Imaging Technology for Translational Medicine
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Recently, PET detectors or systems which can directly digitize the scintillation pulse from photomultiplier became available. Unlike traditional PET equipments, they allow using software with sophisticated analyzing algorithms on resulted samples for events information extracting and coincidence data filtering. Previously, we have proposed the MVT method for directly sampling the scintillation pulse and developed several kinds of digital PET detectors named basic detector module (BDM). Those modular detectors can directly output the resulted MVT samples using a RJ45 connector in UDP protocol. With such digital detectors, a PET system is easy to build and configure. The output MVT samples from BDM's use a unified format and the system geometry is described by a definition file named SG file. Those standards enable anyone to readily develop digital signal processing (DSP) software that is compatible with varies PET systems for different applications using all kinds of BDMs and system geometries. The single events information picking up, coincidence events filtering, imaging reconstructing and data analyzing will all be performed in the DSP software. In this case, a plug-and-imaging coincidence measurement system could be realized as an architecture consisting of only two components: digital PET detectors and software. In this work, we present such a system architecture, as well as the descriptions of BDM, definition of data formation. The software component itself also adopts a modularized design approach. Its functions will be fulfilled by separate modules, which pass the input and output data through files. Since the files are also using a well defined format, users/developers can replace any module to add functionality or enhance processing/reconstruction. For instance, we have developed a preclinical PET system and a clinical PET system, as well as an in-vitro radioactive tracer activity measuring system using the proposed system architecture and software.