

# A scheme for automatically building 3D morphometric anatomical atlases based on feature lines: a list of references

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## 1 Building automatically 3D landmark based morphometric atlases

- Brain segmentation: [Ayache et al., 1996, Kapur et al., 1996, Worth et al., 1997].
- General presentation of the problem: [Bookstein, 1991, Bookstein, 1994, Mazziotta et al., 1995, Toga and Thompson, 1998, Mazziotta, 1997].

## 2 Line feature extraction

### 2.1 The crest lines

- Mathematical definitions of crest lines [Porteous, 1987, Koenderink, 1990, Hosaka, 1992, Anoshkina et al., 1995, Monga and Benayoun, 1995, Thirion and Gourdon, 1995, van den Elsen et al., 1995, Bruce et al., 1996, Eberly, 1996, Kent et al., 1996, Lang, 1997]. Review of all the definitions [Belyaev et al., 1996, Subsol, 1998].
- "Marching Lines" algorithm [Thirion and Gourdon, 1996].
- Example of crest lines: engine, skull, brain, heart ventricle) [Subsol, 1995], skull mandible [Andresen et al., 1998].

### 2.2 Anatomical validity

- Definition of "ridge lines" on the skull [Bookstein and Cutting, 1988, Cutting, 1991] and on the brain [Dean et al., 1996].
- Template of "ridge lines" extracted under the supervision of an anatomist: skull [Cutting et al., 1993, Dean et al., 1995] and brain ventricles [Dean et al., 1996].

	<i>Points</i>	<i>Lines</i> (ordered list of points)	<i>Surface</i> (continuous representation)
<i>Liver</i>	[Boes et al., 1994]		
<i>Skull</i>		[Cutting et al., 1993] [Subsol, 1995, Subsol et al., 1998]	
<i>Brain</i>			[Martin, 1995, Martin et al., 1998]
<i>Cortical Surface</i>			
<i>Sulci</i>		[Subsol, 1995, Subsol et al., 1996] [Counce and Taylor, 1998] [Royackkers et al., 1995]	[Thompson et al., 1996] [Manceaux-Demiau et al., 1998] [Mangin et al., 1995b]
<i>Ventricles</i>	[Hill et al., 1993]	[Subsol et al., 1996, Subsol et al., 1997] [Dean et al., 1996]	[Martin, 1995, Martin et al., 1998]
<i>Caudate Nucleus</i>	[Hill et al., 1993]		
<i>Brain Stem</i>	[Hill et al., 1993]		
<i>Thalamus</i>			[Martin, 1995, Martin et al., 1998]
<i>Globus Pallidus</i>			
<i>Hippocampus</i>			[Joshi et al., 1997, Joshi, 1998] [Kelemen et al., 1998]
<i>Putamen</i>			[Kelemen et al., 1998] [Martin, 1995, Martin et al., 1998]

Table 1: Some references about morphometric anatomical atlases based on 3D geometric features.

- Comparison of crest lines and ridge lines on the skull [Subsol, 1995, Subsol et al., 1998] and on the brain [Subsol, 1998].
- Anatomical justification of using high curvature features on the brain [Griffin, 1994, Joshi et al., 1995, Davatzikos et al., 1996, Collins et al., 1996].
- Sulci atlas [Ono et al., 1990, Damasio, 1995].

### 2.3 How to improve the crest lines?

- Curvature thresholding [Subsol, 1995, Subsol et al., 1998].
- Multi-scale extraction of crest lines: a simple scheme [Subsol, 1995, Subsol, 1998] or a sophisticated method [Fidrich, 1998].
- Extraction of curves on the brain by dynamic programming [Khaneja et al., 1998].

### 2.4 Other types of line feature

- Extremal mesh: [Thirion, 1996b].
- Lines of curvature: [Vemuri and Malladi, 1993, Maekawa et al., 1996].
- Geodesics [Bookstein and Cutting, 1988, Cutting et al., 1993].
- Other lines defined by differential geometry: [Hosaka, 1992, Bruce et al., 1996].
- Lines extracted by digital topology methods: anatomical justification on the skull of the Medial Axis Transform [Bookstein and Cutting, 1988], extraction on the brain based on skeletonization [Mangin et al., 1995a, Royackkers et al., 1995, Fernández-Vidal and Malandain, 1996, Manceaux-Demiau et al., 1997, Lohmann and von Cramon, 1998], extraction on the brain based on Vorono tessellation [Székely et al., 1992, Näf et al., 1997].

- Links between differential geometry and digital topology methods [Belyaev et al., 1996, Sherbrooke et al., 1996].
- Skeletal curves: [Verroust and Lazarus, 1997].

### 3 Feature registration

- Reviews about registration techniques: [Brown, 1992, Maintz and Viergever, 1998].

	<i>Rigid</i>	<i>Non-rigid</i>
<i>Points</i>	[Besl and McKay, 1992] [Zhang, 1994]	[Szeliski and Lavallée, 1996]
<i>Frames</i>	[Thirion, 1996a] [Pennec and Thirion, 1997]	
<i>Patches</i>		[Feldmar and Ayache, 1996]
<i>Lines</i>	[Bastuscheck et al., 1986] [Schwartz and Sharir, 1987] [Mokhtarian, 1993] [Kishon et al., 1991] [Guéziec and Ayache, 1994] [Zhang, 1994] [Pajdla and Van Gool, 1995]	[Luo and Evans, 1995] [Subsol, 1995, Subsol et al., 1998, Subsol, 1998] [Langlois et al., 1995] [Counce and Taylor, 1998] [Andresen et al., 1998] [Bakircioğlu et al., 1998]

Table 2: Some references about feature registration algorithms.

- About ICP algorithm and its generalizations: [Besl and McKay, 1992, Zhang, 1994, Cuchet et al., 1996, Feldmar and Ayache, 1996].
- Connectivity-based constraints: [Geiger and Vlontzlos, 1993, Subsol, 1998, Counce and Taylor, 1998].
- Warping:
  - General references about warping: [Thompson and Toga, 1996, Toga, 1998].
  - Kriging: [Stytz and Parrott, 1993].
  - Link between kriging and thin-plate spline: [Kent and Mardia, 1994, Nielsen and Andresen, 1998].
- Validation of the registration: rigid case [Ayache et al., 1993, Penec and Ph., 1997], by comparing automatic methods [Thirion et al., 1996] or by comparing the results given by manual and model-based segmentation [Gee et al., 1993, Haller et al., 1997, Subsol, 1998, Wang et al., 1998].
- Some algorithms to find the "optimal" matching between two curves: [Serra and Berthod, 1994, Cohen and Herlin, 1998, Younes, ].

### 4 Common feature identification

- [Subsol et al., 1998].
- Problem of topology of common lines: [Ono et al., 1990].

<i>Problem-Based</i>	<i>Mathematic-Based</i>	<i>Physics-Based</i>	<i>Singularity-Based</i>
<b>Intra-Patient: Rigid</b> [Arun et al., 1987] [Horn, 1987] <b>Talairach</b> [Talairach and Tournoux, 1988] <b>User-Defined</b> [Barr, 1984] [Pentland and Williams, 1989] <b>Experimental Modes</b> [Hill et al., 1993] [Martin, 1995] [Kelemen et al., 1998] <b>Procrustes</b> [Rohlf and Slice, 1990]	<b>Polynomial</b> [Goshtasby, 1988] [Maguire et al., 1991] [Greitz et al., 1991] [Brown, 1992] [Szeliski and Lavallée, 1996] <b>Spline</b> [Cinquin, 1987] [Bookstein, 1989] [Declerck et al., 1995] [Rohr et al., 1996] <b>Multiresolution Spline</b> [Szeliski and Lavallée, 1996] <b>Spline+Rigid</b> [Little et al., 1996] <b>Radial Basis Function</b> [Arad, 1995] [Wirth et al., 1997] <b>Locally affine</b> [Feldmar and Ayache, 1994]	<b>Linear Elasticity</b> [Christensen et al., 1994] [Christensen et al., 1997] [Gee and Bajcsy, 1998] <b>Non-Linear Elasticity</b> [Kyriacou et al., 1998] <b>Viscous Fluid</b> [Christensen et al., 1997] [Bro-Nielsen and Gramkow, 1996] [Bro-Nielsen, 1996] [Lester et al., 1998]	<b>Homeomorphism</b> [Christensen et al., 1995] [Christensen et al., 1997] <b>Diffeomorphism</b> [Joshi, 1998] [Trouvé, 1998]

Table 3: Some references about types of deformation used in feature registration.

## 5 Feature average

- General papers or surveys about shape theory: [Kendall, 1989, Small, 1996, Bookstein, 1996, Rohlf, 1998, Bookstein, 1997b].
- Normalization:
  - Edge-based superimposition: [Goodall, 1991].
  - Procrustes-based superimposition: [Rohlf, 1990, Rohlf and Slice, 1990].
  - Robust superimposition: [Dryden, 1996, Rohlf and Slice, 1990, Dryden and Walker, 1998].
  - Affine superimposition: [Rohlf and Slice, 1990].
  - Comparison of all the methods: [Goodall, 1991].
- Anatomical validity of the normalization: [David and Laurin, 1989].
- Procrustean mean: [Le, 1995a, Kent and Mardia, 1997].
- Frchet mean: [Pennec, 1996, Pennec and Ayache, 1998, Pennec, 1998].
- Link between Frchet and Procrustean mean: [Le, 1995b, Le, 1998].
- Shape average and bias: [Mardia and Dryden, 1994].
- Iterative algorithm to compute the mean: [Le, 1995a].
- Average of curves: in 2D [Rice and Silverman, 1991, Ramsay and Li, 1998], in 3D [Cutting et al., 1993, Dean, 1993, Bookstein, 1997a, Subsol et al., 1998].
- Resampling of points along curves: [Guéziec and Ayache, 1994].

## 6 Feature deformation analysis

- Example of "old morphometrics": [Abbot et al., 1990].
- New morphometrics: [Rohlf and Marcus, 1993].

	<i>Points</i>	<i>Lines</i>	<i>Surface</i>
<i>Predefined modes</i>			[Barr, 1984] [Pentland and Williams, 1989] [Pentland, 1992]
<i>Mathematical modes</i>			
Fourier		[Renaud et al., 1996]	[Székely et al., 1995]
Thin-Plate Splines	[Bookstein, 1989]	[Dean et al., 1996]	[Cutting et al., 1995]
Modal analysis		[Subsol et al., 1998]	[Nastar and Ayache, 1996] [Pentland and Sclaroff, 1991] [Sclaroff and Pentland, 1995] [Syn and Prager, 1995]
<i>Experimental modes</i>			
PCA		[Cootes et al., 1995]	[Hill et al., 1993] [Shen and Hogg, 1995] [Martin, 1995]
Non-linear PCA		[Sozou et al., 1994] [Sozou et al., 1995]	

Table 4: Some references about modes decomposition.

- Comparison of different kinds of modes: [Martin, 1995, Neumann and Lorenz, 1997].
- Probability distribution for 2D curves: [Blake and Isard, 1998] (chapter 8) [Sun et al., 1996].
- Probability distribution for shape variation: [Cootes and Taylor, 1997].
- Comparisons of 3D curves: [Mardia et al., 1996].
- Multivariate statistics: [Anderson, 1958, Kanungo and Haralick, 1995, Thompson et al., 1996, Thirion et al., 1998, Bookstein, 1998b].
- Distance between lines: [Subsol, 1995, Younes, 1998].
- Statistics about rigid transformations: [Penneec, 1998].

## 7 Some applications

- Skull:
  - Crouzon's disease: [Cutting et al., 1995].
  - Mandible hypoplasia: [Subsol, 1998].
  - Paleontology: study of the skull shape [Dean, 1993, Subsol, 1995].
  - Study of the skull growth: [Subsol, 1995, Subsol et al., 1998, Andresen et al., 1998].
  - Study of ethnicity and sex: [Dean et al., 1998].
  - Facial reconstruction: [Quatrehomme et al., 1997].
- Brain:

- Alzheimer’s disease: [Martin, 1995, Martin et al., 1998, Thompson and Toga, 1997].
  - Schizophrenia: [Dean et al., 1996, Joshi et al., 1997, Joshi, 1998, Martin, 1995, Martin et al., 1998, Kelemen et al., 1998].
  - Normal-pressure hydrocephalus: [Martin, 1995, Martin et al., 1998].
  - Cerebral atrophy: [Subsol et al., 1996, Subsol et al., 1997].
  - Tumour: [Thompson and Toga, 1997].
- Other applications : shape-based indexing [Zhang et al., 1998].

## 8 Conclusion

- Building atlases that are based on average intensity: [Andreasen et al., 1994, Evans et al., 1994, Collins and Evans, 1997, Guimond et al., 1998, Gee, 1998].
- Combining average and variability of both intensity and geometry: [Bookstein, 1994, Cootes et al., 1998, Guimond et al., 1998].
- A new kind of landmarks, the singularities of deformation grids: [Lamberti et al., 1997, Philippou and Strickland, 1997, Bookstein, 1998a].
- Some other computerized atlases: [Greitz et al., 1991, Höhne et al., 1992, Nowinski et al., 1997].

## References

- [Abbot et al., 1990] Abbot, A. H., Netherway, D. J., David, D. J., and Brown, T. (1990). Application and Comparison of Techniques for Three-Dimensional Analysis of Craniofacial Anomalies. *The Journal of Craniofacial Surgery*, 1(3):119–134.
- [Anderson, 1958] Anderson, T. W. (1958). *An Introduction to Multivariate Statistical Analysis*. Wiley Publications in Statistics.
- [Andreasen et al., 1994] Andreasen, N. C., Arndt, S., Swayze II, V., Cizadlo, T., Flaum, M., O’Leary, D., Ehrhardt, J. C., and Yuh, W. T. C. (1994). Thalamic Abnormalities in Schizophrenia Visualized Through Magnetic Resonance Image Averaging. *Science*, 266:294–298.
- [Andresen et al., 1998] Andresen, P. R., Nielsen, M., and Kreiborg, S. (1998). 4D Shape-Preserving Modelling of Bone Growth. In *Medical Image Computing and Computer-Assisted Intervention*, Boston (USA). Accepted for publication. Electronic version: <http://www.lab3d.odont.ku.dk/~pra/>.
- [Anoshkina et al., 1995] Anoshkina, E. V., Belyaev, A. G., Huang, R., and Kunii, T. L. (1995). Ridges and Ravines on a Surface and Related Geometry of Skeletons, Caustics and Wavefronts. In Earnshaw, R. A. and Vince, J. A., editors, *Computer Graphics: Developments in Virtual Environments*, chapter 22, pages 311–326. Academic Press. Electronic version: anonymous ftp at <ftp.u-aizu.ac.jp/u-aizu/doc/Tech-Report/1995/95-1-009.tar.gz>.
- [Arad, 1995] Arad, N. (1995). *Image Warp Design Based on Variational Principles*. PhD thesis, Tel-Aviv University. Electronic version: <http://www.math.tau.ac.il/~nur/>.
- [Arun et al., 1987] Arun, K., Huang, T., and Blostein, S. (1987). Least-Squares Fitting of Two 3-D Point Sets. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 9(5):698–700.
- [Ayache et al., 1996] Ayache, N., Cinquin, P., Cohen, I., Cohen, L., Leitner, F., and Monga, O. (1996). Segmentation of Complex Three-Dimensional Medical Objects: A Challenge and a Requirement for Computer-Assisted Surgery Planning and Performance. In Taylor, R., Lavallée, S., Burdea, G., and Mösges, R., editors, *Computer-Integrated Surgery*, chapter 4, pages 59–74. The MIT Press.
- [Ayache et al., 1993] Ayache, N., Guéziec, A., Thirion, J. P., Gourdon, A., and Knoploch, J. (1993). Evaluating 3D Registration of CT-Scan Images Using Crest Lines. In Wilson, D. and Wilson, J., editors, *Mathematical Methods in Medical Imaging II*, volume 2035, pages 29–44, San Diego, California (USA). SPIE.
- [Bakircioğlu et al., 1998] Bakircioğlu, Grenander, U., Khaneja, N., and Miller, M. I. (1998). Curve Matching on Brain Surfaces Using Induced Frenet Distance Metrics. *Human Brain Mapping*. To be published. Electronic version: [http://cis.wustl.edu/wu\\_publications/b/bakircioglum1.html](http://cis.wustl.edu/wu_publications/b/bakircioglum1.html).
- [Barr, 1984] Barr, A. H. (1984). Global and Local Deformations of Solid Primitives. *Computer Graphics*, 18(3):21–30.
- [Bastuscheck et al., 1986] Bastuscheck, C. M., Schonberg, E., Schwartz, J. T., and Sharir, M. (1986). Object recognition by three-dimensional curve matching. *International Journal of Intelligent Systems*, 1:105–132.
- [Belyaev et al., 1996] Belyaev, A. G., Bogaevski, I. A., and Kunii, T. L. (1996). Principal direction ridges. Technical Report 96-4-001, Center for Mathematical Sciences, The University of Aizu, Japan. Electronic version: anonymous ftp at <ftp.u-aizu.ac.jp/u-aizu/doc/Tech-Report/1996/96-4-001.tar.gz>.
- [Besl and McKay, 1992] Besl, P. J. and McKay, N. D. (1992). A Method for Registration of 3-D Shapes. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 14(2):239–255.
- [Blake and Isard, 1998] Blake, A. and Isard, M. (1998). *Active Contours*. Springer.

- [Boes et al., 1994] Boes, J., Bland, P., Weymouth, T., Quint, L., Bookstein, F., and Meyer, C. (1994). Generating a Normalized Geometric Liver Model Using Warping. *Investigative Radiology*, 29(3):281–286.
- [Bookstein, 1996] Bookstein, F. (1996). Biometrics, Biomathematics and the Morphometric Synthesis. *Bulletin of Mathematical Biology*, 58(2):313–365.
- [Bookstein, 1989] Bookstein, F. L. (1989). Principal Warps: Thin-Plate Splines and the Decomposition of Deformations. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 11(6):567–585.
- [Bookstein, 1991] Bookstein, F. L. (1991). Thin-Plate Splines and the Atlas Problem for Biomedical Images. In Colchester, A. C. F. and Hawkes, D. J., editors, *Information Processing in Medical Imaging*, number 511 in Lecture Notes in Computer Science, pages 326–342, Wye (UK). Springer-Verlag.
- [Bookstein, 1994] Bookstein, F. L. (1994). Landmarks, Edges, Morphometrics, and the Brain Atlas Problem. In Thatcher, R. W., Hallett, M., Zaffiro, T., Roy John, E., and Huerta, M., editors, *Functional Neuroimaging. Technical Foundations*, chapter 10, pages 107–119. Academic Press.
- [Bookstein, 1997a] Bookstein, F. L. (1997a). Landmark methods for forms without landmarks: morphometrics of group differences in outline shape. *Medical Image Analysis*, 1(3):225–243.
- [Bookstein, 1997b] Bookstein, F. L. (1997b). Shape and the Information in Medical Images: A Decade of the Morphometric Synthesis. *Computer Vision and Image Understanding*, 66(2):97–118.
- [Bookstein, 1998a] Bookstein, F. L. (1998a). Singularities and the Features of Deformation Grids. In Vemuri, B., editor, *Workshop on Biomedical Image Analysis*, pages 46–55, Santa Barbara, California (USA). IEEE Computer Society Press.
- [Bookstein, 1998b] Bookstein, F. L. (1998b). Thin Plate Splines. In Toga, A. W., editor, *Brain Warping*, chapter 11. Academic Press. To be published.
- [Bookstein and Cutting, 1988] Bookstein, F. L. and Cutting, C. B. (1988). A proposal for the apprehension of curving cranofacial form in three dimensions. In Vig, K. and Burdi, A., editors, *Cranofacial Morphogenesis and Dymorphogenesis*, pages 127–140.
- [Bro-Nielsen, 1996] Bro-Nielsen, M. (1996). *Medical Image Registration and Surgery Simulation*. PhD thesis, Technical University of Denmark, Department of Mathematical Modelling. Electronic version: <http://www.imm.dtu.dk/documents/users/bro/papers.html>.
- [Bro-Nielsen and Gramkow, 1996] Bro-Nielsen, M. and Gramkow, C. (1996). Fast Fluid Registration of Medical Images. In Höhne, K. H. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 267–276, Hamburg (Germany). Springer. Electronic version: <http://www.imm.dtu.dk/documents/users/bro/papers.html>.
- [Brown, 1992] Brown, L. G. (1992). A Survey of Image Registration Techniques. *ACM Computing Surveys*, 24(4):325–376. Abstract: <http://www.acm.org/pubs/citations/journals/surveys/1992-24-4/p325-brown/>.
- [Bruce et al., 1996] Bruce, J., Giblin, P., and Tari, F. (1996). Ridges, Crests and Sub-Parabolic Lines of Evolving Surfaces. *International Journal of Computer Vision*, 18(3):195–210.
- [Counce and Taylor, 1998] Counce, A. and Taylor, C. J. (1998). 3D Point Distribution Models of the Cortical Sulci. In *International Conference on Computer Vision*, pages 402–407, Bombay (India). Narosa Publishing House.
- [Christensen et al., 1997] Christensen, G. E., Joshi, S. C., and Miller, M. I. (1997). Volumetric Transformation of Brain Anatomy. *IEEE Transactions on Medical Imaging*, 16(6):864–877.
- [Christensen et al., 1994] Christensen, G. E., Miller, M. I., and Vannier, M. (1994). A 3D Deformable Magnetic Resonance Textbook Based on Elasticity. In *Applications of Computer Vision in Medical Image Processing*, pages 153–156, Stanford (USA).

- [Christensen et al., 1995] Christensen, G. E., Rabbitt, R. D., Miller, M. I., Joshi, S. C., Grenander, U., Coogan, T. A., and Van Essen, D. C. (1995). Topological Properties of Smooth Anatomic Maps. In Bizais, Y., Barillot, C., and Di Paola, R., editors, *Information Processing on Medical Imaging, Computational Imaging and Vision*, pages 101–112. Kluwer Academic Publishers. Electronic version: [http://cis.wustl.edu/wu\\_publications/c/christenseng10.html](http://cis.wustl.edu/wu_publications/c/christenseng10.html).
- [Cinquin, 1987] Cinquin, P. (1987). *Application des fonctions-spline au traitement d'images numériques*. PhD thesis, Université scientifique, technologique et médicale de Grenoble. In French.
- [Cohen and Herlin, 1998] Cohen, I. and Herlin, I. (1998). Tracking Meteorological Structures through Curves Matching Using Geodesic Paths. In *International Conference on Computer Vision*, pages 396–401, Bombay (India). Electronic version: <http://www.inria.fr/RRRT/RR-3191.html>.
- [Collins et al., 1996] Collins, D., Le Goualher, G., Venugopal, R., Caramanos, A., Evans, A., and Barillot, C. (1996). Cortical Constraints for Non-Linear Cortical Registration. In Höhne, K. H. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 307–316, Hamburg (Germany). Springer.
- [Collins and Evans, 1997] Collins, D. L. and Evans, A. C. (1997). ANIMAL: Validation and Applications of Nonlinear Registration-Based Segmentation. *International Journal of Pattern Recognition and Artificial Intelligence*, 11(8):1271–1294.
- [Cootes et al., 1998] Cootes, T., Edwards, G., and Taylor, C. (1998). Active Appearance Models. In Burkhardt, H. and Neumann, B., editors, *European Conference on Computer Vision*, volume 2 of *Lecture Notes in Computer Science*, pages 484–498. Springer. Electronic version: <http://s10d.smb.man.ac.uk/~bim/refs.html>.
- [Cootes and Taylor, 1997] Cootes, T. and Taylor, C. (1997). A Mixture Model for Representing Shape Variation. In Clark, A., editor, *British Machine Vision Conference*, volume 1, pages 110–119. BMVA Press. Electronic version: <http://s10d.smb.man.ac.uk/~bim/refs.html>.
- [Cootes et al., 1995] Cootes, T. F., Taylor, C. J., Cooper, D. H., and Graham, J. (1995). Active Shape Models - Their Training and Application. *Computer Vision and Image Understanding*, 61(1):38–59.
- [Cuchet et al., 1996] Cuchet, E., Knoplich, J., Dormont, D., and Marsault, C. (1996). Registration in neurosurgery and neuroradiotherapy applications. *Journal of Image Guided Surgery*, 1(4):198–207.
- [Cutting et al., 1995] Cutting, C., Dean, D., Bookstein, F. L., Haddad, B., Khorramabadi, D., Zonneveld, F. Z., and Mc Carthy, J. (1995). A Three-dimensional Smooth Surface Analysis of Untreated Crouzon's Disease in the Adult. *Journal of Craniofacial Surgery*, 6:1–10.
- [Cutting, 1991] Cutting, C. B. (1991). Applications of computer graphics to the evaluation and treatment of major craniofacial malformations. In Udupa, J. K. and T., H. G., editors, *3D Imaging in Medicine*, chapter 6, pages 163–189. CRC Press.
- [Cutting et al., 1993] Cutting, C. B., Bookstein, F. L., Haddad, B., Dean, D., and Kim, D. (1993). A spline-based approach for averaging three-dimensional curves and surfaces. In Wilson, D. C. and Wilson, J. N., editors, *Mathematical Methods in Medical Imaging II 1993*, pages 29–44, San Diego, California (USA). SPIE. Abstract: <http://www.cwru.edu/dental/orth/ortho/dean/spieavg.html>.
- [Damasio, 1995] Damasio, H. (1995). *Human Brain Anatomy in Computerized images*. Oxford University Press.
- [Davatzikos et al., 1996] Davatzikos, C., Vaillant, M., Resnick, S. M., Prince, J. L., Letovsky, S., and Bryan, R. N. (1996). A Computerized Approach for Morphological Analysis of the Corpus Callosum. *Journal of Computer Assisted Tomography*, 20:88–97. Electronic version: [http://ditzel.rad.jhu.edu/~hristos/html/christos\\_bio.html](http://ditzel.rad.jhu.edu/~hristos/html/christos_bio.html).

- [David and Laurin, 1989] David, B. and Laurin, B. (1989). Déformations ontogénétiques et évolutives des organismes : l'approche par la méthode des points homologues. *C. R. Académie des Sciences Paris*, II(309):1271–1276.
- [Dean, 1993] Dean, D. (1993). *The Middle Pleistocene Homo erectus/Homo sapiens Transition: New Evidence from Space Curve Statistics*. PhD thesis, The City University of New York.
- [Dean et al., 1996] Dean, D., Buckley, P., Bookstein, F., Kamath, J., Kwon, D., Friedman, L., and Lys, C. (1996). Three Dimensional MR-Based Morphometric Comparison of Schizophrenic and Normal Cerebral Ventricles. In Höhne, K. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 363–372, Hamburg (Germany). Springer. Abstract: <http://www.cwru.edu/dental/orth/ortho/dean/Schizo.html>.
- [Dean et al., 1995] Dean, D., Guéziec, A., and B., C. C. (1995). Homology and the Criteria for Building Deformable Templates. In Mardia, K. V. and Gill, C. A., editors, *Current Issues in Statistical Shape Analysis*, pages 202–205, Leeds (United Kingdom). University of Leeds Press.
- [Dean et al., 1998] Dean, D., L., B. F., Koneru, S., Lee, J. H., Kamath, J., Cutting, C. B., Hand, M., and Goldberg, J. (1998). Average African-American 3D-CT Skull Images: The Potential Clinical Importance of Ethnicity and Sex. *Journal of Craniofacial Surgery*, 9:348–358. Abstract: <http://www.cwru.edu/dental/orth/ortho/dean/avgafam1.html>.
- [Declerck et al., 1995] Declerck, J., Subsol, G., Thirion, J. P., and Ayache, N. (1995). Automatic retrieval of anatomical structures in 3D medical images. In Ayache, N., editor, *CVRMed'95*, volume 905 of *Lecture Notes in Computer Science*, pages 153–162, Nice (France). Springer Verlag. Electronic version: <http://www.inria.fr/RRRT/RR-2485.html>.
- [Dryden, 1996] Dryden, I. (1996). General Shape and Registration Analysis. Technical Report STAT96-03, University of Leeds, Department of Statistics. Electronic version: <http://www.amsta.leeds.ac.uk/~iand/index.html>.
- [Dryden and Walker, 1998] Dryden, I. L. and Walker, G. (1998). Shape Analysis using Highly Resistant Regression. Technical Report STAT98-03, University of Leeds, Department of Statistics. Electronic version: <http://www.amsta.leeds.ac.uk/~iand/index.html>.
- [Eberly, 1996] Eberly, D. (1996). *Ridges in Image and Data Analysis*. Kluwer Academic Publishers.
- [Evans et al., 1994] Evans, A. C., Kamber, M., Collins, D. L., and MacDonald, D. (1994). An MRI-Based Probabilistic Atlas of Neuroanatomy. In Shorvon, S., Fish, D., Andermann, F., Bydder, G. M., and Stefa, H., editors, *Magnetic Resonance Scanning and Epilepsy*, volume 264 of *NATO ASI Series A, Life Sciences*, pages 263–274. Plenum Press.
- [Feldmar and Ayache, 1994] Feldmar, J. and Ayache, N. (1994). Locally Affine Registration of Free-Form Surfaces. In *CVPR*, pages 496–501, Seattle, Washington (USA).
- [Feldmar and Ayache, 1996] Feldmar, J. and Ayache, N. (1996). Rigid, Affine and Locally Affine Registration of Free-Form Surfaces. *International Journal of Computer Vision*, 18(2):99–119. Electronic version: <http://www.inria.fr/RRRT/RR-2220.html>.
- [Fernández-Vidal and Malandain, 1996] Fernández-Vidal, S. and Malandain, G. (1996). Squelettes Euclidiens d'Objets Discrets  $n$ -Dimensionnels. Technical Report 2771, INRIA. In French. Electronic version: <http://www.inria.fr/RRRT/RR-2771.html>.
- [Fidrich, 1998] Fidrich, M. (1998). Iso-surface extraction in  $nD$  applied to tracking feature curves across scale. *Image and Vision Computing*, 16:545–555.
- [Gee, 1998] Gee, J. C. (1998). On matching brain volumes. *Pattern Recognition*. To appear. Electronic version: <http://www.cis.upenn.edu/~gee/bibliography.html>.

- [Gee and Bajcsy, 1998] Gee, J. C. and Bajcsy, R. K. (1998). Elastic Matching: Continuum Mechanical and Probabilistic Analysis. In Toga, A. W., editor, *Brain Warping*. Academic Press. To appear. Electronic version: <http://www.cis.upenn.edu/~gee/bibliography.html>.
- [Gee et al., 1993] Gee, J. C., Reivich, M., and Bajcsy, R. (1993). Elastically Deforming 3D Atlas to Match Anatomical Brain Images. *Journal of Computer Assisted Tomography*, 17(2):225–236.
- [Geiger and Vlontzlos, 1993] Geiger, D. and Vlontzlos, J. A. (1993). Matching Elastic Contours. In *Computer Vision and Pattern Recognition*, pages 602–604, New York City, New York (USA). IEEE Computer Society Press.
- [Goodall, 1991] Goodall, C. (1991). Procrustes Methods in the Statistical Analysis of Shape. *Journal of the Royal Statistical Society. Series B. Methodological*, 53(2):285–339.
- [Goshtasby, 1988] Goshtasby, A. (1988). Image Registration by Local Approximation Methods. *Image and Vision Computing*, 6(4):255–261.
- [Greitz et al., 1991] Greitz, T., Bohm, C., Holte, S., and Eriksson, L. (1991). A Computerized Brain Atlas: Construction, Anatomical Content and Some Applications. *Journal of Computer Assisted Tomography*, 15(1):26–38.
- [Griffin, 1994] Griffin, L. D. (1994). The Intrinsic Geometry of the Cerebral Cortex. *J. Theor. Biol.*, 166:261–273.
- [Guéziec and Ayache, 1994] Guéziec, A. and Ayache, N. (1994). Smoothing and Matching of 3D-Space Curves. *International Journal of Computer Vision*, 12(1):79–104.
- [Guimond et al., 1998] Guimond, A., Meunier, J., and Ph., T. J. (1998). Automatic Computation of Average Brain Models. In *Medical Image Computing and Computer-Assisted intervention*, Boston (USA). Accepted for publication.
- [Haller et al., 1997] Haller, J. W., Banerjee, A., Christensen, G. E., Gado, M., Joshi, S., Miller, M. I., Sheline, Y., Vannier, M. W., and Csernansky, J. G. (1997). Three-dimensional Hippocampal MR Morphometry with High-dimensional Transformation of Neuroanatomic Atlas. *Radiology*, 202(2):504–510.
- [Hill et al., 1993] Hill, A., Thornham, A., and Taylor, C. J. (1993). Model-Based Interpretation of 3D Medical Images. In Illingworth, J., editor, *British Machine Vision Conference*, volume 2, pages 339–348, Guildford (UK). BMVA Press. Electronic version: <http://s10d.smb.man.ac.uk/publications/index.htm>.
- [Höhne et al., 1992] Höhne, K., Bomans, M., Riemer, M., Schubert, R., Tiede, U., and Lierse, W. (1992). A Volume-based Anatomical Atlas. *IEEE Computer Graphics & Applications*, pages 72–78.
- [Horn, 1987] Horn, B. (1987). Closed Form Solutions of Absolute Orientation Using Unit Quaternions. *Journal of Optical Society of America*, A-4(4):629–642.
- [Hosaka, 1992] Hosaka, M. (1992). *Modeling of Curves and Surfaces in CAD/CAM*. Springer-Verlag.
- [Joshi, 1998] Joshi, C. S. (1998). *Large Deformation Diffeomorphisms and Gaussian Random Fields for Statistical Characterization of Brain Sub-Manifolds*. PhD thesis, Washington University - Sever Institute of Technology. Electronic version: [http://cis.wustl.edu/wu\\_publications/joshis7.html](http://cis.wustl.edu/wu_publications/joshis7.html).
- [Joshi et al., 1997] Joshi, S. C., Miller, M. I., and Grenander, U. (1997). On the Geometry and Shape of Brain Sub-Manifolds. *International Journal of Pattern Recognition and Artificial Intelligence*, 11(8):1317–1343. Electronic version: [http://cis.wustl.edu/wu\\_publications/j/joshi6.html](http://cis.wustl.edu/wu_publications/j/joshi6.html).
- [Joshi et al., 1995] Joshi, S. C., Wang, J., and Miller, M. I. (1995). On the Differential Geometry of the Cortical Surface. In *SPIE International Symposium on Optical Science, Engineering and Instrumentation*, volume Vision Geometry IV, 2573, pages 304–311, San Diego, California (USA). Electronic version: [http://cis.wustl.edu/wu\\_publications/j/sarang\\_abs\\_aug95\\_2.html](http://cis.wustl.edu/wu_publications/j/sarang_abs_aug95_2.html).

- [Kanungo and Haralick, 1995] Kanungo, T. and Haralick, R. M. (1995). Multivariate Hypothesis Testing for Gaussian Data: Theory and Software. Technical Report ISL-TR-95-05, University of Washington, Department of Electrical Engineering. Electronic version: <http://www.cfar.umd.edu/~kanungo/software/software.html>.
- [Kapur et al., 1996] Kapur, T., Grimson, W. E. L., Wells III, W. M., and Kikinis, R. (1996). Segmentation of Brain Tissue from Magnetic Resonance Images. *Medical Image Analysis*, 1(2):109–127.
- [Kelemen et al., 1998] Kelemen, A., Székely, G., and Gerig, G. (1998). Three-dimensional Model-based Segmentation. In *Model-Based 3D Image Analysis*, pages 87–96, Mumbai (India). Electronic version: [http://www.vision.ee.ethz.ch/cgi-bin/create\\_abshtml.pl?141](http://www.vision.ee.ethz.ch/cgi-bin/create_abshtml.pl?141).
- [Kendall, 1989] Kendall, D. G. (1989). A Survey of the Statistical Theory of Shape. *Statistical Science*, 4(2):87–120.
- [Kent and Mardia, 1997] Kent, J. and Mardia, K. (1997). Consistency of Procrustes Estimators. *Journal of the Royal Statistical Society B*, 59(1):281–290.
- [Kent et al., 1996] Kent, J. T., Lee, D., Mardia, K. V., and Linney, A. D. (1996). Using Curvature Information in Shape Analysis. In Mardia, K. V., Gill, C. A., and Dryden, I. L., editors, *Image Fusion and Shape Variability Techniques*, pages 88–99, Leeds (UK). Leeds University Press.
- [Kent and Mardia, 1994] Kent, J. T. and Mardia, K. V. (1994). The Link between Kriging and Thin-plate Spline. In Kelly, F. P., editor, *Probability, Statistics and Optimization: A Tribute to Peter Whittle*, chapter 24, pages 325–339. John Wiley & Sons.
- [Khaneja et al., 1998] Khaneja, N., Miller, M. I., and Grenander, U. (1998). Dynamic Programming Generation of Curves on Brain Surfaces. *IEEE Transactions on Pattern Recognition and Machine Intelligence*. Accepted for publication. Electronic version: <http://cis.wustl.edu/wu-publications/k/khanejan1.html>.
- [Kishon et al., 1991] Kishon, E., Hastie, T., and Wolfson, H. (1991). 3-D Curve Matching Using Splines. *Journal of Robotic Systems*, 6(8):723–743.
- [Koenderink, 1990] Koenderink, J. J. (1990). *Solid Shape*. The MIT Press.
- [Kyriacou et al., 1998] Kyriacou, S. K., Davatzikos, C., Zinreich, S. J., and Bryan, R. N. (1998). Modeling Brain Pathology and Tissue Deformation Using a Finite Element Based Nonlinear Elastic Model. In *Medical Image Computing and Computer-Assisted Intervention*. To appear. Electronic version: <http://beast.cbm.v.jhu.edu/~kyriacou/>.
- [Lamberti et al., 1997] Lamberti, C., Sarti, A., and Bertucci, F. (1997). Topology of Optical Flow in 3D Echocardiography. In *Computers in Cardiology*, volume 24, pages 227–230, Lund (Sweden). IEEE.
- [Lang, 1997] Lang, V. (1997). Surface Reconstruction, Curvature Computation and Ridge Extraction. Application to Noh Mask Scattered Data. Technical Report 97-1-011, Department of Computer Science, The University of Aizu, Japan. Electronic version: anonymous ftp at <ftp://ftp.u-aizu.ac.jp/u-aizu/doc/Tech-Report/1997/97-1-011.tar.gz>.
- [Langlois et al., 1995] Langlois, S., Royackers, N., Fawal, H., Desvignes, M., and M., T. J. (1995). Cortical sulci model and matching from 3D brain magnetic resonance images. In *5th International Conference on Image Processing and its Applications*, pages 124–128, Edinburgh (United Kingdom). Electronic version: <http://www.greyc.ismra.fr/version-gb/publications.html>.
- [Le, 1995a] Le, H. (1995a). Mean Size-and-Shapes and Mean Shapes: A Geometric Point of View. *Advances in Applied Probability*, 27:44–55.
- [Le, 1995b] Le, H. (1995b). On consistency of procrustean mean shapes. Technical Report 95-09, University of Nottingham - Nottingham Statistics Group.

- [Le, 1998] Le, H. (1998). On the Consistency of Procrustean Mean Shapes. *Advances in Applied Probabilities*, 30:53–63.
- [Lester et al., 1998] Lester, H., Arridge, S. R., and Jansons, K. M. (1998). Local deformation metrics and nonlinear registration using a fluid model with variable viscosity. In *Medical image Understanding and Analysis*, Leeds (UK). Electronic version: <http://www.leeds.ac.uk/miua/>.
- [Little et al., 1996] Little, J. A., JHill, D. G., and Hawkes, D. J. (1996). Deformations Incorporating Rigid Structures. In *Mathematical Methods in Biomedical Image Analysis*, pages 104–113, San Francisco, California (USA). IEEE Computer Society Press.
- [Lohmann and von Cramon, 1998] Lohmann, G. and von Cramon, D. Y. (1998). Automatic Detection and Labelling of the Human Cortical Folds in Magnetic Resonance Data Sets. In Burkhardt, H. and Neumann, B., editors, *European Conference on Computer Vision*, volume II of *Lecture Notes in Computer Science*, pages 369–381, Freiburg (Germany). Springer.
- [Luo and Evans, 1995] Luo, S. and Evans, A. C. (1995). A Method to Match Human Sulci in 3D-Space. In *IEEE Engineering in Medicine & Biology 17th Annual Conference & 21st Canadian Medical and Biological Engineering Conference*. Electronic version: [http://funsan.biomed.mcgill.ca/~funnell/embc95\\_cd/texts/617.htm](http://funsan.biomed.mcgill.ca/~funnell/embc95_cd/texts/617.htm).
- [Maekawa et al., 1996] Maekawa, T., Wolter, F. E., and Patrikalakis, N. M. (1996). Umbilics and lines of curvature for shape interrogation. *Computer Aided Geometric Design*, 13:133–161.
- [Maguire et al., 1991] Maguire, G. Q., Noz, M. E., Rusinek, H., Jaeger, J., Kramer, E. L., Sanger, J. J., and Smith, G. (1991). Graphics Applied to Medical Image Registration. *IEEE Computer Graphics & Applications*, pages 20–27.
- [Maintz and Viergever, 1998] Maintz, J. B. A. and Viergever, M. A. (1998). A survey of medical image registration. *Medical Image Analysis*, 2(1):1–36.
- [Manceaux-Demiau et al., 1998] Manceaux-Demiau, A., Bryan, R. N., and Davatzikos, C. (1998). A probabilistic ribbon model for shape analysis of the cerebral sulci: application to the central sulcus. *Journal of Computer Assisted Tomography*. In press. Electronic version: [http://ditzel.rad.jhu/~hristos/html/christos\\_bio.html](http://ditzel.rad.jhu/~hristos/html/christos_bio.html).
- [Manceaux-Demiau et al., 1997] Manceaux-Demiau, A., Mangin, J. F., Régis, J., Pizzato, O., and Frouin, V. (1997). Differential Features of Cortical Folds. In Troccaz, J., Grimson, E., and Mösges, R., editors, *CVRMed-MRCAS*, number 1205 in *Lecture Notes in Computer Science*, pages 439–448, Grenoble (France). Springer.
- [Mangin et al., 1995a] Mangin, J. F., Frouin, V., Bloch, I., Régis, J., and J., L.-K. (1995a). From 3D Magnetic Resonance Images to Structural Representations of the Cortex Topography using Topology Preserving Deformations. *Journal of Mathematical Imaging and Vision*, 5:297–318.
- [Mangin et al., 1995b] Mangin, J. F., Regis, J., Bloch, I., Frouin, V., Samson, Y., and Lopez-Krahe, J. (1995b). A MRF Based Random Graph Modelling the Human Cortical Topography. In Ayache, N., editor, *CVRMed'95*, volume 905 of *Lecture Notes in Computer Science*, pages 177–183, Nice (France). Springer-Verlag.
- [Mardia et al., 1996] Mardia, K., Baczkowski, A., Feng, X., and Millner, P. (1996). A study of three-dimensional curves. *Journal of Applied Statistics*, 23(1):139–148.
- [Mardia and Dryden, 1994] Mardia, K. V. and Dryden, I. L. (1994). Shape Averages and their Bias. *Advances in Applied Probabilities*, 26:334–340.
- [Martin et al., 1998] Martin, J., Pentland, A., Sclaroff, S., and Kikinis, R. (1998). Characterization of Neuropathological Shape Deformation. *IEEE Transactions on Pattern Recognition and Machine Intelligence*, 20(2):97–112.

- [Martin, 1995] Martin, J. W. (1995). *Characterization of Neuropathological Shape Deformations*. PhD thesis, Massachusetts Institute of Technology. Electronic version: <http://splweb.bwh.harvard.edu:8000/pages/papers/martin/thesis.ps.Z>.
- [Mazziotta, 1997] Mazziotta, J. (1997). *Atlases and Anatomies*. Electronic version: <http://orkide.lab3d.odont.ku.dk/pet/HBM97/atlases.html>.
- [Mazziotta et al., 1995] Mazziotta, J. C., Toga, A. W., Evans, E., Fox, P., and Lancaster, J. (1995). A Probabilistic Atlas of the Human Brain: Theory and Rationale for Its Development. *Neuroimage*, 2:89–101.
- [Mokhtarian, 1993] Mokhtarian, F. (1993). Multi-Scale, Torsion-Based Shape Representations for Space Curves. In *Computer Vision and Pattern Recognition*, pages 660–661, New-York (USA).
- [Monga and Benayoun, 1995] Monga, O. and Benayoun, S. (1995). Using Partial Derivatives of 3D Images to Extract Typical Surface Features. *Computer Vision and Image Understanding*, 61(2):171–189.
- [Näf et al., 1997] Näf, M., Székely, G., Kikinis, R., Shenton, M. E., and Kübler, O. (1997). 3D Voronoi Skeletons and Their Usage for the Characterization and Recognition of 3D Organ Shape. *Computer Vision and Image Understanding*, 66(2):147–161. Electronic version: <http://www.vision.ee.ethz.ch/publications/>.
- [Nastar and Ayache, 1996] Nastar, C. and Ayache, N. (1996). Frequency-based Nonrigid Motion Analysis: Application to Four Dimensional Medical Images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 18(11):1067–1079.
- [Neumann and Lorenz, 1997] Neumann, A. and Lorenz, C. (1997). Comparison and Application of Selected Statistical Shape Models in Medical Imaging. In Del Bimbo, A., editor, *International Conference on Image Analysis and Processing*, volume II, pages 680–687, Florence (Italy). IAPR, Springer.
- [Nielsen and Andresen, 1998] Nielsen, M. and Andresen, P. R. (1998). Feature Displacement Interpolation. In *International Conference on Image Processing*, Chicago, Illinois (USA). Accepted for publication. Electronic version: <http://www.lab3d.odont.ku.dk/pra>.
- [Nowinski et al., 1997] Nowinski, W. L., Fang, A., Nguyen, B., Raphel, J., Jagannathan, L. and Raghavan, R., Bryan, R. N., and Miller, G. A. (1997). Multiple Brain Atlas Database and Atlas-Based neuroimaging System. *Computer Aided Surgery*, 2:42–66.
- [Ono et al., 1990] Ono, M., Kubik, S., and Abernathy, C. D. (1990). *Atlas of the Cerebral Sulci*. Georg Thieme Verlag.
- [Pajdla and Van Gool, 1995] Pajdla, T. and Van Gool, L. (1995). Matching of 3-D Curves using Semi-differential Invariants. In *International Conference on Computer Vision*, pages 390–395, Cambridge, Massachusetts (USA).
- [Penec and Ph., 1997] Penec, X. and Ph., T. J. (1997). A Framework for Uncertainty and Validation of 3D Registration Methods based on Points and Frames. *International Journal of Computer Vision*, 25(3):203–229. Electronic version: <http://www.inria.fr/epidaure/personnel/pennec/Publications.html>.
- [Penec, 1996] Penec, X. (1996). Multiple Registration and Mean Rigid Shapes. In Mardia, K. V., Gill, C. A., and Dryden, I. L., editors, *Image Fusion and Shape Variability Techniques - 16th Leeds Annual Statistical Workshop*, pages 178–185, Leeds (UK). University of Leeds. Electronic version: <http://www.inria.fr/epidaure/personnel/pennec/Publications.html>.
- [Penec, 1998] Penec, X. (1998). Computing the Mean of Geometric Features. Application to the Mean Rotation. Technical Report 3371, INRIA. Electronic version: <http://www.inria.fr/RRRT/RR-3371.html>.
- [Penec and Ayache, 1998] Penec, X. and Ayache, N. (1998). Uniform Distribution, Distance and Expectation Problems for Geometric Features Processing. *Journal of Mathematical Imaging and Vision*, 9:49–67. Electronic version: <http://www.inria.fr/epidaure/personnel/pennec/Publications.html>.

- [Pennec and Thirion, 1997] Penneç, X. and Thirion, J. (1997). A Framework for Uncertainty and Validation of 3D Registration Methods based on Points and Frames. *International Journal of Computer Vision*, 25(3):203–229.
- [Pentland, 1992] Pentland, A. (1992). Modal Descriptions for Recognition and Tracking. In *IAPR Workshop on Machine Vision Applications*, pages 435–444, Tokyo (Japan).
- [Pentland and Sclaroff, 1991] Pentland, A. and Sclaroff, S. (1991). Closed-Form Solutions for Physically Based Shape Modeling and Recognition. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 13(7):715–729.
- [Pentland and Williams, 1989] Pentland, A. and Williams, J. (1989). Good Vibrations: Modal Dynamics for Graphics and Animation. *Computer Graphics*, 23(3):215–222.
- [Philippou and Strickland, 1997] Philippou, P. A. and Strickland, N. (1997). Vector Field Analysis and Synthesis Using Three-Dimensional Phase Portraits. *Graphical Models and Image Processing*, 59(6):446–462.
- [Porteous, 1987] Porteous, I. R. (1987). Ridges and Umbilics of Surfaces. In Martin, R. R., editor, *The mathematics of surfaces II*, pages 447–458. Clarendon Press - Oxford.
- [Quatrehomme et al., 1997] Quatrehomme, G., Cotin, S., Subsol, G., Delingette, H., Garidel, Y., Grevin, G., Fidrich, M., P., B., and Ollier, A. (1997). A Fully Three-Dimensional Method for Facial Reconstruction Based on Deformable Models. *Journal of Forensic Sciences*, 42(4):649–652.
- [Ramsay and Li, 1998] Ramsay, J. O. and Li, X. (1998). Curve registration. *Journal of Royal Statistical Society B*, Part 2(60):351–363.
- [Renaud et al., 1996] Renaud, S., Michaux, J., Jaeger, J. J., and Auffray, J. C. (1996). Fourier analysis applied to *Stephanomys* (Rodentia, Muridae) molars: nonprogressive evolutionary pattern in a gradual lineage. *Paleobiology*, 2(22):251–261.
- [Rice and Silverman, 1991] Rice, J. A. and Silverman, B. W. (1991). Estimating the Mean and Covariance Structure Nonparametrically when the Data are Curves. *Journal of the Royal Statistical Society, B*, 53(1):233–243.
- [Rohlf, 1990] Rohlf, F. J. (1990). Rotational fit (Procrustes) Methods. In Rohlf, F. J. and Bookstein, F. L., editors, *Proceedings of the Michigan Morphometrics Workshop*, pages 227–236, Ann Arbor, Michigan (USA). The University of Michigan, Museum of Zoology. Electronic version: <http://life.bio.sunysb.edu/ee/rohlf/reprints.html>.
- [Rohlf, 1998] Rohlf, F. J. (1998). On Applications of Geometric Morphometrics to Studies of Ontogeny and Phylogeny. *Systematic Biology*. To appear. Electronic version: <http://life.bio.sunysb.edu/ee/rohlf/reprints.html>.
- [Rohlf and Marcus, 1993] Rohlf, F. J. and Marcus, L. F. (1993). A Revolution in Morphometrics. *Trends in Ecology and Evolution*, 8(4):129–132. Electronic version: <http://life.bio.sunysb.edu/ee/rohlf/reprints.html>.
- [Rohlf and Slice, 1990] Rohlf, F. J. and Slice, D. (1990). Extensions of the Procrustes Method for the Optimal Superimposition of Landmarks. *Systematic Zoology*, 39(1):40–59.
- [Rohr et al., 1996] Rohr, K., Stiehl, H. S., Sprengel, R., Beil, W., Buzug, T. M., Weese, J., and Kuhn, M. H. (1996). Point-Based Elastic Registration of Medical Image Data Using Approximating Thin-Plate Splines. In Höhne, K. H. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 297–306, Hamburg (Germany). Springer. Electronic version: <http://kogs-www.informatik.uni-hamburg.de/PUBLICATIONS/kogs-publications.html>.

- [Royackkers et al., 1995] Royackkers, N., Fawal, H., Desvignes, M., Revenu, M., and Travère, J. (1995). Feature Extraction for Cortical Sulci Identification. In *9th Scandinavian Conference on Image Analysis*, volume 2, pages 1147–1154, Uppsala (Sweden).
- [Schwartz and Sharir, 1987] Schwartz, J. T. and Sharir, M. (1987). Identification of Partially Obscured Objects in Two and Three Dimensions by Matching Noisy Characteristic Curves. *The International Journal of Robotic Research*, 6(2):29–44.
- [Sclaroff and Pentland, 1995] Sclaroff, S. and Pentland, A. P. (1995). Modal Matching for Correspondence and Recognition. *IEEE Transactions on Pattern Recognition and Machine Intelligence*, 17(6):545–561. Electronic version: <http://www.cs.bu.edu/faculty/sclaroff/pubs.html>.
- [Serra and Berthod, 1994] Serra, B. and Berthod, M. (1994). Subpixel Contour Matching Using Continuous Dynamic Programming. In *Computer Vision and Pattern Recognition*, pages 202–207, Seattle (USA).
- [Shen and Hogg, 1995] Shen, X. and Hogg, D. (1995). Generic 3-D Shape Model: Acquisitions and Applications. In Hlaváč, V. and Šára, R., editors, *Computer Analysis of Images and Patterns*, volume 970 of *Lecture Notes in Computer Science*, pages 98–105. Springer.
- [Sherbrooke et al., 1996] Sherbrooke, E. C., Patrikalakis, N. M., and Wolter, F. E. (1996). Differential and Topological Properties of Medial Axis Transforms. *Graphical Models and Image Processing*, 58(6):574–592.
- [Small, 1996] Small, C. G. (1996). *The Statistical Theory of Shape*. Springer Series in Statistics. Springer.
- [Sozou et al., 1995] Sozou, P. D., Cootes, T. F., Taylor, C. J., and C., D. M. E. (1995). Non-linear Point Distribution Modelling using a Multi-layer Perceptron. In Pyckock, D., editor, *British Machine Vision Conference*, volume 1, pages 107–116. BMVA. Electronic version: <http://s10d.smb.man.ac.uk/publications/index.htm>.
- [Sozou et al., 1994] Sozou, P. D., Cootes, T. F., Taylor, C. J., and Di-Mauro, E. C. (1994). A Non-linear Generalisation of PDMs using Polynomial Regression. In Hancock, E., editor, *British Machine Vision Conference*, volume 2, pages 397–406, York (UK). BMVA Press. Electronic version: <http://s10d.smb.man.ac.uk/publications/index.htm>.
- [Stytz and Parrott, 1993] Stytz, M. R. and Parrott, R. W. (1993). Using Kriging for 3D Medical Imaging. *Computerized Medical Imaging and Graphics*, 17(6):421–442.
- [Subsol, 1995] Subsol, G. (1995). *Construction automatique d’atlas anatomiques morphométriques à partir d’images médicales tridimensionnelles*. PhD thesis, École Centrale Paris. In French. Electronic version: <http://www.inria.fr/RRRT/TU-0379.html>.
- [Subsol, 1998] Subsol, G. (1998). Crest Lines for Curve Based Warping. In Toga, A. W., editor, *Brain Warping*, chapter 13. Academic Press. To be published.
- [Subsol et al., 1997] Subsol, G., Roberts, N., Doran, M., and Thirion, J. P. (1997). Automatic Analysis of Cerebral Atrophy. *Magnetic Resonance Imaging*, 15(8):917–927.
- [Subsol et al., 1996] Subsol, G., Thirion, J. P., and Ayache, N. (1996). Application of an Automatically Built 3D Morphometric Brain Atlas: Study of Cerebral Ventricle Shape. In Höhne, K. H. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 373–382, Hamburg (Germany). Springer.
- [Subsol et al., 1998] Subsol, G., Thirion, J. P., and Ayache, N. (1998). A General Scheme for Automatically Building 3D Morphometric Anatomical Atlases: application to a Skull Atlas. *Medical Image Analysis*, 2(1):37–60.
- [Sun et al., 1996] Sun, J., Raz, J., and Faraway, J. (1996). Confidence Bands for Growth and Response Curves. Technical Report 96-2, University of Michigan, Department of Biostatistics. Electronic version: <http://www.sph.umich.edu/~jonraz/papers.html>.

- [Syn and Prager, 1995] Syn, M. H. M. and Prager, R. W. (1995). FEM Eigenmodes as Shape Features. CUED/F-INFEND/TR 211, Cambridge university, Engineering Department.
- [Székely et al., 1992] Székely, G., Brechbühler, C., Kübler, O., Ogniewicz, R., and Budinger, T. (1992). Mapping the human cerebral cortex using 3D medial manifolds. In Robb, R. A., editor, *Visualization in Biomedical Computing*, pages 130–144, Chapel Hill, North Carolina (USA). SPIE.
- [Székely et al., 1995] Székely, G., Kelemen, A., Brechbühler, C., and Gerig, G. (1995). Segmentation of 3D Objects from MRI Volume Data Using Constrained Elastic Deformations of Flexible Fourier Surface Models. In Ayache, N., editor, *CVRMed'95*, volume 905 of *Lecture Notes in Computer Science*, pages 495–505, Nice (France). Springer-Verlag.
- [Szeliski and Lavallée, 1996] Szeliski, R. and Lavallée, S. (1996). Matching 3-D Anatomical Surfaces with Non-Rigid Deformations using Octree-Splines. *International Journal of Computer Vision*, 18(2):171–186. Electronic version: <http://www-cami.imag.fr/~lavallee/biblio-step.html>.
- [Talairach and Tournoux, 1988] Talairach, J. and Tournoux, P. (1988). *Co-Planar Stereotaxic Atlas of the Human Brain*. Georg Thieme Verlag, Stuttgart.
- [Thirion, 1996a] Thirion, J. P. (1996a). New Feature Points Based on Geometric Invariants for 3D Image Registration. *International Journal of Computer Vision*, 18(2):121–137. Electronic version: <http://www.inria.fr/RRRT/RR-1901.html>.
- [Thirion, 1996b] Thirion, J. P. (1996b). The Extremal Mesh and the Understanding of 3D Surfaces. *International Journal of Computer Vision*, 19(2):115–128. Electronic version: <http://www.inria.fr/RRRT/RR-2149.html>.
- [Thirion and Gourdon, 1995] Thirion, J. P. and Gourdon, A. (1995). Computing the Differential Characteristics of Isointensity Surfaces. *Computer Vision and Image Understanding*, 61(2):190–202. Electronic version: <http://www.inria.fr/RRRT/RR-1881.html>.
- [Thirion and Gourdon, 1996] Thirion, J. P. and Gourdon, A. (1996). The 3D Marching Lines Algorithm. *Graphical Models and Image Processing*, 58(6):503–509. Electronic version: <http://www.inria.fr/RRRT/RR-1881.html>.
- [Thirion et al., 1998] Thirion, J. P., Prima, S., Subsol, G., and Roberts, N. (1998). Statistical Analysis of normal and Abnormal Dissymmetry in Volumetric Medical Images. In Vemuri, B., editor, *Workshop on Biomedical Image Analysis*, pages 74–83, Santa Barbara, California (USA). IEEE Computer Society Press.
- [Thirion et al., 1996] Thirion, J. P., Subsol, G., and Dean, D. (1996). Cross Validation of Three Inter-Patients Matching Methods. In Höhne, K. H. and Kikinis, R., editors, *Visualization in Biomedical Computing*, volume 1131 of *Lecture Notes in Computer Science*, pages 327–336, Hamburg (Germany). Springer.
- [Thompson and Toga, 1996] Thompson, P. and Toga, A. W. (1996). A Surface-Based Technique for Warping Three-Dimensional Images of the Brain. *IEEE Transaction on Medical Imaging*, 15(4):402–417. Abstract: [http://autarch.loni.ucla.edu/thompson/IEEE\\_abs.html](http://autarch.loni.ucla.edu/thompson/IEEE_abs.html).
- [Thompson and Toga, 1997] Thompson, P. and Toga, A. W. (1997). Detection, visualization and animation of abnormal anatomic structure with a deformable probabilistic brain atlas based on random vector field transformations. *Medical Image Analysis*, 1(4):271–294. Abstract: <http://autarch.loni.ucla.edu/thompson/MIA97.html>.
- [Thompson et al., 1996] Thompson, P. M., Schwartz, C., and Toga, W. (1996). High-Resolution Random Mesh Algorithms for Creating a Probabilistic 3D Surface Atlas of the Human Brain. *Neuroimage*, 3:19–34.
- [Toga, 1998] Toga, A., editor (1998). *Brain Warping*. Academic Press.

- [Toga and Thompson, 1998] Toga, A. W. and Thompson, P. (1998). Multimodal Brain Atlases. Electronic version: [http://www.loni.ucla.edu/thompson/whole\\_atlas.html](http://www.loni.ucla.edu/thompson/whole_atlas.html).
- [Trouvé, 1998] Trouvé, A. (1998). Diffeomorphisms groups and Pattern matching in image analysis. *International Journal of Computer Vision*, 28(3):213–221.
- [van den Elsen et al., 1995] van den Elsen, P. A., Maintz, J. B. A., Pol, E. J. D., and Viergever, M. A. (1995). Automatic Registration of CT and MR Brain Images Using Correlation of Geometrical Features. *IEEE Transactions on Medical Images*, 14(2):384–398.
- [Vemuri and Malladi, 1993] Vemuri, B. C. and Malladi, R. (1993). Constructing Intrinsic Parameters with Active Models for Invariant Surface Reconstruction. *IEEE Transactions on Pattern Recognition and Machine Intelligence*, 15(7):668–681.
- [Verroust and Lazarus, 1997] Verroust, A. and Lazarus, F. (1997). Extracting Skeletal Curves from 3D Scattered Data. Technical Report 3250, INRIA. Electronic version: <http://www.inria.fr/RRRT/RR-3250.html>.
- [Wang et al., 1998] Wang, L., Cui, J., and Miller, M. I. (1998). Validating High-Dimensional Transformations of the Hippocampus. In *Fourth International Conference on Functional Mapping of the Human Brain*, volume 7, page 690, Montreal (Canada). Electronic version: [http://cis.wustl.edu/wu\\_publications/w/wangl3.html](http://cis.wustl.edu/wu_publications/w/wangl3.html).
- [Wirth et al., 1997] Wirth, M. A., Choi, C., Hulskamp, J., and Jennings, A. (1997). Non-Linear Registration and Fusion of Elastic-Body Medical Images Using Radial Basis Functions. In *Image Analysis and Information Fusion*, Adelaide (Australia). Electronic version: <http://www.cse.rmit.edu.au/s9601460/papers.html>.
- [Worth et al., 1997] Worth, A. J., Makris, N., Caviness, V. S., and Kennedy, D. N. (1997). Neuroanatomical Segmentation in MRI: Technological Objectives. *International Journal of Pattern Recognition and Artificial Intelligence*, 11(8):1161–1187.
- [Younes, ] Younes, L. Optimal matching between shapes via elastic deformations. Web site. Electronic version: <http://tarte.cmla.ens-cachan/Utilisateurs/younes/index.html>.
- [Younes, 1998] Younes, L. (1998). Computable Elastic Distances Between Shapes. *SIAM Journal on Applied Mathematics*, 58(2):565–586. Electronic version: <http://tarte.cmla.ens-cachan.fr/Utilisateurs/younes/publi.html>.
- [Zhang et al., 1998] Zhang, W., Dickinson, S., Sclaroff, S., Feldman, J., and Dunn, S. (1998). Shape-Based Indexing in a Medical Image Database. In Vemuri, B., editor, *Workshop on Biomedical Image Analysis*, pages 221–230, Santa Barbara, California (USA). IEEE Computer Society Press.
- [Zhang, 1994] Zhang, Z. (1994). Iterative Point Matching for Registration of Free-Form Curves and Surfaces. *International Journal of Computer Vision*, 13(2):119–152. Electronic version: <http://www.inria.fr/RRRT/RR-2146.html>.