientation filter was used to filter the noise out.

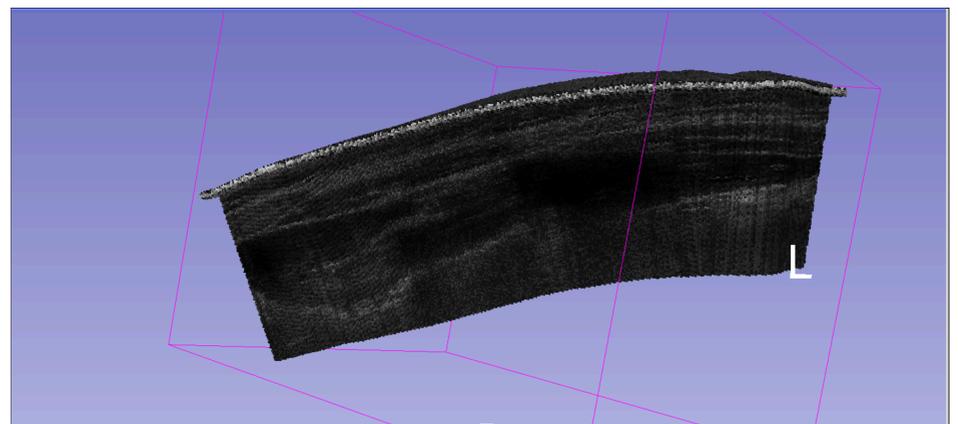
## RESULTS & DISCUSSION



- The volume shown was reconstructed from 861 2D ultrasound images with run time of 0.76 sec/image\*. The volume was encoded in a way that can be opened on 3D Slicer and Unity with texture for further medical usages.

\*not linear

An acquired 3D ultrasound volume of vessels is shown in two different views above and below.



- Qualitatively, the vessels seemed to be continuous throughout, including on the corners as shown. The reconstructed path of the ultrasound transducer also seemed to be continuous. The actual volumetric precision of the method is to be determined with phantoms.

## CONCLUSION

- By using two IMUs and two optical trackers, we successfully obtained a low-cost 3D ultrasound volume which can be opened on 3D Slicer and Unity for further medical usages.
- The volumetric precision of the method is to be determined by using phantoms in the future.