Medical Imaging 2021

Image-Guided Procedures, Robotic Interventions, and Modeling

Cristian A. Linte
Jeffrey H. Siewerdsen
Editors

15–19 February 2021
Online Only, United States

Sponsored by
SPIE

Cooperating Organizations
AAPM—American Association of Physicists in Medicine (United States)
MIPS—Medical Image Perception Society (United States)
SIIM—Society for Imaging Informatics in Medicine (United States)
WMIS—World Molecular Imaging Society (United States)

Published by
SPIE

Volume 11598
## Contents

### ROBOT-ASSISTED INTERVENTIONAL PLATFORMS AND DEVICES

11598 04 MRI-compatible mechatronic needle guidance system for focal thermal laser ablation in localized prostate cancer [11598-1]

11598 05 Integrating FireFly fluorescence into image guidance for the da Vinci robot [11598-2]

11598 06 Pre-clinical evaluation of a video-based drill guidance system for orthopaedic trauma surgery [11598-3]

11598 07 Imaging-compatible oral retractor system for use in image-guided transoral robotic surgery [11598-4]

11598 08 Multi-body statistical shape representation of anatomy for navigation in robot-assisted laparoscopic partial nephrectomy [11598-5]

### IMAGE-GUIDED VIDEO-BASED APPLICATIONS

11598 09 Robot-assisted ventriculoscopic 3D reconstruction for guidance of deep-brain stimulation surgery [11598-6]

11598 0A Segmentation and removal of surgical instruments for background scene visualization from endoscopic/laparoscopic video [11598-7]

11598 0B Simultaneous localisation and mapping for laparoscopic liver navigation: a comparative evaluation study [11598-8]

11598 0C Context encoder guided self-supervised siamese depth estimation based on stereo laparoscopic images [11598-9]

11598 0D Stereovision surface stitching for image updating in open spine surgery [11598-10]

11598 0E Single-shot three-dimensional reconstruction for colonoscopic image analysis [11598-11]

### CARDIAC APPLICATIONS

11598 0F Joint deep learning framework for image registration and segmentation of late gadolinium enhanced MRI and cine cardiac MRI [11598-12]
Quantitative assessment of proton beam dose and myocardial lesion formation detected by high-resolution, ex vivo delayed contrast-enhanced MRI for treatment of ventricular tachycardia [11598-13]

EX VIVO CONSTRUCTS AND PHANTOMS FOR INTERVENTION PLANNING AND GUIDANCE: JOINT SESSION WITH CONFERENCES 11598 AND 11601

Assessment of system performance and phantom validation of ultrasound-guided breast biopsy under dedicated positron emission mammography localization [11598-14]

Effect of uncertainty on target registration error in image-guided renal interventions: from simulation to in-vitro assessment [11598-15]

IMAGE SEGMENTATION

Optimization of hepatic vasculature segmentation from contrast-enhanced MRI, exploring two 3D U-net modifications and various loss functions (Image-Guided Procedures, Robotic Interventions, and Modeling Young Scientist Award) [11598-16]

Brain vessel segmentation in contrast-enhanced T1-weighted MR images for deep brain stimulation of the anterior thalamus using a deep convolutional neural network [11598-17]

Three-dimensional prostate CT segmentation through fine-tuning of a pre-trained neural network using no reference labeling [11598-18]

Multiclass segmentation of brain intraoperative ultrasound images with limited data [11598-19]

Bronchial orifice segmentation on bronchoscopic video frames based on generative adversarial depth estimation [11598-20]

IMAGE-GUIDED RESPIRATORY AND LUNG APPLICATIONS

Method for 3D navigation of airways on a single C-arm using multi-sweep limited angle acquisition and frame-by-frame device reconstruction [11598-21]

Kernel-based modeling of pneumothorax deformation using intraoperative cone-beam CT images [11598-22]

Lung parenchymal characterization via thoracic dynamic MRI in normal children and pediatric patients with T1S [11598-23]

Image quality assessment for closed-loop computer-assisted lung ultrasound [11598-24]

A quantitative prediction of the post-operative lobectomy lung physiology using a GPU-based linear elastic lung biomechanics model and a constrained generative adversarial learning approach [11598-25]
Autonomous planning and guidance for convex-probe endobronchial ultrasound bronchoscopy [11598-26]

**IMAGE REGISTRATION APPLICATIONS FOR IGT**

11598 0U Are fiducial registration error and target registration error correlated? SciKit-SurgeryFRED for teaching and research [11598-27]

11598 0V Feasibility of automated fiducial registration with a nasopharyngeal stent for electromagnetic navigation [11598-28]

11598 0W Improving accuracy of image-to-physical laparoscopic liver registration via reconstruction of intrahepatic pressure changes from abdominal insufflation [11598-29]

**ULTRASOUND IMAGE GUIDANCE: JOINT SESSION WITH CONFERENCES 11598 AND 11602**

11598 0X Ultrasound-guided needle placement system optimized for translation to Mauritania [11598-30]

11598 0Y Delineation of coronary stents in intravascular ultrasound pullbacks [11598-31]

11598 0Z Automated catheter segmentation using 3D ultrasound images in high-dose-rate prostate brachytherapy [11598-32]

**TISSUE CLASSIFICATION AND CHARACTERIZATION**

11598 10 Hyperspectral imaging for tissue classification in glioblastoma tumor patients: a deep spectral-spatial approach [11598-33]

11598 11 Pixel-level tumor margin assessment of surgical specimen with hyperspectral imaging and deep learning classification [11598-34]

11598 12 Graph-based analysis of mass spectrometry data for tissue characterization with application in basal cell carcinoma surgery [11598-35]

11598 13 Deep learning-based multi-class COVID-19 classification with x-ray images [11598-36]

11598 14 Machine learning to detect brain lesions in focal epilepsy [11598-37]

**FUTURE OR: DECISION SUPPORT, WORKFLOW CONTROL, AND SKILL ASSESSMENT: JOINT SESSION WITH CONFERENCES 11598 AND 11601**

11598 15 Augmented immersive telemmedicine through camera view manipulation controlled by head motions [11598-38]
| 11598 16 | **Object detection to compute performance metrics for skill assessment in central venous catheterization** [11598-39] |
| 11598 17 | **Automated detection of surgical wounds in videos of open neck procedures using a mask R-CNN** [11598-40] |

**DATA DRIVEN DEFORMABLE IMAGE REGISTRATION FOR IGTR**

| 11598 18 | **CT-MRI pelvic deformable registration via deep learning** [11598-41] |
| 11598 19 | **Deformable MR-CT image registration using an unsupervised synthesis and registration network for neuro-endoscopic surgery** [11598-42] |
| 11598 1A | **Abdominal CT-CBCT deformable image registration using Deep Neural Network with directional local structural similarity** [11598-43] |
| 11598 1B | **Data-driven deformable 3D-2D registration for guiding neuroelectrode placement in deep brain stimulation** [11598-44] |
| 11598 1C | **Image registration between MRI and spot mammograms for X-ray guided stereotactic breast biopsy: preliminary results** [11598-45] |

**NOVEL APPLICATIONS IN IMAGE-GUIDED THERAPY**

| 11598 1D | **Mapping the progression of resection continuously during brain tumor surgery** [11598-46] |
| 11598 1E | **Cochlear implant electric field estimation using 3D neural networks** [11598-47] |
| 11598 1F | **A framework of metal object insertion in the projection domain for interventional CT image quality optimization** [11598-48] |
| 11598 1G | **Fluoroscopic guidance of a surgical robot: pre-clinical evaluation in pelvic guidewire placement** [11598-49] |
| 11598 1H | **In-vivo markerless motion detection from volumetric optical coherence tomography data using CNNs** [11598-50] |
| 11598 1I | **Automatic image-based pedicle screw planning** [11598-51] |

**POSTER SESSION**

| 11598 1J | **Neural network pruning for biomedical Image segmentation** [11598-52] |
| 11598 1K | **Segmentation of the subthalamic nucleus in MRI via Convolutional Neural Networks for deep brain stimulation planning** [11598-53] |
Multi-organ segmentation of male pelvic CT using dual attention networks [11598-54]

Synthetic MRI-aided multi-organ segmentation in head-and-neck cone beam CT [11598-55]

Automatic segmentation of the prostate on MR images based on anatomy and deep learning [11598-56]

Snake-based interactive tooth segmentation for 3D mandibular meshes [11598-57]

2D/3D deep registration for real-time prostate biopsy navigation (Cum Laude Poster Award) [11598-58]

An online platform for automatic skull defect restoration and cranial implant design [11598-59]

Deep learning-based volumetric image generation from projection imaging for prostate radiotherapy [11598-60]

Deep learning-based multi-catheter reconstruction for MRI-guided HDR prostate brachytherapy [11598-61]

Region proposal network for multi-organ segmentation in CT for pancreatic radiotherapy [11598-62]

Correction of metallic stent struts and guide wire shadows in intravascular optical coherence tomography images using conditional generative adversarial networks [11598-63]

Bronchoscopic video synchronization for Interactive multimodal inspection of bronchial lesions [11598-64]

Semi-automated calibration of a hand-held stereovision system using a tracked calibration frame for image guided surgery [11598-65]

A new Eulerian temporal filtering method for boosting endoscopic video motion magnification [11598-66]

Quantitative evaluation of a new gamma correction method for endoscopic image improvement [11598-67]

On the merits of using angled fiber tips in office-based laser surgery of the vocal folds (Image-Guided Procedures, Robotic Interventions, and Modeling Student Paper Award) [11598-68]

Electroacoustic tomography (EAT): 2D electric field reconstruction for electroporation treatment monitoring [11598-69]

Artificial intelligence-based radiotherapy planning with reinforcement learning [11598-70]

Comparison of different automatic solutions for resection cavity segmentation in postoperative MRI volumes including longitudinal acquisitions [11598-71]
Radiation dose prediction for pancreatic stereotactic body radiotherapy via convention neural networks [11598-72]

Validation of a hybrid active shape and deep learning intracochlear anatomy segmentation method for image-guided cochlear implant programming [11598-73]

Intraoperative guidance of orthopaedic instruments using 3D correspondence of 2D object instance segmentations [11598-75]

End-to-end forecasting of needle trajectory in percutaneous ablation [11598-76]

Automatic detection and tracking of the region of interest during fluoroscopy-guided procedures for radiation exposure reduction [11598-77]

Ultrasound multi-needle detection using deep attention U-Net with TV regularizations [11598-78]

Deep learning based needle tracking in prostate fusion biopsy (Cum Laude Poster Award) [11598-79]

Augmented-reality visualization for improved patient positioning workflow during MR-HIFU therapy [11598-81]

Virtual reality assisted cardiac catheterization [11598-82]

Toward image-guided gynecologic brachytherapy using intraoperative 3D ultrasound imaging [11598-83]

Realistic synthesis of brain tumor resection ultrasound images with a generative adversarial network [11598-84]

Electrical stimulation overlap visualization for image-guided cochlear implant programming [11598-85]

Modeling the effects of bipolar helical cuff electrodes in vagus nerve stimulation [11598-86]

Optimal boundary conditions for model based brain shift simulation in deep brain stimulation surgery [11598-88]

Computer-aided classification of lung nodules on CT images with expert knowledge [11598-89]

Development of an open-source system for prostate biopsy training in Senegal [11598-91]