MRI Correction In 5-7 Minutes
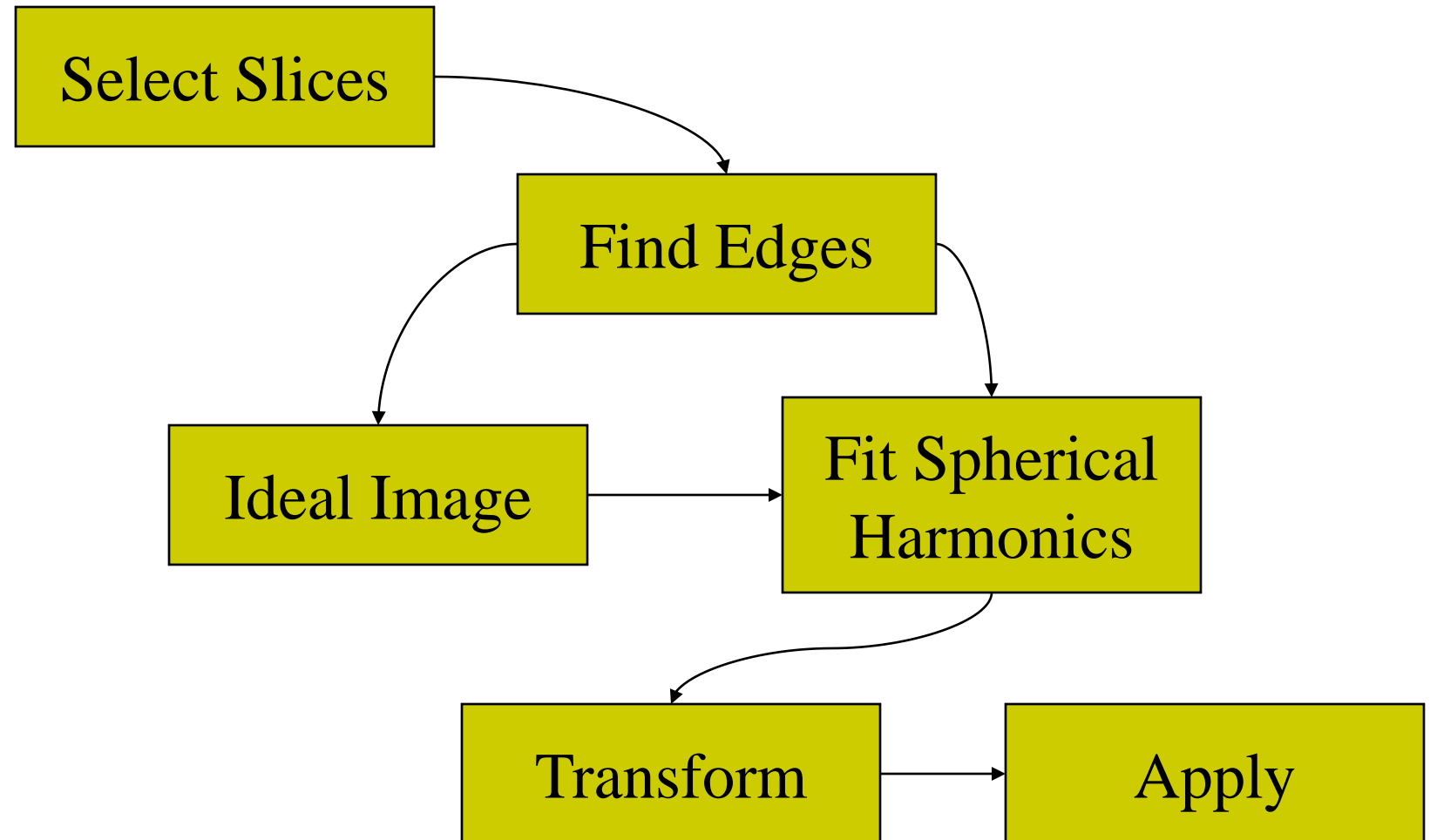
Dr. Keith Evan Schubert

Situation

- Functional Neurosurgery
  - Parkinson's Disease, Trigeminal Neuralgia
  - Error < 1mm
- MRI target localization
  - Distinguish tissue types
  - More than 250k pixels/study
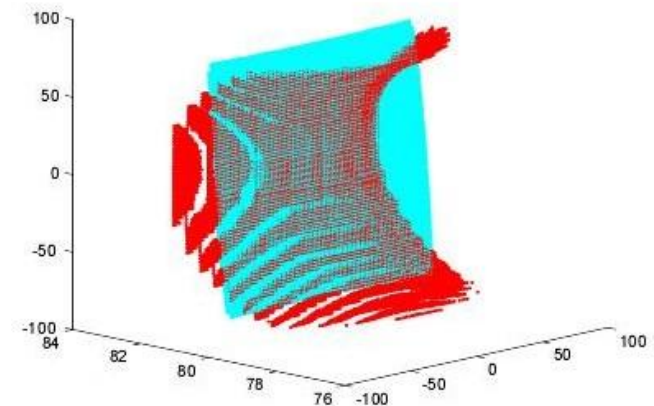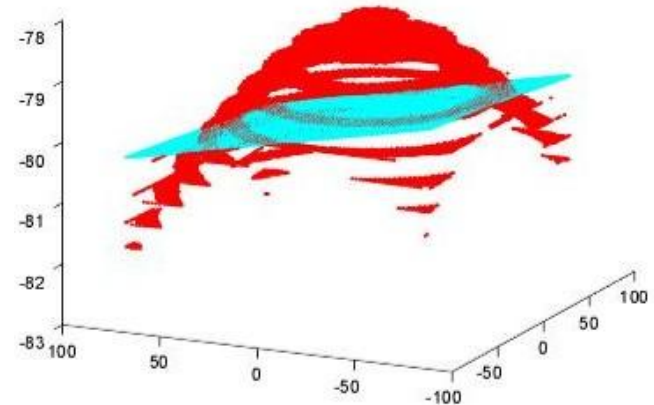 - Gradient Nonlinearity Distortion ~2mm error

Basic Process

Spherical Harmonics

- Cylinder's Magnetic field
  - (x^2+y^2), z^2
  - Combinations & multiples
- Pixel locations → b
- Basis functions & Ideal → A
- Unknown Coefficients → x
- Solve Ax=b for x

Corrected Images

Axial

Coronal

Sagital

Conclusions

- Error reduction
  - Was 2mm or more
    - 5 to 8 pixels
  - $\sigma \approx .15$mm to $.25$mm
    - Less than 1 pixel
  - $3\sigma < .8$mm
    - About 2 pixels
- Meets medical needs