An X6-1 transducer clip for the UltraFit headset

Saumya Raj sraj1@swarthmore.edu
Jonathan N. Washington jwashin1@swarthmore.edu
Swarthmore College

Introduction

Description ("what")

- 3D-printed adapter (clip)
- for using Philips X6-1 transducer
- with UltraFit headset from Articulate Instruments (AI)

Motivation ("why")

- Headsets are stable, comfortable for imaging
- Philips X6-1 used in a couple labs with EPIQ 7
  - high-end transducer, very high quality imaging
  - 3D ultrasound capture at reasonable frame rates
  - simultaneous 2D capture of midsagittal and lateral planes
  - larger, heavier than most 2D transducers used for UTI
- Bespoke X6-1 adapter available for older metal AI headset
- Nylon UltraFit headset lighter, easier to fit, widely used

Development

- >20 iterations of 3D scanning, measuring with calipers, design work, prototyping
- X6-1 scanned using early model SHINING 3D Einscan scanner
- Blender used for initial design and development
- Fusion 360 used for additional work
- Final file compiled on Cura
- Design files made freely available for non-commercial use.

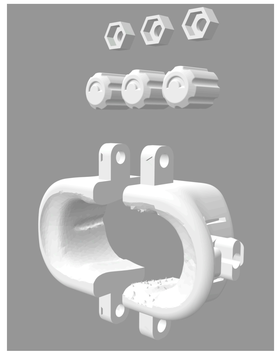
UltraFit headset holding X6-1 transducer using clip:

An X6-1 transducer clip for the UltraFit headset

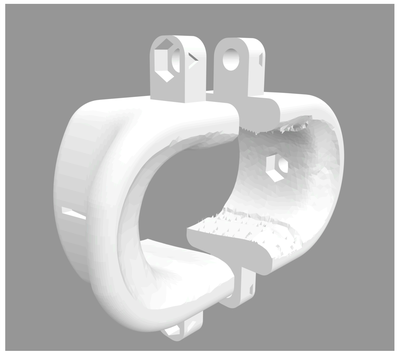
Scan with mobile camera
to access the style file
& download the poster

https://github.com/SwatPhonLab/X6-1_UltraFit_clip

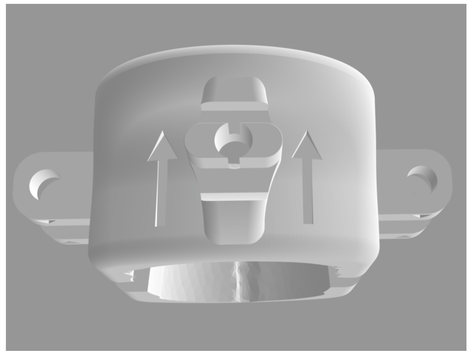
clip pieces, nut casings, front rotated view:



clip sides, back rotated view:



clip front bottom view:



Conclusion

- Clip supports X6-1 probe with UltraFit headset
- Sturdy and able to perform normally
  - despite larger size and added weight of X6-1 transducer
- Clip is openly licensed and freely available for non-commercial use (CC BY-NC-SA)
- Adds to availability of stabilisation methods for ultrasound tongue imaging

SWARTHMORE

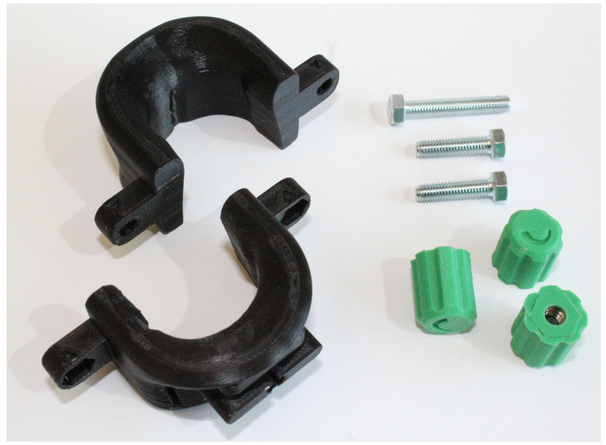
Design

Consruction

- Constructed from PLA of size 2.85 mm (lightweight, durable, good balance of flexibility and rigidity, smooth matte finish)
- Printed on UltiMaker S5 3D printer with layer height of 0.1mm (medium quality), infill density of 10% (slightly lighter and softer), grid pattern (good structural fit)
- Support material used (for overhangs and bridge)

Eight parts

- 2 sides of the clip
- 3 zinc M7 bolts
  - 2cm bolts (2) hold together two sides of clip
  - 3cm bolt (1) attaches clip to headset
- 3 nuts
  - zinc nuts encased in 3D-printed PLA cases
  - (designed to mimic those of original UltraFit headset)



Weight

- fully assembled clip ~45g
- does not significantly affect weight of headset (~300g alone)
- X6-1 transducer approximately doubles weight of headset:
  - probe: ~270g
  - half of 2m cable length (seated subject) adds ~120g
- Subjectively sturdy nonetheless

Future work

- Evaluate stability
  - clip relies on existing stability of UltraFit headset
  - reported error range of 3mm
- Adjust orientation
  - clip currently configured for subject-facing orientation of thin rubber detail on X6-1
  - standing practice is to point rubber detail away from subject
  - for now EPIQ 7 setting flips direction of acquisition