ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ
ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ ΤΗΣ ΠΛΗΡΟΦΟΡΙΑΣ
SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY

ΤΜΗΜΑ ΣΤΑΤΙΣΤΙΚΗΣ
DEPARTMENT OF STATISTICS

ΚΥΚΛΟΣ ΣΕΜΙΝΑΡΙΩΝ ΣΤΑΤΙΣΤΙΚΗΣ ΔΕΚΕΜΒΡΙΟΣ 2017

Nickolas Protonotarios

Doctoral Researcher, Academy of Athens, Founder and Organizer of Hub Science

Attenuated spline reconstruction technique for nuclear emission tomography

ΠΕΜΠΤΗ 14/12/2017
13:15

ΑΙΘΟΥΣΑ 607, 6ος ΟΡΟΦΟΣ,
ΚΤΙΡΙΟ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
(ΕΥΕΛΠΙΔΩΝ & ΛΕΥΚΑΔΟΣ)

ΠΕΡΙΛΗΨΗ

The analytical approach to single photon emission computed tomography (SPECT) requires the inversion of a certain generalization of the two-dimensional Radon transform, which is called attenuated Radon transform. Both Radon and attenuated Radon transforms are line integrals. We present a modification of the explicit formula for this inversion which was derived in 2006 by Fokas, following the pioneering work of Novikov. We also present a numerical implementation of this Inverse Attenuated Radon Transform (IART), which we call the attenuated Spline Reconstruction Technique (aSRT). For this numerical implementation we utilize both the attenuated sinogram obtained from SPECT and the reconstructed attenuation coefficient obtained from a CT (computerized tomography) scan. The relevant data are provided by a SPECT/CT scanner. Our analytic formula of the IART involves the calculation of the Hilbert transform of the linear attenuation correction coefficient and the Hilbert transform of two sinusoidal functions of the attenuated sinogram. For the aSRT we have employed custom-made cubic splines. We aim to present the mathematical formulation of aSRT and to evaluate it via the reconstruction of various simulated phantoms, including an image-quality (IQ) phantom under Poisson noise. Furthermore, we aim to showcase a simple and powerful CUSUM method to eliminate streak artifacts outside the objects being imaged.

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AUEB STATISTICS SEMINAR SERIES DECEMBER 2017

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Doctoral Researcher, Academy of Athens, Founder and Organizer of Hub Science

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THURSDAY 14/12/2017
13:15

ROOM 607, 6th FLOOR,
POSTGRADUATE STUDIES BUILDING
(EVELPIDON & LEFKADOS)

ABSTRACT

The analytical approach to single photon emission computed tomography (SPECT) requires the inversion of a certain generalization of the two-dimensional Radon transform, which is called attenuated Radon transform. Both Radon and attenuated Radon transforms are line integrals. We present a modification of the explicit formula for this inversion which was derived in 2006 by Fokas, following the pioneering work of Novikov. We also present a numerical implementation of this Inverse Attenuated Radon Transform (IART), which we call the attenuated Spline Reconstruction Technique (aSRT). For this numerical implementation we utilize both the attenuated sinogram obtained from SPECT and the reconstructed attenuation coefficient obtained from a CT (computerized tomography) scan. The relevant data are provided by a SPECT/CT scanner. Our analytic formula of the IART involves the calculation of the Hilbert transform of the linear attenuation correction coefficient and the Hilbert transform of two sinusoidal functions of the attenuated sinogram. For the aSRT we have employed custom-made cubic splines. We aim to present the mathematical formulation of aSRT and to evaluate it via the reconstruction of various simulated phantoms, including an image-quality (IQ) phantom under Poisson noise. Furthermore, we aim to showcase a simple and powerful CUSUM method to eliminate streak artifacts outside the objects being imaged.