

SPRING 2008 SEMINAR SERIES

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Time: 11:00 am – 12:00 pm

Room: ET 137

Everyone is invited

Quantification of Orthodontic Tooth Displacement

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Abstract: Orthodontic treatment results can be greatly improved, if the orthodontic tooth displacement can be quantified accurately. Orthodontic tooth displacement is an important outcome, which can be used to evaluate treatment strategies and orthodontic appliance. Different methods have been developed to quantify the orthodontic tooth displacement. Compared with the traditional two-dimensional (2D) methods, like superimposition of serial panoramic and cephalometric radiographs, three-dimensional (3D) methods have many advantages. Thus, the goal of this study is to develop two methods, using dental casts and cone-beam CT (CBCT) images respectively, to quantify the 3D orthodontic tooth displacement, and assess their accuracy and variation. In the dental cast method, the quantification procedure was defined, and two maxillary dental casts from a patient taken before and after treatment were used to test the accuracy and variation of the method. Iterative Closest Point (ICP) algorithm was used to align the two digital cast models and to calculate the transformation matrix between the moving tooth's before and after treatment positions. Local coordinate system was defined, and all six displacement components are expressed in it. In the CBCT method, Images of the same mandible taken with two weeks in between without any treatment were used. The ICP algorithm was used to superimpose unchanged bony part of a mandible, and to find the transformation matrix between a tooth's two positions before and after the orthodontic tooth movement. The results of both the two methods show that 3D tooth displacement can be obtained from the dental casts and the CBCT images and the accuracy is acceptable for the clinical use.

About the Speaker: Shuning Li is a Master's student and Research Assistant at the Mechanical Engineering Department, IUPUI. She received her Bachelor's degree in Mechanical Engineering from Hebei University of Technology, China in July, 2002, and her Master's degree in Mechanical Engineering from Tsinghua University, China in July, 2005. The members of Shuning Li's advisor committee are Dr. Jie Chen, Dr. Thomas Katona and Dr. Hazim El-Mounayri.