Objective Severity Metric for Craniosynostosis
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INTRODUCTION
Craniosynostosis is a medical condition caused by premature fusion of individual bone plates in the skull, resulting in deformed head shapes in children.

• Affects 1 in 2000 newborns
• Patients face social difficulties and increased brain pressure may cause neuro-psychiatric disorders and vision loss
• Final aim is to define a severity scale, to aid in decision for surgery which tends to be a risky procedure

Severity Scale = 0 1 2 3 4 5

NORMATIVE HEAD MODEL
• To model deformities we need to understand and model normal head variation
• Hard to get CT data for normal kids, so have to work with MRI scans from PedsMRI dataset at NIH [4], with age less than a year
• Using ShapeWorks [1] to find the normative statistical skull model

RELATED WORK
• Some geometric metrics like
  (a) Bitemporal dist./ intercantal dist.
  (b) Frontal angle
• Shape analysis on other applications using [1]

VISUALIZATION
• Need fast mesh reconstruction from points to better visualize shape variation
• Use of biharmonic coordinates from [2]

FUTURE WORK
• Test different statistical models on the normative head model
• Compare the pathological cases with the normative head model and analyze variation
• Form a statistical distance metric of the severity scale for craniosynostosis

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Segmented head from the MRI scan, using [3]
Statistical analysis on the correspondence points to find normal “modes of variation”
Capturing global and local shape variation

Correspondence points using ShapeWorks [1] on three different normal heads