

Computed Tomography and Digital Radiography of X-rays.

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INTRODUCTION

X-ray imaging has expanded quickly recently, becoming more widely used outside of the medical industry. It is now essential to many different study fields. X-ray imaging has become more popular due to the potential and non-invasiveness of computed tomography and digital radiography. essential tool in many domains, including cultural heritage research, material and industrial component characterization, and medical diagnostics.

Together with greater processing power, the design and development of new detectors and X-ray sources have allowed for previously unimaginable levels of image clarity and spatial resolution, enabling the imaging of even submicron details with instruments in the lab.

The purpose of this Special Issue, "X-ray Digital Radiography and Computed Tomography," is to introduce and showcase new tools and state-of-the-art techniques for X-ray imaging, along with a variety of applications across several industries.

Submissions for this Special Issue came from a variety of nations, including the US, Australia, and Europe, and they were centered on the most diversified study topics. Twenty-three manuscripts were chosen following a thorough evaluation process: nineteen research articles and four review articles that demonstrate the use of computed tomography and X-ray digital radiography in a variety of

fields, including medical imaging [1-3], the study of cultural heritage objects [4-6], and the fusion of X-ray and neutron imaging [7].

Additional subjects included in this Special Issue are analytical methods such as microscopic synchrotron X-ray fluorescence [12] and the application of synchrotron light for phase-contrast and multi-contrast imaging [8-11]. New performance algorithms created for the reduction of cone-beam artifacts in CT images are the subject of several contributions [13], additionally retrieving signals from non-sinusoidal intensity modulations in neutron and X-ray interferometry [14], or devoted to novel approaches like high-speed X-ray imaging [17], rotation-free dynamic multi-angle X-ray tomography [16], and multiscale holotomography [15]. In the previous two research papers, the design and building of a new furnace for in situ wettability experiments at high temperatures under X-ray microtomography [19] and the implementation concepts of a full CT reconstruction toolchain [18] are described.

Four review papers, which are interesting, present the principles and viewpoint of radiographic imaging with muons [20], a review of coherent X-rays from early synchrotron tests to the most recent brain studies [22], a comparison of imaging techniques for biological and biomedical studies [21], and an overview of photon-counting spectral imaging detectors [21].

As the Special Issue Editors, we hope that this book will help the scientific community and advance understanding of the many different uses of computed tomography and X-ray digital radiography.

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REFERENCES

1. Romanucci, G.; Zantedeschi, L.; Ventriglia, A.; Mercogliano, S.; Bisighin, M.V.; Cugola, L.; Bricolo, P.; Rella, R.; Mandarà, M.; Benassuti, C.; et al. Lobular Breast Cancer Conspicuity on Digital Breast Tomosynthesis Compared to Synthesized 2D Mammography: A Multireader Study. *J. Imaging* 2021, 7, 185. [CrossRef] [PubMed]

2. Elbishlawi, S.; Abdelpakey, M.H.; Shehata, M.S.; Mohamed, M.M. CORONA-Net: Diagnosing COVID-19 from X-ray Images Using Re-Initialization and Classification Networks. *J. Imaging* 2021, 7, 81. [CrossRef] [PubMed]
3. Zheng, X.; Gutsche, L.; Al-Hayek, Y.; Stanton, J.; Elshami, W.; Jensen, K. Impacts of Phantom Off-Center Positioning on CT Numbers and Dose Index CTDI_v: An Evaluation of Two CT Scanners from GE. *J. Imaging* 2021, 7, 235. [CrossRef] [PubMed]
4. Albertin, F.; Morigi, M.P.; Bettuzzi, M.; Brancaccio, R.; Macchioni, N.; Saccuman, R.; Quarta, G.; Calcagnile, L.; Picchi, D. X-ray Tomography Unveils the Construction Technique of Un-Montu's Egyptian Coffin (Early 26th Dynasty). *J. Imaging* 2022, 8, 39. [CrossRef] [PubMed]
5. Norris, D.; Watson, O. Illuminating the Imperceptible, Researching Mina'i Ceramics with Digital Imaging Techniques. *J. Imaging* 2021, 7, 233. [CrossRef] [PubMed]
6. Vigorelli, L.; Re, A.; Guidorzi, L.; Cavaleri, T.; Buscaglia, P.; Nervo, M.; Facchetti, F.; Borla, M.; Grassini, S.; Lo Giudice, A. X-ray Imaging Investigation on the Gilding Technique of an Ancient Egyptian Taweret Wooden Statuette. *J. Imaging* 2021, 7, 229. [CrossRef]
7. Kovalenko, E.; Murashev, M.; Podurets, K.; Tereschenko, E.; Yatsishina, E. Neutron and Synchrotron Imaging Studies of Preservation State of Metal of Cultural Heritage Objects. *J. Imaging* 2021, 7, 224. [CrossRef]
8. Patera, A.; Bonnin, A.; Mokso, R. Micro- and Nano-Scales Three-Dimensional Characterisation of Softwood. *J. Imaging* 2021, 7, 263. [CrossRef]
9. Qiao, Z.; Shi, X.; Wojcik, M.; Assoufid, L. High-Resolution Scanning Coded-Mask-Based X-ray Multi-Contrast Imaging and Tomography. *J. Imaging* 2021, 7, 249. [CrossRef]
10. Zakharova, M.; Mikhaylov, A.; Vlnieska, V.; Kunka, D. Single-Shot Multicontrast X-ray Imaging for In Situ Visualization of Chemical Reaction Products. *J. Imaging* 2021, 7, 221. [CrossRef]
11. Schreiner, S.; Akstaller, B.; Dietrich, L.; Meyer, P.; Neumayer, P.; Schuster, M.; Wolf, A.; Zielbauer, B.; Ludwig, V.; Michel, T.; et al. Noise Reduction for Single-Shot Grating-Based Phase-Contrast Imaging at an X-ray Backlighter. *J. Imaging* 2021, 7, 178. [CrossRef]
12. Osterode, W.; Falkenberg, G.; Wrba, F. Copper and Trace Elements in Gallbladder Form Patients with Wilson's Disease Imaged and Determined by Synchrotron X-ray Fluorescence. *J. Imaging* 2021, 7, 261. [CrossRef] [PubMed]
13. Magkos, S.; Kupsch, A.; Bruno, G. Suppression of Cone-Beam Artefacts with Direct Iterative Reconstruction Computed Tomography Trajectories (DIRECTT). *J. Imaging* 2021, 7, 147. [CrossRef] [PubMed]
14. Pinzek, S.; Gustschin, A.; Neuwirth, T.; Backs, A.; Schulz, M.; Herzen, J.; Pfeiffer, F. Signal Retrieval from Non-Sinusoidal Intensity Modulations in X-ray and Neutron Interferometry Using Piecewise-Defined Polynomial Function. *J. Imaging* 2021, 7, 209. [CrossRef] [PubMed]
15. Ullherr, M.; Diez, M.; Zabler, S. Robust Image Reconstruction Strategy for Multiscalar Holotomography. *J. Imaging* 2022, 8, 37. [CrossRef] [PubMed]
16. Henningsson, A.; Hall, S.A. A Continuity Flow Based Tomographic Reconstruction Algorithm for 4D Multi-Beam High Temporal—Low Angular Sampling. *J. Imaging* 2021, 7, 246. [CrossRef]
17. Langkemper, R.; Moser, S.; Büttner, M.; Rakus, D.; Sättler, A.; Nau, S. A Priori Information Based Time-Resolved 3D Analysis of the Trajectory and Spatial Orientation of Fast-Moving Objects Using High-Speed Flash X-ray Imaging. *J. Imaging* 2022, 8, 28. [CrossRef]
18. Hofmann, J.; Flisch, A.; Zboray, R. Principles for an Implementation of a Complete CT Reconstruction Tool Chain for Arbitrary Sized Data Sets and Its GPU Optimization. *J. Imaging* 2022, 8, 12. [CrossRef]
19. Fedele, R.; Hameed, F.; Cefis, N.; Vergani, G. Analysis, Design and Realization of a Furnace for In Situ Wettability Experiments at High Temperatures under X-ray Microtomography. *J. Imaging* 2021, 7, 240. [CrossRef]
20. Cimmino, L. Principles and Perspectives of Radiographic Imaging with Muons. *J. Imaging* 2021, 7, 253. [CrossRef]
21. Pickford Scienti, O.L.P.; Darambara, D.G. An Overview of X-ray Photon Counting Spectral Imaging (x-CSI) with a Focus on Gold Nanoparticle Quantification in Oncology. *J. Imaging* 2021, 8, 4. [CrossRef] [PubMed]
22. Keklikoglou, K.; Arvanitidis, C.; Chatzigeorgiou, G.; Chatzinikolaou, E.; Karagiannidis, E.; Koletsis, T.; Magoulas, A.; Makris, K.; Mavrothalassitis, G.; Papanagnou, E.-D.; et al. Micro-CT for Biological and Biomedical Studies: A Comparison of Imaging Techniques. *J. Imaging* 2021, 7, 172. [CrossRef] [PubMed]
23. Margaritondo, G.; Hwu, Y. Imaging with Coherent X-rays: From the Early Synchrotron Tests to SYNAPSE. *J. Imaging* 2021, 7, 132. [CrossRef] [PubMed]