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Non-Ionising Optical Tomography and Inverse Radon Reconstruction for Imaging Diffuse Environments

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This study presents a novel approach to imaging diffuse environments using non-ionising optical tomography combined with inverse Radon reconstruction techniques. We developed and characterised gelatin-based phantom materials with distinct spectral properties, measured using a CloudSpec spectrophotometer across the 350–850 nm range. These materials simulate biological tissues and enable precise modelling of light propagation in scattering media. A custom Python-based pipeline was implemented for sinogram preprocessing and image reconstruction via filtered back-projection, facilitating the transformation of raw optical data into high-resolution 2D images. Control and experimental scans, including vials containing full cream milk, demonstrate the system's capability to resolve internal structures in highly scattering samples. This work lays the foundation for safe, cost-effective, and portable imaging systems suitable for biomedical and environmental applications.

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