Techniques for Improving Positron Emission Tomography Image Quality and Tracking Real-Time Biological Processes

Tech ID: 30582 / UC Case 2020-001-0

ABSTRACT

Researchers at the University of California, Davis have developed methodologies that perform dynamic PET imaging and provide opportunities for tracing blood flow and other biological systems in real-time.

FULL DESCRIPTION

PET is the most sensitive molecular imaging modality available currently for tracing biomedical processes in vivo. However, compared to other imaging modalities, the images provided by PET scanners often have high noise. As a result, PET scans must take longer to capture enough signal, resulting in poor temporal resolution and motion blurring artifacts. To address this, some PET imaging applications require the use of external devices, such as ECG, a breathing belt, or optical markers and fast dynamic applications have not been feasible. This limitation has historically resulted in PET scanners being less effective for monitoring blood flow, as well as cardiac, respiratory or other human systems. Thus, a method providing high temporal resolution PET scanning would offer enhanced imaging applications.

Researchers at the University of California, Davis have developed a methodology for high temporal resolution, dynamic PET by applying the kernel-regularized reconstruction paradigm to PET scanner data. This technique provides high-quality images for tracking fast tracer dynamics, such as blood flow and dynamic responses to neural modulation. Furthermore, the improved PET methodology enables real-time blood flow/circulatory system tracking, as well as motion-freeze monitoring for cardiovascular, cerebrovascular, and respiratory system function. This imaging can now occur without the need for additional external devices – and can be applied to any clinical PET system for marker-free, motion-free, real-time, fast tracer tracking.

APPLICATIONS

- Study fast tracer dynamics, such as blood flow and dynamic response to neural modulation
- Obtain motion-frozen images for cardiovascular and respiratory system function diagnosis

FEATURES/BENEFITS

- Can perform dynamic imaging with a temporal resolution of 100ms or less
- Does not require external devices to perform real-time motion tracking

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,171,546	12/24/2024	2020-001
Patent Cooperation Treaty	Published Application	WO 2021/011815	01/21/2021	2020-001

CONTACT

Andrew M. Van Court
amvancourt@ucdavis.edu
tel: .



INVENTORS

- Badawi, Ramsey D.
- Cherry, Simon R.
- Wang, Guobao
- Zhang, Xuezhu

OTHER INFORMATION

KEYWORDS

PET, temporal resolution, fast tracer imaging, real-time motion tracking, kernel-regularized reconstruction, penalized image reconstruction

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Diagnostics
  - Disease: Blood and Lymphatic System
  - Disease: Cardiovascular and Circulatory System
  - Disease: Respiratory and Pulmonary System
  - Imaging

RELATED CASES

2020-001-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Improved Method for Real-Time Collection of Cardiac and Respiratory Raw Data During Clinical Imaging
- Real-Time Tissue Assessment During Surgical Procedures
- Quantitative Multiparametric PET/CT Imaging for Nonalcoholic Fatty Liver Diseases
- Multiparametric Imaging with PET Scans Using High Temporal-Resolution Dynamic Data Acquisition and Modeling
- A Combined Time-Walk and Timing-Shift Correction Method for Dual-Ended Readout TOF-DOI PET Detector

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel: 530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax: 530.754.7620

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