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CURRENT TRACK: Cardiovascular
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Awards Applied For:

AWARDS: Correlative Imaging Council Walter Wolf Young Investigator Award|Cardiovascular Council Young Investigator Award Symposium|Berson-Yalow Award |Young Professional Committee (YPC) Award|Art Weis Call for Abstracts
Abstract Title

TITLE: Automatic Detection of Patient Motion Using Fiducial Markers in Dynamic Cardiac PET Images
Abstract Body

ABSTRACT BODY:
Objectives : Dynamic positron emission tomography (PET) is being increasingly utilized to quantify myocardial blood flow (MBF) leading to improved prognostic value, and may improve management of coronary artery disease. Patient motion during image acquisition can result in severe MBF estimation errors. Tracking of patient motion in a dynamic cardiac positron emission tomography (PET) image sequence can be difficult due to the changing tracer distribution from blood to perfused tissues. Fiducial markers may help identify cases with patient motion during dynamic image acquisition. This work evaluates two automated algorithms for detection of intra- and inter-frame fiducial marker motion.
Methods : 65 patients undergoing dynamic cardiac Rubidium-82 PET imaging at rest and stress had a 1uCi Sodium-22 fiducial marker affixed to their chest during PET imaging. The 130 images (rest and stress) were visually inspected for the presence of inter- and intra-frame motion (gold standard). Inter-frame motion was determined automatically as greater than one pixel distance change in marker center of mass (COM) between successive frames. Intra-frame motion was determined as pixel intensity gradient broadening radially outwards from the marker COM, by fitting a modified Gaussian function.
Results : Intra-frame motion was present in 604 (31%) of 1950 (130 dynamic PET images x 15 frames) frames. The intra-frame algorithm detected motion in 632 (32%) frames. The sensitivity and specificity was 0.81 and 0.89 respectively, using a motion threshold >3 mm. Inter-frame motion was present in 374 (20%) of 1890 (130 dynamic PET images x 14 frame-pairs). The inter-frame algorithm detected motion in 328 (17%) with 0.80 and 0.98 sensitivity and specificity respectively, using >3 mm motion threshold.
Conclusions : The intra and inter-frame algorithms may be suitable for automated fiducial marker tracking to identify scans with patient motion, in which MBF quantification may not be reliable.
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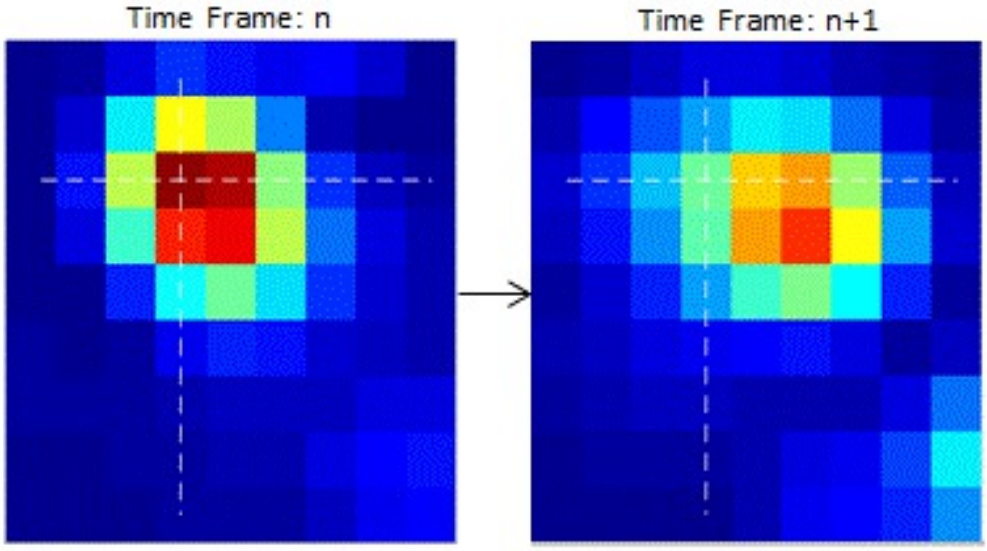
.		Visual Standard		.		Visual Standard	
		Motion	No Motion			Motion	No Motion
Intra-frame Algorithm n=1950	Motion	25%	7%	Inter-frame Algorithm n=1890	Motion	16%	2%
	No Motion	6%	62%		No Motion	4%	79%

Supporting Data Image

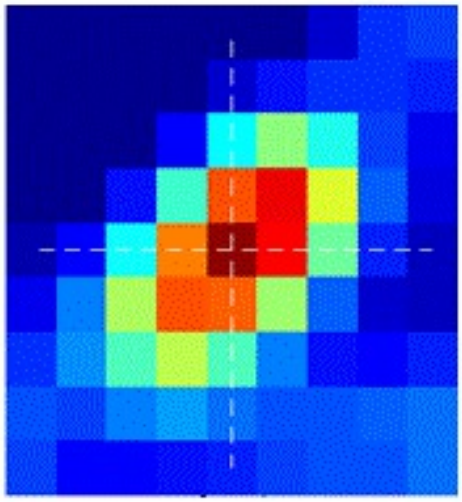
Figure 1: Inter- and Intra-frame Motion Examples

Inter-Frame: Marker motion between two frames



*Cross hair was not moved between frames

Intra-Frame: Marker motion (blurring) in a frame



References:

Presentation Preference

PRESENTATION TYPE: Oral or Poster

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Author Disclosures

FDA Disclosure -Phy/Sci/Pharm*: I do not have any applicable devices or drugs to disclose.

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