

PET-Related Bibliography.

Organized by topic. Biased toward PET. Slightly annotated. Hardly complete.

Outline

I. PET Scanner Quantitation, Physics.

- A. Normalization
- B. Scatter correction, scatter
- C. Attenuation Correction
- D. Calibration Correction
- E. Sensitivity, NEC
- F. Reconstruction
- G. Performance standards, acceptance test, QA/QC, NEMA
- H. 3D PET
- J. Resolution
- K. Specific PET Scanners
 - 1. GE Advance
 - 2. CTI ECAT/953B
 - 3. CTI EXACT HR+
 - 4. CTI HR++

II. PET studies

- A. F-DOPA
- B. Dosimetry, dosimetry
- C. [C-11]-raclopride
- D. FDG
- E. CBF
- F. Depression, serotonin, dopamine
- G. Fallypride

III. PET Data Analysis

- A. Coregistration
- B. Statistical Analysis
- C. Physiological Modeling
- D. Time-Activity Curve (TAC) measurements
- E. Reliability measurements
- F. Partial Volume Correction
- G. SPM
- H. Noise

IV. MRI Data Analysis

- A. MRI Image Segmentation
- B. Noise in MRI data
- C. Image display
- D. ROIs

V. fMRI Data Analysis

- A. Coregistration

VI. Cyclotrons, cyclotron targets

VII. Radiochemistry

#####

I. PET Scanner Quantitation, Physics.

A. Normalization

Casey ME and Hoffman EJ, "Quantitation in positron emission computed tomography: A technique to reduce noise in accidental coincidence measurements and coincidence efficiency calibration", *J. Comput. Assist. Tomogr.*, 10(5):845-850, 1986.

Hoffman EJ, Guerrero TM, Germano G, Digby WM, Dahlbom M, "PET system calibrations and corrections for quantitative and spatially accurate images", *IEEE Trans. Nuc. Sci.* vol. 36(1):1108-1112, 1989.

Defrise M, Townsend DW, Bailey D, Geissbuhler A, Michel C, and Jones T, "A normalization technique for 3D PET data", *Phys. Med. Biol.*, 36(7):939-952, 1991.

Stazyk MW, Sossi V, Buckley KR, Ruth TJ, "Normalization measurements in septa-less PET scanners", *J. Nucl. Med.*, vol 35 p.41P (abstract) 1994.

Casey ME, Gadagker H, Newport D, "A component based method for normalization in volume PET" Proc. Intl. Meeting on Fully Three-Dimensional Reconstruction in Radiology and Nuclear Medicine, Aix-les-Bains, France, pp.67-71, 1995.

Ollinger JM, "Detector efficiency and Compton scatter in fully 3D PET", *IEEE Trans. Nucl. Sci.*, 42:1168-1173, 1995.

Kinahan PE, Townsend DW, Bailey DL, Sashin D, Jadali F, Mintun M, "Efficiency Normalization techniques for 3D PET Data", Proc. 1995 IEEE/MIC Conference, 1995.

Bailey DL, Townsend DW, Kinahan P, Grootoonk S, Jones T, "An investigation of factors affecting detector and geometric correction in normalisation of 3-D PET data", *IEEE Trans. Nuc. Sci.*, vol. 43(6), pp. 3300-3307, 1996.

Oakes TR, Sossi V and Ruth TJ, "Normalization for 3D PET with a low-scatter planar source: Technique, Implementation and Validation", Proc. for 1997 Conference on Fully 3D Image Reconstruction for Radiology and Nuclear Medicine, Pittsburgh, Pennsylvania, June 25-28 1997.

Hermansen F, Spinks TJ, Camici PG, Lammertsma AA, "Calculation of single detector efficiencies and extension of the normalization sinogram in PET", *Phys. Med. Biol.*, 42:1143-1154, 1997.

Oakes TR, Sossi V and Ruth TJ, "Normalization for 3D PET with a low-scatter planar source and measured geometric factors", *Phys. Med. Biol.*, (in press) 1998.

Badawi RD, Lodge MA, Marsden PK, "Algorithms for calculating detector efficiency normalisation coefficients for true coincidences in 3D PET", *Phys. Med. Biol.*, (in press) 1998.

Oakes TR, Sossi V, and Ruth TJ, "Normalization in 3D PET: Comparison of detector efficiencies obtained from uniform planar and cylindrical sources", Proc. 1997 IEEE Medical Imaging Conference, Albuquerque, NM, 1997.

Oakes TR, Hurtado T, Jivan S, Buckley K, and Ruth TJ, "A positron plane-source which approaches the limit of low scatter", *J. Nucl. Med.*, vol 39(5) (abstract) 1998.

Ferreira NC, Trebossen R, Gregoire M.-C., Bendriem B, "Influence of malfunctioning block detectors on the calculation of single detector efficiencies in PET", *IEEE TNS*, 46(4):1062-9, 1999.

B. Scatter correction, scatter:

Bergstrom M, Erisson L, Bohm C, Blomqvist G, Litton J, Correction for scattered radiation in a ring detector positron camera by integral transformation of the projections. *J Comput Assist Tomogr*, 7:42-50, 1983.

Bailey DL and Meikle SR, "A convolution-subtraction scatter correction method for 3D PET", *Phys. Med. Biol.*, 39:411-24, 1993.

Daube-Witherspoon M, Bacharach S, Carson R, Influence of activity outside the field-of-view on 3-D PET imaging. *J. Nucl. Med.*, 36:184P, 1995.

Stearns C, Scatter correction method for 3D PET using 2D fitted Gaussian functions. *J. Nucl. Med.*, 36:105P, 1995.

Ollinger JM, "Detector efficiency and Compton scatter in fully 3D PET", *IEEE Trans Nucl Sci.*, 42(4):1168-73, 1995.

Ollinger JM, "Model-based scatter correction for fully 3D PET", *Phys. Med. Biol.*, 41:153-176, 1996.

Adam LE, Bellemann ME, Brix G, Lorenz WJ, "Monte Carlo-based analysis of PET scatter components", *J. Nucl. Med.*, 37(12):2024-2029.

C. Attenuation Correction:

Chan B, Bergstrom M, Palmer MR, Sayre C, Pate BD, "Scatter distribution in transmission measurements with positron emission tomography", *J. Comput. Assist. Tomogr.*, 10(2):296-301, 1986.

Huesman RH, Derenzo SE, Cahoon JA, et al., Orbiting transmission source for positron emission tomography. *IEEE Trans Nucl Sci*, 35:735-739, 1988.

Carson RE, Daube-Witherspoon ME, and Green MV, "A method for postinjection PET transmission measurements with a rotating source", *J. Nucl. Med.*, 29:1558-1567, 1988.

deKemp RA and Nahmias C, "Attenuation correction in PET using single photon transmission measurement", *Med. Phys.*, 21(6):771-778, 1994.

Beyer T, Kinahan PE, Townsend DW, "Optimization of transmission and emission scan duration in 3D whole-body PET", *Proc. 1996 IEEE NSS/MIC, IEEE Trans. Nuc. Science*, 44(6), 2400-2407.

D. Calibration Correction:

Bailey DL, Jones T, Spinks TJ, "A method for measuring the absolute sensitivity of positron emission tomographic scanners", *Eur. J. Nucl. Med.*, 18:374-379, 1991.

E. Sensitivity, NEC

Strother SC, Casey ME, Hoffman EJ, Measuring PET scanner sensitivity: relating countrates to image signal-to-noise ratios using noise equivalent counts. *IEEE Trans Nucl Sci*, 37:783-788, 1990.

F. Reconstruction

Dempster AP, Laird NM, Rubin DB, "Maximum likelihood from incomplete data via the EM algorithm", *J Roy Stat Soc B*, 39:1-38, 1977.

[Early implementation of EM algorithm.]

Shepp LA, Vardi Y, "Maximum likelihood reconstruction for emission tomography", *IEEE Trans Med Imag*, vol MI-2, pp. 113-122, 1982.

[EM algorithm applied to PET.]

Kinahan PE and Rogers JG, Analytic 3-D image reconstruction using all detected events. *IEEE Trans Nucl Sci*, 36(1):964-968, 1989.

Townsend DW, Geissbuhler A, Defrise M, et al., Fully three-dimensional reconstruction for a PET camera with retractable septa. *IEEE Trans Med Imag*, 10:505-512, 1991.

Cherry SR, Dahlbom M, Hoffman EJ, Evaluation of a 3D reconstruction algorithm for multi-slice PET scanners. *Phys. Med. Biol.*, 37(3):305-320, 1994.

Hudson HM, Larkin RS, "Accelerated image reconstruction using ordered subsets of projection data", *IEEE Trans Med Imag*, 13:601-609, 1994.

[OSEM introduced.]

Fessler JA, Hero AO, "Space-alternating generalized expectation-maximization algorithm", *IEEE Trans Sig Proc*, 42:2664-2677, 1994.

[SAGE introduced.]

Fessler JA, Hero AO, "Penalized maximum-likelihood image reconstruction using space-alternating generalized EM algorithms", *IEEE Trans Imag Proc*, 4:1417-1429, 1995.

[SAGE, continued.]

Defrise M, Kinahan PE, Townsend DW, Michel C, Sibomana M, Newport DF, "Exact and approximate rebinning algorithms for 3-D PET data", *IEEE Trans Med Imag.*, 16:145-158, 1997.

[FORE rebinning algorithm compared to others.]

G. Performance standards, acceptance test, QA/QC, NEMA:

Karp JS, Daube-Witherspoon ME, Hoffman EJ, Lewellen TK, Links JM, Wong W, et al., "Performance standards in positron emission tomography", *J Nucl Med*, 32:2342:2350, 1991.

"A phantom study evaluating the quantitative aspect of 3D PET imaging of the brain", V Sossi, TR Oakes and TJ Ruth, *Phys.Med.Biol.*, 43(9):2615-2630, 1998.

H. 3D PET:

Colsher JG, Fully three-dimensional positron emission tomography, *Phys. Med. Biol.*, 25:103-115, 1980.

Cherry SR, Dahlbom M, Hoffman EJ, "Three-dimensional PET using a conventional multislice tomograph without septa", *J Comput Assist Tomogr*, 15:655-668, 1991.

Li HH, Votaw JR, "Spatial variation of SNR in 2D & 3D Neuro PET", *Proc. 1995 IEEE NSS/Medical Imaging Conference*, Oct. 21-28, San Francisco, USA, pp. 1079-1083, 1995.

Badawi RD, Marsden PK, Cronin BF, Sutcliffe JL, Maisey MN, "Optimisation of noise-equivalent count rates in 3D PET", Phys. Med. Biol., 41:1755-76, 1996.

Pajevic S, Daube-Witherspoon ME, Bacharach SL, Carson RE, "Noise characteristics of 3-D and 2-D PET images", IEEE Trans Med Imag 17(1) pp9-23, 1998

Sossi V, Oakes TR, Chan G, Schulzer M, Ruth TJ, "Quantitative comparison of three- and two-dimensional PET with human brain studies", J.Nucl.Med., 39(10):1714-9, 1998.

Trebossen R, Bendriem B, Ribiero MJ, Fontaine A, Frouin V, Remy P, Validation of the three-dimensional acquisition mode in positron emission tomography for the quantitation of [18F]fluoro-DOPA uptake in the human striata, J. Cereb. Blood FLOW Metab., 18(9):951-9, 1998.

Daube-Witherspoon ME, Carson RE, Axial slice width in 3D PET: characterization and potential improvement with axial interleaving, Physics Med. Biol., 43(4):921-8, 1998.

Raylman RR, Kison PV, Wahl RL, Capabilities of two- and three-dimensional FDG-PET for detecting small lesions and lymph nodes in the upper torso: a dynamic phantom study, European J. Nuc. med., 26(1):39-45, 1999.

Spinks TJ, Miller MO, Bailey DL, The effect of activity outside the direct field of view in a 3D-only whole-body positron tomograph, Physics Med. Biol., 43(4):895-904, 1998.

Badawi RD, 3D-mode acquisition in clinical PET, Nuclear Med. Comm., 18(9):801-4, 1997.

J. Resolution

Dahlbom MD, Chatziioannou A, Hoh CK, "Resolution characterization of continuous axial sampling in whole body PET", Proc. 1995 IEEE NSS/Medical Imaging Conference, Oct. 21-28, San Francisco, USA, pp. 1011-1015, 1995.

Erlandsson K, Strand S-E, "Improved axial resolution in 2D PET with 3D reconstruction", Proc. 1995 IEEE NSS/Medical Imaging Conference, Oct. 21-28, San Francisco, USA, pp. 1267-71, 1995.
[But the tradeoff is noisier images...]

Yang J, Huang SC, Lin KP, Czernin J, Wolfendrin P, Dahlbom M, Hoh CK, Phelps ME, "A new axial smoothing method based on elastic mapping", Proc. 1995 IEEE NSS/Medical Imaging Conference, Oct. 21-28, San Francisco, USA, pp. 1420-24, 1995.

K. Specific PET Scanners:

1. GE Advance:

DeGrado TR, Turkington TG, Williams JJ, Stearns CW, Hoffman JM, Coleman RE, Performance characteristics of a whole-body PET scanner, J Nucl Med 35:1398-1406, 1994.

Lewellen T, Kohlmyer S, Miyaoka R, Schubert S, Stearns C, Investigation of the count rate performance of the General Electric ADVANCE positron emission tomograph. IEEE Trans Nucl Sci, 42:1051-1057, 1995.

Crandall P and Stearns C, A scalable multiprocessor implementation of the reprojection algorithm for volumetric PET imaging, Conf. Rec. IEEE MIC (San Francisco), in press 1995.

Stearns C, Scatter correction method for 3D PET using 2D fitted Gaussian functions. J. Nucl. Med., 36:105P, 1995.

Holm S, Toft P, Jensen M, "Estimation of the noise contributions from blank, transmission and emission scans in PET", IEEE Trans. Nuc. Science, 43(4), 2285-91, 1996.

Lewellen TK, Kohlmeyer SG, Miyaoka RS, Kaplan MS, Stearns CW and Schubert SF, Investigation of the performance of the General Electric ADVANCE positron emission tomograph in 3D mode, IEEE Trans Nucl Sci 43:2199-2206, 1996.

Pajevic S, Daube-Witherspoon ME, Bacharach SL, Carson RE, Noise characteristics of 3-D and 2-D PET images, IEEE Trans Med Imag 17(1) pp9-23, 1998

"Comparison of 2D and 3D PET for Cerebral FDG in Human Subjects", TR Oakes, JE Holden, RW Pyzalski, AD Roberts, WD Brown, RJ Nickles, RJ Davidson, *in press, IEEE TNS*, June 2000.

2. CTI ECAT/953B:

Spinks TJ, Jones T, Bailey DL, Townsend DW, Grootoank S, Bloomfield PM, Gilardi M-C, Casey ME, Sipe B, Reed J, "Physical performance of a positron tomograph for brain imaging with retractable septa", Phys.Med.Biol., 37:8, pp.1637-55, 1992.

Sossi V, Oakes TR, Chan G, Schulzer M, Ruth TJ, "Quantitative comparison of three- and two-dimensional PET with human brain studies", J.Nucl.Med., 39(10):1714-9, 1998.

Chan GL et al., Reproducibility studies with 11C-DTBZ, a monoamine vesicular transporter inhibitor in healthy human subjects, J Nuc. Med., 40(2):283-9, 1999.

3. CTI EXACT, HR+

Wienhard K et al., "Performance evaluation of the positron scanner ECAT EXACT", J. Comput. Assist. Tomog., 16:804-813, 1992.

Morenu-Cantu JJ, Thompsen CJ, Zatorre RJ, Evaluation of the ECAT EXACT HR+ 3-D PET scanner in H2(15)O brain activation studies: dose fractionation strategies for rCBF and signal enhancing protocols, IEEE TNS, 17(6):979-85, 1998.

4. CTI HR++

Isoardi RA, Townsend DW et al., A study of the injected dose for brain mapping on the ECAT HR++: activation images for a parametric verbal working memory task, Neuroimage, 9(1):145-53, 1999,

#####

II. PET studies

A. F-DOPA:

Oakes, TR, "Clinical Investigation of the Dopaminergic System with PET and 18F-Fluoro-L-DOPA". Doctoral Thesis, University of Wisconsin-Madison (Medical Physics Dept.),1995

"Fluorine-18-fluoro-L-DOPA dosimetry with Carbidopa Pretreatment", WD Brown, TR Oakes, OT DeJesus, MD Taylor, AD Roberts, RJ Nickles, Holden JE, *J. Nucl. Med.*, 39:1884-91, 1998.

B. Dosimetry, dosimetry:

"Fluorine-18-fluoro-L-DOPA dosimetry with Carbidopa Pretreatment", WD Brown, TR Oakes, OT DeJesus, MD Taylor, AD Roberts, RJ Nickles, Holden JE, *J. Nucl. Med.*, 39:1884-91, 1998.

Deloar M, Fujiwara, et al., "Estimation of internal absorbed dose of L-[methyl-11C] methionine using whole-body positron emission tomography", *Eur. J. Nucl. Med.*, 25: 629-633, 1998.

C. [C-11]-raclopride

Koepp MJ, Gunn RN, Lawrence AD, Cunningham VJ, Dagher A, Jones T, Brooks DJ, Bench CJ & Grasby PM, "Evidence for striatal dopamine release during a video game", *Nature*, 393:266-7, 21 May 1998.

D. FDG

Sokoloff L, Reivich M, Kennedy C, Des Rosiers MH, Patlak CS, Pettigrew KD, Sakurada O, Shinohara M, "The [14C]deoxyglucose method for the measurement of local cerebral glucose utilization: Theory, procedure, and normal values in the conscious and anesthetized albino rat", *J. Neurochemistry*, 28:897-916, 1977.

Gallagher JNM 1977.

[urinary excretion of FDG in dogs within 1 hr p.i.]

Phelps ME, Huang SC, Hoffman EJ, Selin C, Sokoloff L, Kuhl DE, "Tomographic measurement of local cerebral glucose metabolic rate in humans with (F-18)2-fluoro-2-deoxy-D-glucose: Validation of method", *Ann Neurol* 6:371-388, 1979.

[Original reference for using FDG as a tracer in humans.]

Brownell GL, Kearfott KJ, Kaireto AL, Elmaleh DR, Alpert NM, Correia JA, Wechsler L, Ackerman RH, "Quantitation of regional cerebral glucose metabolism", *J. Comput. Assist. Tomogr.*, 7:919-924, 1983.

[Heated-hand venous method for FDG.]

Reivich M, Alavi A, Wolf A, Fowler J, Russel J, Arnett C, MacGregor RR, Shiue CY, Atkins H, Anand A, Dann R, Greenburg JH, "Glucose Metabolic rate kinetic model parameter determination in humans: The lumped constants and rate constants for [18F]fluorodeoxyglucose and [11C]deoxyglucose", *J. Cereb. Blood Flow Metab.*, 5:179-192, 1985.

Chang JYC, Duara R, Barker W, Apicella A, Finn R, "Two behavioral states studied in a single PET/FDG procedure: Theory, method and preliminary results", *J. Nucl. Med.*, 28:852-860, 1987.

[Concise summary of 3-compartment model, mathematical equations.]

Takikawa et al, "Noninvasive quantitative fdg pet studies with an estimated input function derived from a population-based arterial blood curve", *Radiology* 188(1):131, 1993.

Wang GJ, Volkow ND, Wolf AP, Brodie JD, Hitzemann RJ, "Intersubject variability of brain glucose metabolic measurements in young normal males", *J. Nucl. Med.*, 35:1457-1466, 1994.

Schmidt KC, Lucignani G, Sokoloff L, "Fluorine-18-fluorodeoxyglucose PET to determine regional cerebral glucose utilization: A re-examination", *JNM*, 37(2):394-399, 1996.

Boerner AR et al., Optimal scan time for fluorine-18 fluorodeoxyglucose positron emission tomography in breast cancer, *European J Nucl. Med.*, 26(3):201-7, 1999.

Hochachka PW, Clark CM, Brown WD, Stone CK, Nickles RJ, and Holden JE, "Effects on regional brain metabolism of prolonged high altitude exposure. A study of six US marines", *Am. J. Physiol.*, 46:R314-R319, 1999.

E. CBF, Cerebral Blood Flow

Kety SS and Schmidt CF, "The determination of cerebral blood flow in man by the use of nitrous oxide in low concentrations", *Amer. J. Physiol.*, 143:53-66, 1945.

Kety S, "Measurement of local blood flow by the exchange of an inert, diffusible substance", *Methods Med. Res.*, 8:229-236, 1960. (???? Not certain of journal, date)

Ingvar DH and Lassen NA, "Regional blood flow of the cerebral cortex determined by krypton85", *Acta Physiol. Scand.*, 54:325-338, 1962.

Lassen NA, Hoedt-Rasmussen K, Sorensen SC, Skinhoj E, Cronquist S, Bodforss B, Eng E, Ingvar DH, "Regional cerebral blood flow in man determined by krypton85", *Neurology*, 13(9):719-727, 1963.

Hoedt-Rasmussen K, Sveinsdottir E, Lassen NA, "Regional cerebral blood flow in man determined by intr-arterial injection of radioactive inert gas", *Circulation Research*, 18(3):237-247, 1966.

Ter-Pogossian MM, Eichling JO, Davis DO, Welch MJ, and Metzger JM, "The determination of regional cerebral blood flow by means of water labeled with radioactive oxygen 15", *Radiology* 93:31-40, 1969.

Yamamoto YL, Thompson CJ, Meyer E, et al., "Dynamic positron emission tomography for the study of cerebral hemodynamics in a cross section of the head using positron emitting 68Ga-EDTA and 77Kr", *J. Comput. Assist. Tomogr.*, 1:43-56, 1977.
[Dynamic method.]

Kanno I and Lassen NA, "Two methods for calculating regional cerebral blood flow from emission computed tomography of inert gas concentrations", *J. Comput. Assist. Tomogr.*, 3(1):71-76, 1979.

Ginsberg MD, Lockwood AH, Busto R, et al., "A simplified in vivo autoradiographic strategy for the detection of regional cerebral blood flow by positron emission tomography: Theoretical considerations and validation studies in rats", *J. Cereb. Blood Flow Metab.*, 2:89-98, 1982.
[Autoradiographic method.]

Huang S-C, Carson RE, Hoffman EJ et al., "Quantitative measurement of local cerebral blood flow in humans by positron computed tomography and 15O-water", *J. Cereb. Blood Flow Metab.*, 3:141-153, 1983.
[Dynamic method.]

Herscovitch P, Markham J, Raichle ME, "Brain blood flow measured with intravenous H2-15O, Theory and error analysis", *J. Nucl. Med.*, 24:782-789, 1983.
[Autoradiographic method.]

Raichle ME, Martin WRW, Herscovitch P et al., "Brain blood flow measured with intravenous H2-15O. 2. Implementation and validation", *J. Nucl. Med.*, 24:790-798, 1983.
[Autoradiographic method.]

Kanno I, Lammetsma AA, Heather JD, Gibbs JM, Rhodes CG, Clark JC, Jones T, "Measurement of cerebral blood flow using bolus inhalation of C15O2 and positron emission tomography: description of method and its comparison with the C15O2 continuous inhalation method", *J. Cereb. Blood Flow Metab.*, 4:224-234, 1984.

Koeppel RA, Holden JE, Polcyn RE, Nickles RJ, Hutchins GD, Weese JL, "Quantitation of local cerebral blood flow and partition coefficient without arterial sampling: Theory and validation", *J. Cereb. Blood Flow Metab.*, 5:214-224, 1985.
[Dynamic method.]

Iida H, Kanno I, Miura S, Murakami M, Takahashi K, Uemura K, "Error analysis of a quantitative cerebral blood flow measurement using H2-15O autoradiography and positron emission tomography, with respect to the dispersion of the input function", *J. Cereb. Blood Flow Metab.*, 6:536-545, 1986.

Koeppel RA, Hutchins GD, Rothley JM, Hichwa RD, "Examination of assumptions for local cerebral blood flow studies in PET", J. Nucl. Med., 28:1695-1703, 1987.

Alpert N, "Optimization of regional cerebral blood flow measurements with PET" (editorial), J. Nucl. Med., 32(10):1934-1935, 1991.

[Summary, comparison of several methods.]

Newton, C, Wilson DA, Gunnoe E, Wagner B, Cope M, Traystman RJ, "Measurement of cerebral blood flow in dogs with near infrared spectroscopy in the reflectance mode is invalid", J. Cereb. Blood Flow Metab., 17:695-703, 1997.

Morenu-Cantu JJ, Thompsen CJ, Zatorre RJ, Evaluation of the ECAT EXACT HR+ 3-D PET scanner in H₂(15)O brain activation studies: dose fractionation strategies for rCBF and signal enhancing protocols, IEEE TNS, 17(6):979-85, 1998.

Li HH, Votaw JR, Optimization of PET activation studies based on the SNR measured in the 3-D Hoffman brain Phantom, IEEE TNS, 17(4):596-605, 1998.

F. Depression, serotonin, dopamine

Smith GS, Dewey SL, Brodie JD, Logan J, Vitkun SA, Simkowitz P, Schloesser R, Alexoff DA, Hurley A, Cooper T, Volkow ND, "Serotonergic modulation of dopamine measured with [11C]raclopride and PET in normal human subjects", Am. J. Psychiatry, 154:490-496, 1997,

[Good methodology, nice examination of unclear results.]

G. Fallypride

Mukherjee J, Yang Z, Das M, Brown T, "Fluorinated benzamide neuroleptics-III. Development of (S)-N-[(1-allyl-2-pyrrolidinyl)methyl]-5-(3-[18F]fluoropropyl)-2,3-dimethoxybenzamide as an improved dopamine D-2 receptor tracer", Nucl. Med. Biol., 22(3):283-296, 1995.

Mukherjee J, Yang Z, Lew R, Brown T, Kronmal S, Coopwe M, Seiden L, "Evaluation of d-amphetamine effects on the binding of dopamine D-2 receptor radioligand, 18F-Fallypride in nonhuman primates using positron emission tomography", Synapse, 27:1-13, 1997.

#####

III. PET Data Analysis

A. Coregistration:

Pelizzari CA, Chen GTY, Spelbring DR, Weichselbaum RR, Chen CT, "Accurate three-dimensional registration of CT, PET, and/or MR images of the brain", J. Comput. Assist. Tomogr., 13(1):20-26, 1989.

Pietrzyk U, Herholz K and Heiss WD, "Three-dimensional alignment of functional and morphological tomograms", J. Comput. Assist. Tomogr., 14(1):51-59, 1990.

Woods RP, Cherry SR, Mazziotta JC, "Rapid automated algorithm for aligning and reslicing PET images", J. Comput. Assist. Tomogr., 16(4):620-633, 1992.

Woods RP, Mazziotta JC, Cherry SR, "MRI-PET registration with automated algorithm", J. Comput. Assist. Tomogr., 17(4):536-546, 1993.

Pietrzyk U, Herholz K, Fink G, Jacobs A, Mielke R, Slansky I, Wuerker M, Heiss WD, "An interactive technique for three-dimensional image registration: Validation for PET, SPECT, MRI and CT brain studies", J. Nucl. Med., 35:2011-2018, 1994.

Strother SC, Anderson JR, Xu XL, Liow JS, Bonar DC, Rottenberg DA, "Quantitative comparisons of image registration techniques based on high-resolution MRI of the brain", J. Comput. Assist. Tomogr., 18(6):954-962, 1994.

Swerdluff SJ, "A framework for the study of the significance of differences in PET images: An objective method for quantifying functional change", Dissertation, University Wisconsin-Madison Medical Physics Dept., Madison, WI, 1995.

Friston KJ, Ashburner J, Poline JB, Frith CD, Heather JD, Frackowiak RSJ, "Spatial registration and normalization of images", Human Brain Mapping, 2:165-189, 1995.

Jiang A, Kenedy DN, et al., "Motion detection and correction in functional MRI imaging", Human Brain Mapping, 3:224-235, 1995.

Black KJ, Videen TO, and Perlmutter JS, "A metric for testing the accuracy of cross-modality image registration: validation and application", J. Comput. Assist. Tomogr., 20(5):855-861, 1996.

Klein GJ, et al., Huesman RH, "A methodology for specifying PET volumes-of-interest using multi-modality techniques", Proc. BrainPET'97 Conference, Washington, DC, June 1997.

Julin P, Lindqvist J, et al., "MRI-guided SPECT measurements of medial temporal lobe blood flow in Alzheimer's disease", J. Nucl. Med., 38:914-919, 1997.

West J, Fitzpatrick JM, et al. [LOTS], "Comparison and evaluation of retrospective intermodality brain image registration techniques", J. Comput. Assist. Tomogr., 21(4):554-566, 1997.

Woods RP, Grafton ST, Holmes CJ, Cherry SR, Mazziotta JC, "Automated image registration I: General methods and intrasubject, intramodality validation", J. Comput. Assist. Tomogr., 22(1):139-152, 1998.

Woods RP, Grafton ST, Watson JDG, Sicotte NL, Mazziotta JC, "Automated image registration I: Intersubject validation of linear and nonlinear models", J. Comput. Assist. Tomogr., 22(1):153-165, 1998.

B. Statistical Analysis:

Clark C, Carson R, Kessler R, Margolin R, Buchsbaum M, DeLisi L, King C, and Cohen R, "Alternative statistical models for the examination of clinical positron emission tomography/ fluorodeoxyglucose data", J. Cereb. Blood Flow, 5:142-150, 1985.

[Differences in gCRMglu account for 75% of inter-subject variability.]

Woods RP, Iacoboni M, Grafton ST, and Mazziotta JC. Improved Analysis of Functional Activation Studies Involving Within-Subject Replications Using a Three-Way ANOVA Model. In "Quantification of Brain Function Using PET", Myers R, Cunningham V, Bailey D, Jones T, Eds. Proceedings of Brain PET 95, Oxford, July 1995.

[For studies with large numbers of parameters you may want to consider using a higher prob threshold.]

McIntosh AR, Grady CL, Haxby JV, Maisog JM, Horwitz B, and Clark CM, "Within-subject transformations of PET regional cerebral blood flow data: ANCOVA, ratio, and z-score adjustments on empirical data", Human Brain Mapping, 4:93-102, 1996.

[Nice explanation of z-scores.]

C. Physiological Modeling

Gunn RN, Lammertsma AA, Hume SP, Cunningham VJ, "Parametric imaging of ligand-receptor binding in PET using a simplified reference model", Neuroimage, 6:279-287, 1997.

Phelps ME, Huang SC, Hoffman EJ, Selin C, Sokoloff L, Kuhl DE, "Tomographic measurement of local cerebral glucose metabolic rate in humans with (F-18)2-fluoro-2-deoxy-D-glucose: Validation of method", *Ann Neurol* 6:371-388, 1979.

Logan J, Fowler JS, Volkow ND, Wolf AP, Dewey SL, Schlyer D, MacGregor RR, Hitzemann R, Bendrium B, Gatley SJ, Christman D, "Graphical analysis of reversible radioligand binding from time-activity measurements applied to [N-11C-methyl]-(-)-cocaine PET studies in human subjects", *J. Cereb. Blood Flow Metab.*, 10:740-747, 1990.

Holthoff VA, Koeppe RA, Frey KA, Paradise AH, Kuhl DE, "Differentiation of radioligand delivery and binding in the brain: Validation of the two-compartment model for [11C]-flumazenil", *J. Cereb. Blood Flow Metab.*, 11:745-752, 1991.

Logan J, Volkow N, Fowler J, Wang G, Dewey S, MacGregor R, Schlyer D, Gatley S, Pappas N, King P, "Effects of blood flow on 11C-raclopride binding in the brain: Model simulations and kinetic analysis of PET data", *J. Cereb. Blood Flow Metab.*, 14:995-1010, 1995.

D. Time-Activity Curve (TAC) measurements

Brownell GL, Kearfott KJ, Kairento AL, Elmaleh DR, Alpert NM, Correia JA, Wechsler L, Ackerman RH, "Quantitation of regional cerebral glucose metabolism", *J. Comput. Assist. Tomogr.*, 7:919-924, 1983.
[Heated-hand venous method for FDG. Some support for measuring TAC to only 30 minutes.]

Brooks DC, Black PR, Arcangeli MA, Aoki TT, Wilmore DW, "The heated dorsal hand vein: An alternative arterial sampling site", *Journal of Parenting and Enteral Nutrition*, 13(1):102-105, 1989.

E. Reliability measurements

Small GW, Stern CE, Mandelkern MA, Fairbanks LA, Min, CA, Guze BH, "Reliability of drawing regions of interest for positron emission tomographic data", *Psychiatry Research: Neuroimaging*, 45:177-85, 1992.

Wang GJ, Volkow ND, Wolf AP, Brodie JD, Hitzemann RJ, "Intersubject variability of brain glucose metabolic measurements in young normal males", *J. Nucl. Med.*, 35:1457-1466, 1994.

Friston KJ, Holmes A, Poline J-B, Price CJ, Frith CD, "Detecting activations in PET and fMRI: levels of inference and power", *NeuroImage*, 4:223-235, 1996.

Chan GL et al., "Reproducibility studies with 11C-DTBZ, a monoamine vesicular transporter inhibitor in healthy human subjects", *J. Nucl. Med.*, 40(2):283-9, 1999.

Li HH, Votaw JR, "Optimization of PET activation studies based on the SNR measured in the 3-D Hoffman brain Phantom", *IEEE TNS*, 17(4):596-605, 1998.

F. Partial Volume Correction

Hoffman EJ, Huang SC, Phelps ME, "Quantitation in positron emission computed tomography: 1. Effect of object size", *J. Comput. Assist. Tomogr.*, 3:299-308, 1979.

[Introduces wedge-phantom to measure relation between object size and recovery coefficient. An estimate of object's size is required for PVC.]

Mazziotta JC, Phelps ME, Plummer D, Kuhl DE, "Quantitation in positron emission computed tomography: 5. Physical-anatomical effects", *J. Comput. Assist. Tomogr.*, 5(5):734-43, 1981.

[Early work]

Videen TO, Perlmutter JS, Mintun et al., "Regional correction of positron emission tomography data for the effects of cerebral atrophy", J. Cereb. Blood Flow Metab., 8:662-670, 1988.

Meltzer CC, Leal JP, Mayberg HS, et al., "Correction of PET data for partial volume effects in human cerebral cortex by MRI imaging", J. Comput. Assist. Tomogr., 14(4):561-570, 1990.

Muller-Gartner HW, Links JM, Prince JL et al., "Measurement of radiotracer concentration in brain gray matter using positron emission tomography: MRI-based correction for partial volume effects", J. Cereb. Blood Flow Metab., 12:571-583, 1992.

Rousset OG, Ma Y, Leger GC et al., "Correction for partial volume effects in PET using MRI-based 3D simulations of individual human brain metabolism", in Quantification of Brain Function, Amsterdam, The Netherlands: Elsevier, 1993.

Yang J, Huang SC, Mega M, Lin KP, Toga AW, Small GW, Phelps ME, "Investigation of partial volume correction methods for brain FDG PET studies", IEEE TNS, 43(6):3322-3327, 1996.
[Uses MRI degraded to PET resolution, simulates GM/WM FDG distribution. Only mildly confidence-inspiring.]

Chen CH et al., "Simultaneous recovery of size and radioactivity concentration of small spheroids with PET data", J. Nuc. Med., 40(1):118-30, 1999.

G. SPM

Friston RJ, Holmes AP, Worsley KJ, Poline JP, Frith CD, Frackowiak RSJ, "Statistical parametric maps in functional imaging: a general linear approach", Human Brain Mapping, 2:189-210, 1995.

Friston KJ, Ashburner J, Poline JB, Frith CD, Heather JD, Frackowiak RSJ, "Spatial registration and normalization of images", Human Brain Mapping, 2:165-189, 1995.

Friston KJ Holmes A Poline J-B Price CJ Frith CD, "Detecting activations in PET and fMRI: levels of inference and power", NeuroImage, 4:223-235, 1996.

G. Noise

Li HH, Votaw JR, "Spatial variation of SNR in 2D & 3D Neuro PET", Proc. 1995 IEEE NSS/Medical Imaging Conference, Oct. 21-28, San Francisco, USA, pp. 1079-1083, 1995.

Holm S, Toft P, Jensen M, "Estimation of the noise contributions from blank, transmission and emission scans in PET", IEEE Trans. Nuc. Science, 43(4), 2285-91, 1996.

#####

IV. MRI Data Analysis

A. MRI Image Segmentation

Wang DCC, Vagnucci AH, Li CC, "Gradient inverse weighted smoothing scheme and the evaluation of its performance", Comput Graph Image Processing, 15:167-181, 1981.

Canny J, "A computational approach to edge detection", IEEE Trans Pattern Anal Machine Intell, vol. PAMI-8:679-698, 1986.

Filipek PA, Kennedy DN, Caviness VS, Rosnick SL, Spraggins TA, Starewicz PM, "Magnetic resonance imaging-based brain morphometry: development and application to normal subjects", *Ann Neurol*, 25(1):61-67, 1989.

Kennedy DN, Filipek PA, Caviness VS, "Anatomic segmentation and volumetric calculation in nuclear magnetic resonance imaging", *IEEE TMI*, 8(1):1-7, 1989.

[Early attempt to integrate several filters into a MRI analysis chain. Uses intensity contours, differential intensity contours, and Sobel edge detection for outline optimization. Has some good references of other early work in this field.]

Meyer, F., Beucher, S. "Morphological Segmentation". *J. Visual Commun. Image Repres.* 1(1):21-46; 1990.

Perona P and Malik J, "Scale-space and edge detection using anisotropic diffusion", *IEEE Pattern Anal. Machine Intell.*, 12:629-639, July 1990.

Nordstrom N, "Biased anisotropic diffusion- A unified regularization and diffusion approach to edge detection", *Image Vision Comput*, 8(4):318-327, 1990.

Vincent L., Soille, P "Watersheds in digital spaces: an efficient algorithm based on immersion simulations". *IEEE Trans. Pattern Anal. Machine Intell.*, 13(6):583-598; 1991.

Gerig G, Kubler O, Kikinis R, Jolesz FA, " Nonlinear anisotropic filtering of MRI data", *IEEE Trans Med Imaging*, 11(2):221-232, 1992.

[Describes an improved, integrated approach to nonlinear anisotropic filtering. Presents some earlier work by others. This looks like a worthwhile (but somewhat time-consuming) method.]

Pappas TN, "An adaptive clustering algorithm for image segmentation", *IEEE Trans. Signal Processing*, 40(4):901-914, 1992.

Higgins W E, Ojard E J "Interactive Morphological Watershed Analysis for 3D Medical Images". *Computerized Medical Imaging and Graphics*, Vol 17, no. 4/5, pp.387-395, 1993.

Vincent L "Morphological Grayscale Reconstruction in Image Analysis: Applications and Efficient Algorithms". *IEEE Trans. on Image Processing*, Vol 2, no. 2, pp 176-201, 1993.

Clarke LP, Velthuizen RP, Camacho MA, Heine JJ, Vaidyanathan M, Hall LO, Thatcher RW, Silbiger ML, "MRI segmentation: methods and applications". [Review] [184 refs] *Magnetic Resonance Imaging*. 13(3):343-68, 1995. [95311666]

[Lots of refs. Broad, shallow overview.]

Haller JW, Christensen GE, Joshi SC, Newcomer JW, Milelr MI, Csernasky JG, Vannier MW, "Hippocampal MR imaging morphometry by means of general pattern matching", *Radiology*, 199(3):787-791, 1996.

Haller JW, Banerjee A, Christensen GE, Gado M, Joshi S, Miller MJ, Sheline Y, Vannier MW, Csernansky JG, "Three-dimensional hippocampal MR morphometry with high-dimensional transformation of a neuroanatomic atlas", *Radiology*, 202(2):5054:510, 1997.

Yezzi A, Kichenassamy S, Kumar A, Olver P, Tannenbaum A, "A geometric snake model for segmentation of medical imagery", *IEEE Transactions on Medical Imaging*. 16(2):199-209, 1997. [97255998]

Sijbers J, Scheunders P, Verhoye M, van der Linden A, van Dyck D, Raman E, "Watershed-based segmentation of 3D MR data for volume quantization", *Magnetic Resonance Imaging*. 15(6):679-88, 1997. [97431770]

[Nice explanation of problems, foibles of other methods. Elegant method.]

Teo PC, Sapiro G, Wandell BA, "Creating connected representations of cortical gray matter for functional MRI visualization", *IEEE Transactions on Medical Imaging*. 16(6):852-63, 1997. [98192269]

[Software available. Nice references.]

Atkins MS, Mackiewich BT, "Fully automatic segmentation of the brain in MRI", IEEE Transactions on Medical Imaging. 17(1):98-107, 1998. [98278473]
[Finds edges of brain. Useful to remove skull. Works OK.]

Reiss AL, Hennessey JG, Rubin M, Beach L, Abrams MT, Warsofsky IS, Liu AM, Links JM, "Reliability and validity of an algorithm for fuzzy tissue segmentation of MRI", Journal of Computer Assisted Tomography. 22(3):471-9, 1998. [98269236]
[Explain results of their algorithm for assigning voxels to one of 3 tissue classes. Impressive results, sketchy details. Software available for Mac.]

B. Noise in MRI data

Kaufman L, Kramer DM, Crooks LE, Ortendahl DA, "Measuring signal-to-noise ratios in MR-imaging", Radiology, 173:265-267, 1989.

C. Image display

Kennedy DN and Nelson AC, "Three dimensional display from cross-sectional tomographic images: an application to magnetic resonance imaging", IEEE TMI, MI-6(2):134-140, 1987.
[Describes a silly apparatus using mirrors (really!) to provide a 3D perspective view.]

D. ROIs

Small GW, SternCE, Mandelkern MA, Fairbanks LA, Min, CA, Guze BH, "Reliability of drawing regions of interest for positron emission tomographic data", Psychiatry Research: Neuroimaging, 45:177-85, 1992.

#####

V. fMRI Data Analysis

A. Coregistration:

Jiang A, Kenedy DN, et al., "Motion detection and correction in functional MRI imaging", Human Brain Mapping, 3:224-235, 1995.

#####

VI. Cyclotrons, cyclotron targets.

Roberts AD, Oakes TR and Nickles RJ, "Development of an improved target for [18F]-F2 production", Appl. Radiat. Isot., 46:87, 1995.

#####

VII. Radiochemistry.

O Solin, K Aho, J Bergman, KM Kallman and TR Oakes, "Synthesis of [F-18]F2 from [F18]F-(aq)", IX International Symposium on Radiopharmaceutical Chemistry, Paris, April 6-10, 1992.

J Bergman, K-M Kallman, O Solin, OT DeJesus, TR Oakes, RJ Nickles, "A New Method for the Production of Electrophilic F-18 Starting from Aqueous [F-18]", J. Nucl. Med., vol.34 no. 5 Supplement, p. 69P, 1993.