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Integration of a Network Synchronized Motion Tracking Camera into a Real-Time Positron Emission Tomography Data Acquisition System

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We are building a high-resolution brain PET scanner, the Scanner Approaching in Vivo Autoradiographic Neuro Tomography (SAVANT). Based on the LabPET-II's detector module with 1:1 crystal to APD coupling, it is expected to reach 1.35 mm^3 volumetric resolution. At this resolution level, slight, involuntary head movement will blur the image and spoil the exquisite intrinsic performance of the device. An accurate head motion correction scheme is therefore paramount to maintain the target spatial resolution in-vivo. We selected the NDI Polaris Vega motion capture camera to track head movement with high accuracy during the PET acquisition. Head motion information is then modeled inside the PET reconstruction algorithm to obtain images virtually free of motion blurring. With its ethernet-only connection and IEEE-1588-PTP synchronization support, the camera needs a different integration scheme compared with previous pulse-triggered motion capture schemes.
This work describes the synchronization and integration of the NDI Polaris Vega camera on the hardware, firmware and software levels into the SAVANT's real-time PET DAQ, distributed on Xilinx Zynq-7000 modules. The integration is validated by imaging an 18F phantom undergoing continuous motion through a Quasar respiratory phantom. PET images reconstructed without and with motion correction will be presented at the conference. The design can also bridge the camera to other types of scanners with minor changes, allowing the camera to be shared amongst different scanners installed in an imaging center.

Minioral

Yes

IEEE Member

Yes

Are you a student?

No

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