

Engineering Neuroscience & Health

Department of Biomedical Engineering

Division of Biokinesiology and Physical Therapy



ENH SEMINAR SERIES



Presents:

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Monday

April 6, 2009

4:00 p.m.

Refreshments will be served 3–4 pm

“APPLICATION OF MEDICAL IMAGING IN ORTHOPEDIC BIOMECHANICS”

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In the field of orthopedic biomechanics, geometry, alignment, and movement of the anatomic structure and material properties of the tissues are the common parameters in making a diagnosis and planning treatment. Medical imaging has been a useful tool for possible non-invasive examination. Commonly used imaging techniques consist of x-ray radiography, fluoroscopy, computer tomography (CT), ultrasound (US), and magnetic resonance imaging (MRI). For measuring skeletal motion and the migration of artificial implants, bi-planar stereo radiography has been developed and used. More recently, methods have been developed for registering three-dimensional models to single plane x-ray fluoroscopy images. CT and MRI are available for assessing the skeletal movement based on [imaging](#) registrations and animation. For the assessment of the internal stress and deformation of the musculoskeletal system, the 3D CT scan enables the finite element mesh generation of the internal structure. Applications of the speckle tracking in US and texture or block matching in MRI images enable mapping of deformation and strain fields of the soft tissue. Material properties, such as the modulus and strength of bone, have been quantified by using quantitative CT. Furthermore, elastography based on US and MRI enables the quantification of material properties of soft tissue. In summary, medical imaging provides useful tools for assessing biomechanical parameters of the musculoskeletal system. These technologies are essential for enhancing diagnoses in orthopedics, and monitoring the success of the tissue regeneration in the application of tissue engineering.

Summary

My research in orthopedic biomechanics was initially motivated by the task of developing an artificial implant for total joint replacement. Subsequently, my research interests expanded to include the kinesiology of upper extremities, sports and rehabilitation medicine, and orthopedic surgery. More recently my focus has been on soft tissue mechanics, including tissue regeneration and non-invasive assessment using medical imaging such as magnetic resonance elastography and ultrasound. Ongoing studies are targeted on mechanical and biochemical factors influencing soft tissue integrity, performance, and remodeling.

Locations:

Seminar is simultaneously presented

HSC: CHP 147— LIVE

Center for the Health Professional

HSC Campus Map/Directions:

<http://www.usc.edu/about/visit/hsc/>

UPC: HNB 100 – Video Conference

Hedco Neurosciences Building

UPC Campus Map/Directions:

<http://www.usc.edu/about/visit/upc/>

Organized by Professor Francisco Valero-Cuevas <http://bme.usc.edu/valero/>

Web Cast

<http://capture.usc.edu/college/Catalog/?cid=af180d48-ceff-42b9-a35c-eb199daed320>

Information about all seminars can be found at

<http://www-clmc.usc.edu/~heiko/ENH>