I successfully defended my thesis "Modeling of Aortic Valve Anatomic Geometry from Clinical Multi Detector-Row Computed Tomography Images" yesterday, which completes my Master's degree in biomedical engineering at UConn.

Thesis can be viewed here .

Thesis defense can be viewed here .

UPDATE (2/22/2011): Still waiting for degree conferral. Apparently the process of receiving a graduate degree from UConn is a little slower than for an undergraduate degree. The graduate school is predicting conferral in late March/early April for the December 2010 students.

Here is the abstract for the thesis:

Transcatheter aortic valve implantation (TAVI) is an emerging and viable alternative to surgical valve replacement. A TAVI procedure involves insertion of a catheter into the heart through an artery or transapically, and expanding valve stent in place. This procedure dramatically reduces the recovery time by eliminating the need for open heart surgery. Understanding the biomechanics of the stent-valve interaction is crucial for proper device deployment and function. In this study, we examine the extraction of valve geometries and creation of valve models from multi-detector row computed tomography (MDCT) images that may eventually be used to model stent expansion on a patient specific basis. Our study accomplished three specific goals using clinical 64-slice CT data from Hartford Hospital. First, manual measurement of a variety of aortic root anatomic dimensions was performed on 95 patients using standard methods, to which other measurement methods could be compared. Second, we investigated automatic 2D measurement and a 3D measurement technique and compared them to the standard measurements. Both 2D automatic and 3D manual measurements were similar to the standard manual measurements, but 3D providing more insight into valve shape for TAVI sizing and positioning. Third, we investigated the use of statistical shape models (SSMs) to perform automatic 3D model creation. Training of 3D SSMs is extremely labor-intensive and prone to error because of the manual landmarking step, so we created a novel method to perform automatic landmarking of training data. Our method used high dimensional warping (HDW) to propagate landmarks from a template model. We used this landmarking method to create point distribution models of the aortic valve from patient data.

Future work would include completion of the 3D SSM implementation using active appearance models.