3D Reconstruction of Infants' Cranial Shape using Mobile Devices

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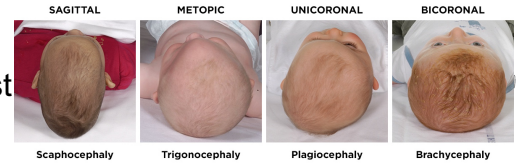
What's the problem?

- 20-30% of newborns develop head malformation in the first few months



- Pediatricians do not have a tool to measure cranial **shape** – only a measure tap is used for Head Circumference.

- Late detection can result in expensive and intensive treatments

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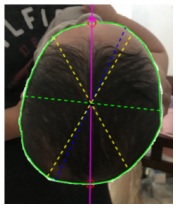
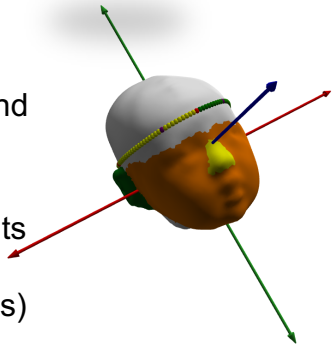
How do we solve it?

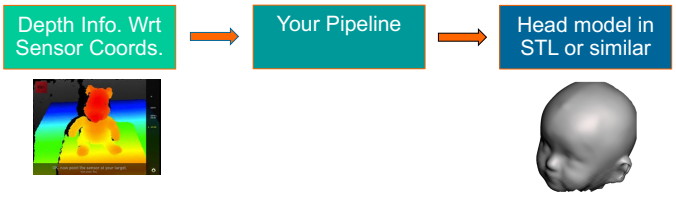
- Currently, we use computer vision with 2D photos for measurements
- This way anyone with a smartphone can measure BUT
- Measuring from a 3D scan means superior precision and accuracy
- Enables other measurements (volume, height) and other conditions (crainiosynostosis)





What will you do?

1. **Implement and test a 3D reconstruction pipeline:**
   - Use structure sensor to collect depth map
   - Implement localization and registration algorithms for reconstruction
   - Output the constructed model in STL or similar format
   - Make your implementation robust for a moving head (bonus)



What will you do?

2. **Experimentally evaluate and compare resulting model accuracy to existing 3D models**
   - Statistical comparison of cranial indices etc. calculated from reconstructed model to those from ground truth models
   - For static and moving baby heads (bonus)



Other Details

- **Deliverables:**
  - Data collected (depth info)
  - Working software pipeline
  - Accuracy evaluation results
- **Desired Skills:**
  - C++, Python, or C# programming
  - Prior experience in 3D reconstruction, registration, or SLAM (preferred)
- **Group Size:** 2
- **Mentors:** Can Kocabalkanli (can@pediametrix.com), Dr. Reza Seifabadi, Dr. Özgür Güler

THANK YOU!