AbstractID: 9747 Title: Enter Title

Minimally invasive cardiac procedures using endovascular access have enabled treatment of patients that previously would have required open-heart surgery. Such procedures are typically carried out in the interventional suite, with x-ray fluoroscopy used to guide the placement of a catheter, followed by a phase of the procedure in which x-ray fluoroscopy provides little to no information on the treatment. C-arm CT has been under development since the early 90's, but has now entered a new phase as the ability to visualize soft tissue and low-contrast lesions improves. By generating 3D images utilizing the x-ray system in the interventional suite, the error prone and time-consuming spatio-temporal registration with prior CT or MRI exams can be avoided. However, C-arm CT imaging in the presence of cardiac motion remains a challenge due to the slow rotation speed of the gantry, and the slow readout rates of the flat-panel detectors. Three main data acquisition approaches to circumvent these limitations will be discussed: multi-sweep retrospective ECG gating for myocardial visualization, single- or double-sweep with volume image fusion for left atrium and pulmonary vein visualization and single-sweep with retrospective gating for coronary artery visualization. Approaches to improve image quality, both hardware and software, such as optimized acquisition timing, motion compensation approaches and algorithms for non-idealities such as x-ray scatter, detector lag, limited field-of-view or angular coverage, data insufficiency and noise will be presented. With these developments the ultimate goal is to accomplish faster and more accurate catheter based interventions with an equivalent success rate as surgical procedures (80-90%). The C-arm CT technology described here could eventually impact many minimally invasive procedures such as RF ablation for atrial fibrillation and coronary stenting, and also future procedures as they become available, such as endocardial injection of stem cells for treatment of myocardial infarction.

Educational Objectives:

1. Learn how 3D cardiac imaging is done in the interventional suite : acquisition protocols, injection protocols, challenges and solutions
2. Learn how image quality of 3D cardiac images can be improved using hardware and algorithm approaches