Cardiac Computerized Tomography

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Atherosclerosis of the coronaries is the leading cause of death in industrialized nations.

- In the U.S., 515,000 deaths/yr result from coronary artery disease (CAD). More than twice all cancers!
- Invasive coronary angiography is the gold standard in the detection of CAD
  - 8% complication rate
  - 0.5% mortality rate in therapeutic procedures
- A non-invasive procedure for assessing CAD is needed
  - Difficult to deal with cardiac motion in MRI
  - Cardiac CT offers the best opportunity
Calcium Blooming Limits: Usefulness of CT

Proximal RCA MIP and cross-sectional image versus coronary angiography

- Blooming causes coronaries to be unevaluable for stenosis
- Our studies have shown
  - 29% of patients have at least 1 unevaluable segment
  - 54% of patients > 65 have at least 1 unevaluable segment

Data courtesy of Udo Hoffmann, MGH
New Approach: Model-based Algebraic Iteration

- **Combines:**
  - Center work on model-based inversion
  - Computer vision work on inpainting
  - Signal processing work on adaptive representations and sparsity
  - Recent advances in computation

- **Significant collaboration with MGH, Scanner vendor**

- **Result is a model-based iterative inversion**
  - Versus conventional filtered back-projection
  - More details in student poster R2-A p4 this afternoon
Preliminary MBAI Example

Conventional (B35f Filter) vs. New MBAI

Comparison of images with different filters, showing differences in intensity and clarity.
Project Sustainability

- **Intellectual Properties**
  - US full utility and world (PCT) application filed

- **Funding opportunities**
  - NIH
    - One NIH application submitted
    - One NIH application in pipeline
    - Will shortly be acquiring preliminary data for another application
  - Industrial sponsored research
    - In discussions with 2 companies

- **Collaboration**
  - Three joint industrial research opportunities in discussion phase
  - Joint CenSSIS research with computational core

- **Other Projects**
  - Applying methods to PET/CT