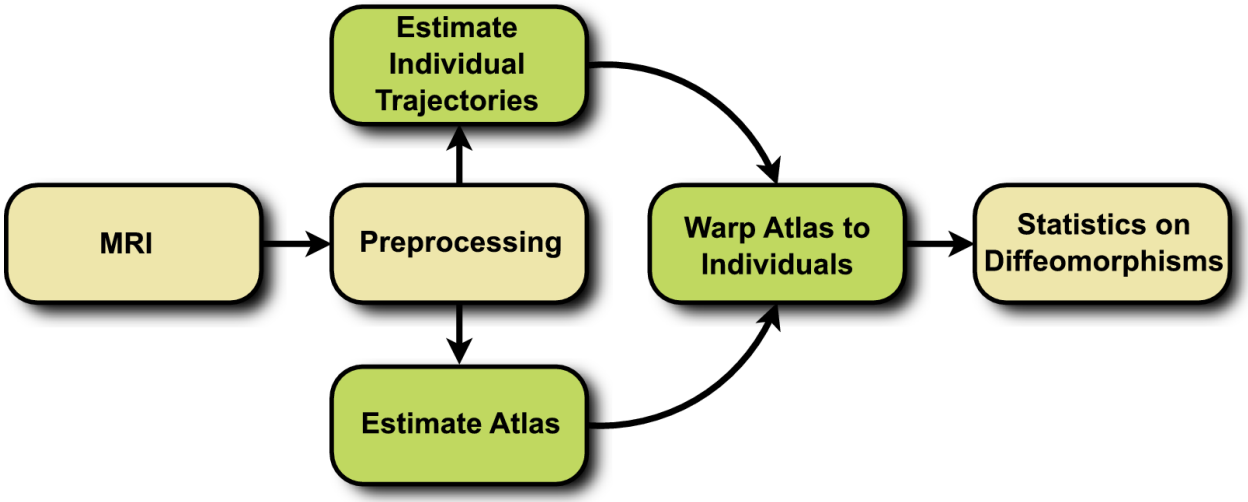
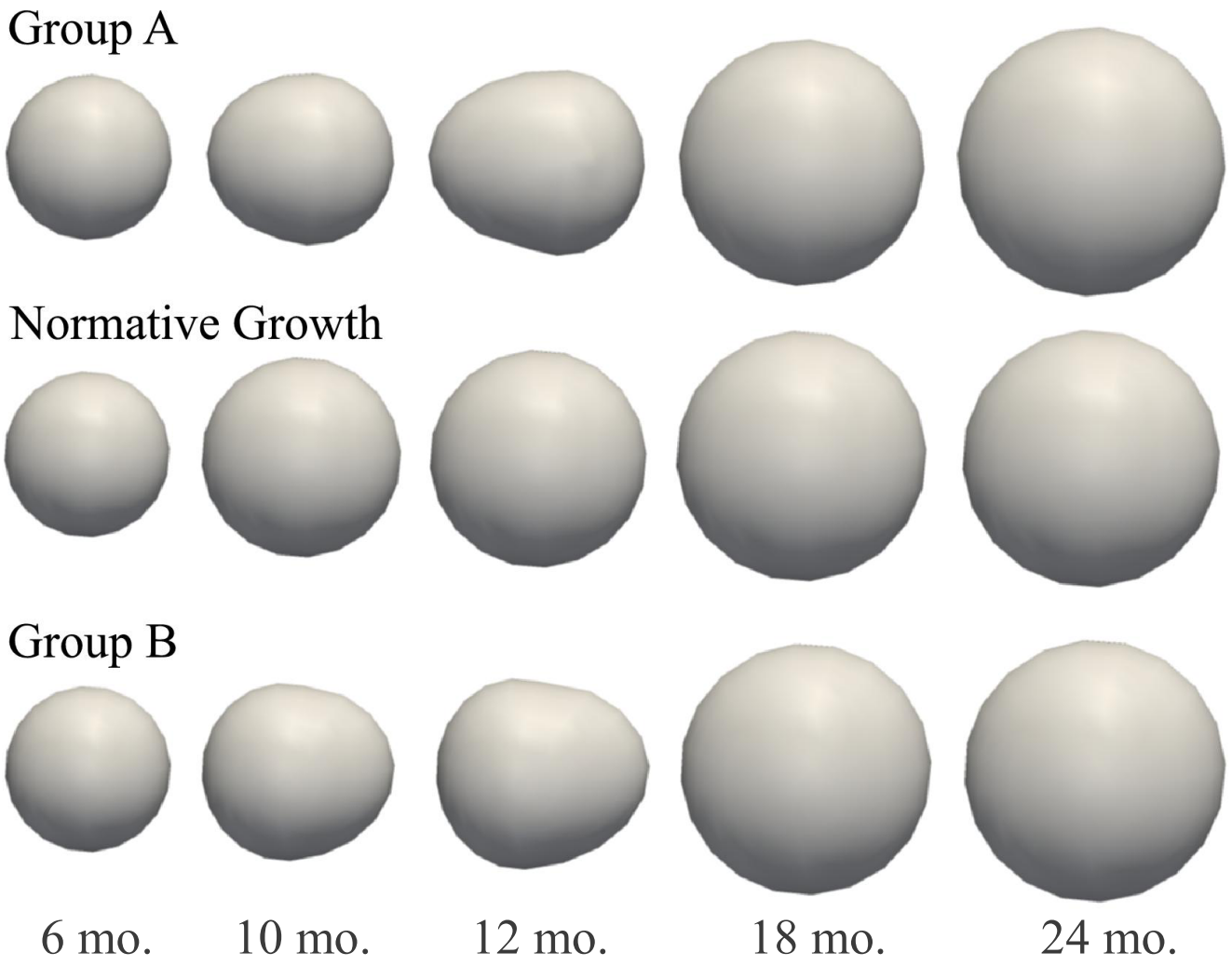
Analysis of Longitudinal Shape Variability (cont.)

Statistical analysis of populations of longitudinal shapes based on

- Cross-sectional atlas construction
- Subject specific growth modeling

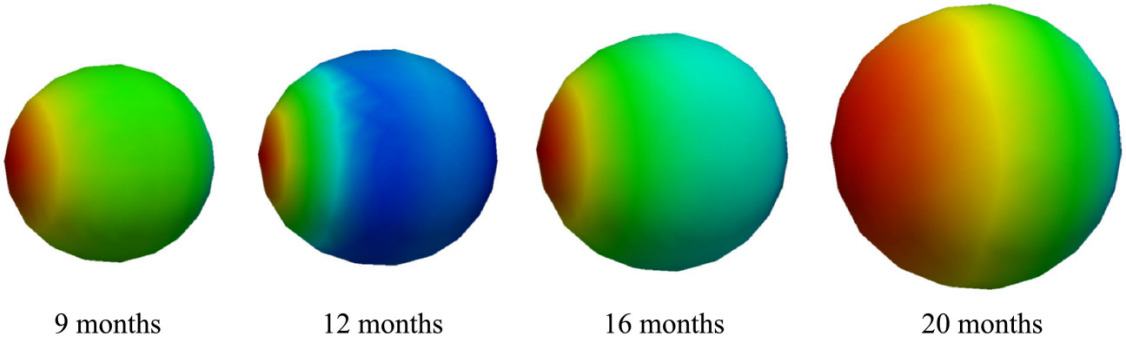


Analysis of Longitudinal Shape Variability (cont.)

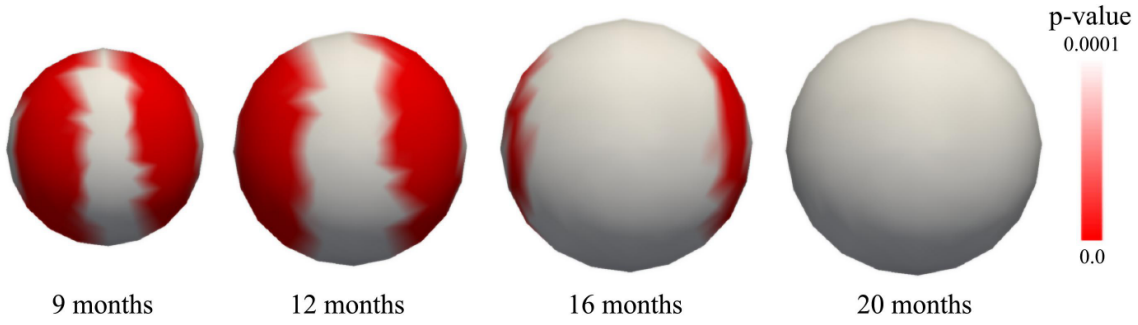


Analysis of Longitudinal Shape Variability (cont.)

PCA on momenta that warp atlas to each individual



Hypothesis testing on magnitude of initial momenta that map reference atlas to individuals

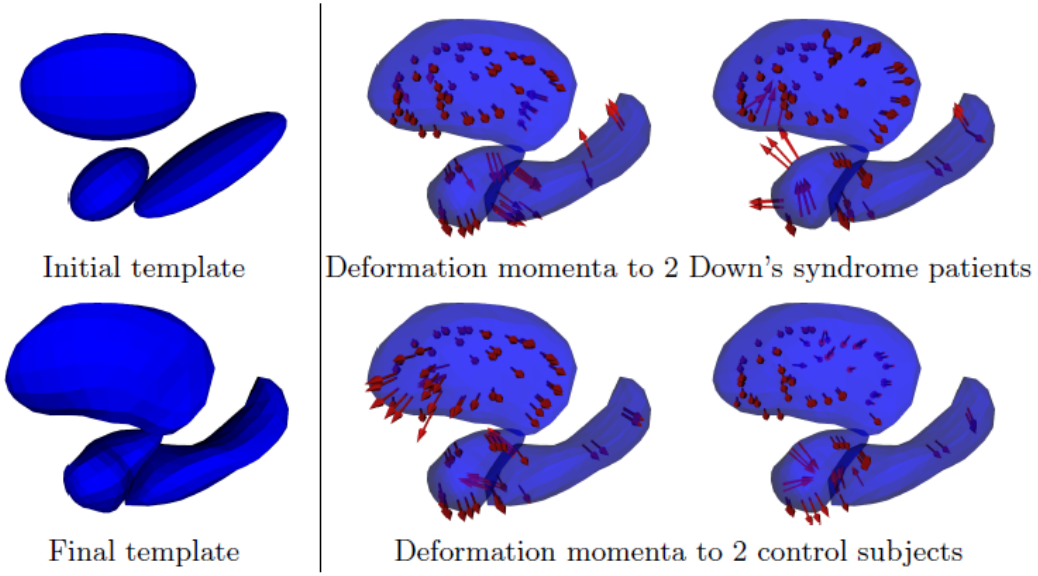


Analysis of Longitudinal Shape Variability (cont.)

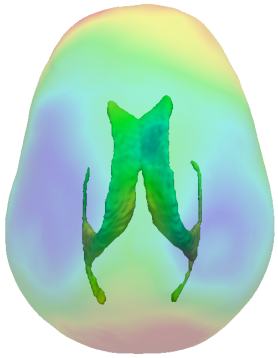
Future work:

- Explicitly incorporate rate of change into the statistical analysis
- Consider more compact growth models (characterize growth by fewer parameters)

Topology Preserving Atlas Construction from Shape Data without Correspondence using Sparse Parameters
Durrleman et al. MICCAI 2012



Software Tools



C/C++ application for estimating continuous evolution from a discrete collection of shapes, designed to produce realistic anatomical trajectories (MICCAI '11)

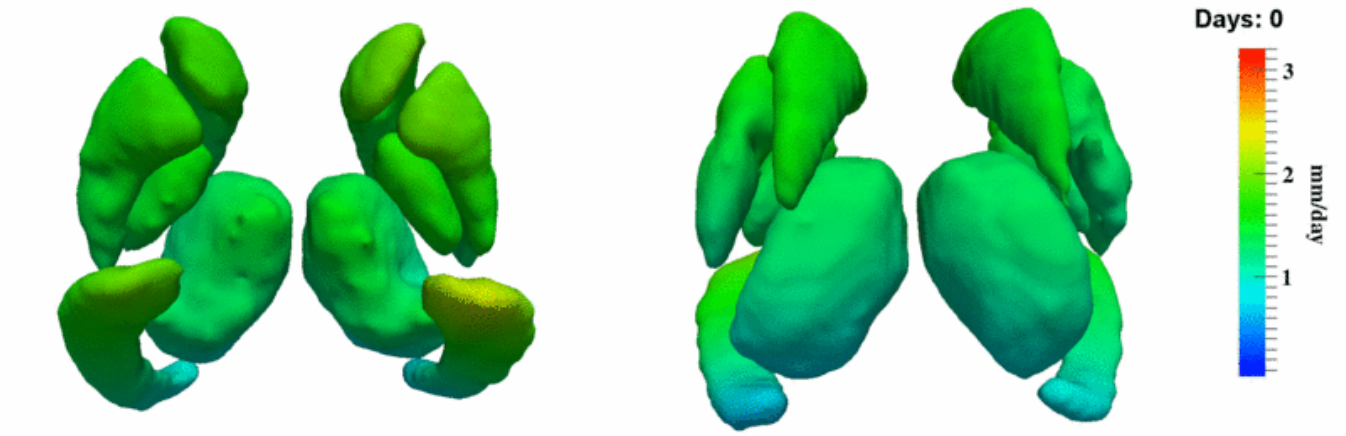
- Met with collaborators at Summer Project Week and defined the needs of users
- Software shared with Iowa (Hans Johnson) for testing

Download and documentation
http://www.cs.utah.edu/~jfishbau/shapereg.html

Software Tools

Next step – Make available in Slicer as a command line module

- Personalized growth trajectories
- Typical pipeline (HD)
  - Load image time series → segment anatomical structures → estimate growth model → watch as movie and compare to normative model



Publications

[1] Fishbaugh, J., Prastawa, M., Durrleman, S., Piven, J., Gerig, G. **Analysis of Longitudinal Shape Variability via Subject Specific Growth Modeling.** Proc. of Medical Image Computing and Computer Assisted Intervention (MICCAI '12). October 2012 (to appear).

[2] Fishbaugh, J., Durrleman, S., Piven, J., Gerig, G. **A framework for longitudinal data analysis via shape regression**. SPIE Medical Imaging 2012: Image Processing. Vol. 8314.

[3] Fishbaugh, J., Durrleman, S., Gerig, G. **Estimation of Smooth Growth Trajectories with Controlled Acceleration from Time Series Shape Data**. Proc. of Medical Image Computing and Computer Assisted Intervention (MICCAI '11). September 2011.