Using Diffuse Optical Tomography with Acoustic Photonic Imaging

Blair Simon and Prof. Charles A. DiMarzio

Joint Imaging Technologies
- Laser
- In vivo finger with diffuse optical tomography[1,2,4]
- Ex vivo confocal ultrasound[5,6]
- X-Ray[7]
- Magnetic Resonance Imaging (MRI)[5,7]

State of the Art

Diffuse Optical Tomography (DOT) used experimentally to image the changes in the scattering coefficient that occur as the joint develops RA. Each image is a reconstruction of the scattering coefficient typical of a healthy human finger joint (far left) to a joint afflicted with RA (far right). The tip of the finger extends to the right and the joint cavity is located in the center of each image. Images from reference [1].

Opportunities for Technology Transfer

- Finite Difference Time Domain Acoustic model
- Novel imaging technique for surface roughness
- Better understanding of the API technique
- Commercial API system in the far future

Background on Rheumatoid Arthritis (RA)

- RA is an autoimmune disease that causes chronic inflammation of the joints.
- The causes are unknown.
- It affect about 2.1 million people in the US.
- The estimated annual losses are in the billions of dollars.
- Diagnosis is done by:
  - Physical Examination
  - Laboratory tests
  - MRI
  - X-Ray

Mr. Simon’s time was supported by a grant from the Department of Education under the Graduate Assistantships in Areas of National Need (GAANN) Fellowship at Northeastern.

References