

## Table of Contents

### 1. Segmentation and deformable models

- Non-rigid image registration using bone growth model (oral) . . . . . 3  
*M. Bro-Nielsen, C. Gramkow, S. Kreiborg*

- Volumetric medical images segmentation using shape constrained deformable models (oral) . . . . . 13  
*J. Montagnat, H. Delingette*

- Medical image segmentation using topologically adaptable surfaces (oral) . . . . . 23  
*T. McInerney, D. Terzopoulos*

- Definition of a 4D continuous polar transformation for the tracking and the analysis of LV motion (oral) . . . . . 33  
*J. Declerck, J. Feldmar, N. Ayache*

- Shape-based segmentation and tracking in 4D cardiac MR images (poster) . . . . . 43  
*D. Rueckert, P. Burger*

- Segmentation using deformable models with affinity-based localization (poster) . . . . . 53  
*T.N. Jones, D.N. Metaxas*

- Advances in elastic matching theory and its implementation (poster) . . . . . 63  
*J.C. Gee, D.R. Haynor, L. Le Briquer, R.K. Bajcsy*

- Automatic detection of articular surfaces in 3D image through minimal subset random sampling (poster) . . . . . 73  
*J.J. Jacq, C. Roux*

- Decimation of iso-surfaces with deformable models (poster) . . . . . 83  
*H. Delingette*

- Comparative estimation of orbital three dimensional CT measurements utilizing ANALYZE<sup>TM</sup> (poster) . . . . . 93  
*U. Bite, P. Yugueros, S. TerKonda, D. D'Souza*

### 2. 3D/2D registration

- Surgical instrument guidance using synthesized anatomical structures (oral) . . . . . 99  
*A. Liu, E. Bullitt, S.M. Pizer*

<b>Kinematic study of lumbar spine using functional radiographies and 3D/2D registration (oral)</b>	109
<i>A. Hamadeh, P. Cinquin</i>	
<b>An approach to 2D/3D registration of a vertebra in 2D X-ray fluoroscopies with 3D CT images (poster)</b>	119
<i>J. Weese, T.M. Buzug, C. Lorenz, C. Fassnacht</i>	
<b>Matching 3D MR angiography data and 2D X-ray angiograms (poster)</b>	129
<i>J. Feldmar, G. Malandain, N. Ayache, S. Fernàndez-Vidal, E. Maurincombe, Y. Troussel</i>	
<b>3. Validation of registration techniques</b>	
<b>A method for evaluating CT-based surgical registration (oral)</b>	141
<i>R.E. Ellis, D.J. Fleet, J.T. Bryant, J. Rudan, P. Fenton</i>	
<b>Retrospective intermodality registration techniques: surface-based versus volume-based (poster)</b>	151
<i>J. West, J.M. Fitzpatrick, M.Y. Wang, B.M. Dawant, C.R. Maurer, Jr, R.M. Kessler, R.J. Maciunas</i>	
<b>Anatomical landmark image registration: validation and comparison (poster)</b>	161
<i>K.C. Strasters, J.A. Little, J. Buurman, D.L.G. Hill, D.J. Hawkes</i>	
<b>Rigid registration of CT, MR and cryosection images using a GLCM framework (poster)</b>	171
<i>M. Bro-Nielsen</i>	
<b>Geometric constraint analysis and synthesis: methods for improving shape-based registration accuracy (poster)</b>	181
<i>D.A. Simon, T. Kanade</i>	
<b>4. Analysis of cardiac and vascular images</b>	
<b>Unwrapping phase in 3D MR phase contrast angiograms (poster)</b>	193
<i>A. Bhalerao, C.-F. Westin, R. Kikinis</i>	
<b>Image registration: convex weighting functions for histogram-based similarity measures (poster)</b>	203
<i>T.M. Buzug, J. Weese, C. Fassnacht, C. Lorenz</i>	
<b>3D Multi-scale line filter for segmentation and visualization of curvilinear structures in medical images (poster)</b>	213
<i>Y. Sato, S. Nakajima, H. Atsumi, T. Koller, G. Gerig, S. Yoshida, R. Kikinis</i>	

<b>A new model for the recovery of cylindrical structures from medical image data (poster) . . . . .</b>	223
<i>T. O'Donnell, A. Gupta, T. Boult</i>	
<b>Multi-scale line segmentation with automatic estimation of width, contrast and tangential direction in 2D and 3D medical images (oral) . . . . .</b>	233
<i>C. Lorenz, I.-C. Carlsen, T.M. Buzug, C. Fassnacht, J. Weese</i>	
<b>Geometrical modeling of abdominal aortic aneurysms (oral) . . . . .</b>	243
<i>V. Juhan, B. Nazarian, K. Malkani, R. Bulot, J.M. Bartoli, J. Sequeira</i>	
<b>Augmented reality for diagnosis based on ultrasound images (oral) . . . . .</b>	253
<i>T. Berlage</i>	
<b>Parametric two-dimensional B-spline representation of vein and artery from 2.5D echography used to aid virtual echography (poster) . . . . .</b>	263
<i>G. Chambelboux, D. Henry</i>	
<b>CT-based simulation of fluoroscopy and DSA for endovascular surgery training (poster) . . . . .</b>	273
<i>T. van Walsum, K.J. Zuiderveld, J.W.C. Chin-A-Woeng, B.C. Eikelboom, M.A. Viergever</i>	
<b>5. Image-guided punctures of soft tissues</b>	
<b>Computer-ASsisted PERicardial punctures: animal feasibility study (oral) . . . . .</b>	285
<i>O. Chavanon, C. Barbe, J. Troccaz, L. Carrat, C. Ribouot, D. Blin</i>	
<b>An efficient needle injection technique and radiological guidance method for percutaneous procedures (oral) . . . . .</b>	295
<i>D. Stoianovici, J.A. Cadeddu, R.D. Demaree, S.A. Basile, R.H. Taylor, L.L. Whitcomb, W.N. Sharpe, L.R. Kavoussi</i>	
<b>An automated system for precise percutaneous access of the renal collecting system (oral) . . . . .</b>	299
<i>A. Bzostek, S. Schreiner, A.C. Barnes, J.A. Cadeddu, W.W. Roberts, J.H. Anderson, R.H. Taylor, L.R. Kavoussi</i>	
<b>6. Basic tools and applications in endoscopy</b>	
<b>3D Visualisation for image guided surgery - a case study in video endoscopy (poster) . . . . .</b>	311
<i>C. v.Pichler, K. Radermacher, W. Boeckmann, G. Jakse, G. Rau</i>	

<b>Virtual endoscopy for planning and simulation of minimally invasive neurosurgery (poster) . . . . .</b>	<b>315</b>
<i>L.M. Auer, D. Auer, J.F. Knoploch</i>	
<b>Robot-assisted minimally invasive neurosurgical procedures: first experimental experience (poster) . . . . .</b>	<b>319</b>
<i>T.M. Gorodia, R.H. Taylor, L.M. Auer</i>	
<b>Real and simulated endoscopy of neurosurgical approaches in an anatomical model (oral) . . . . .</b>	<b>323</b>
<i>K. Darabi, K.D.M. Resch, J. Weinert, U. Jendrysik, A. Perneczky</i>	
<b>Non-invasive 3D patient registration for image-guided intranasal surgery - experimental and clinical results (oral) . . . . .</b>	<b>327</b>
<i>R. Hauser, B. Westermann, R. Probst</i>	
<b>Toward an active three dimensional navigation system in medical imaging (oral) . . . . .</b>	<b>337</b>
<i>M.E. Bellemare, P. Haigron, J.L. Coatrieux</i>	
<b>A low-cost training simulator for initial formation in gynecologic laparoscopy (oral) . . . . .</b>	<b>347</b>
<i>A.-C. Jambon, P. Dubois, S. Karpf</i>	
<b>Automatic tracking of laparoscopic instruments by color coding (oral) . . . . .</b>	<b>357</b>
<i>G.-Q. Wei, K. Arbter, G. Hirzinger</i>	
<b>7. Simulation and augmented reality</b>	
<b>Simulating arthroscopic knee surgery using volumetric object representations, real-time volume rendering and haptic feedback (oral) . . . . .</b>	<b>369</b>
<i>S. Gibson, J. Samosky, A. Mor, C. Fyock, W.E.L. Grimson, T. Kanade, R. Kikinis, H. Lauer, N. McKenzie, S. Nakajima, H. Ohkami, R. Osborne, A. Sawada</i>	
<b>Physically-based model for simulating the human trunk respiration movements (oral) . . . . .</b>	<b>379</b>
<i>E. Promayon, P. Baconnier, C. Puech</i>	
<b>A 3D virtual environment for modeling mechanical cardiopulmonary interactions (oral) . . . . .</b>	<b>389</b>
<i>J. Kaye, D.N. Metaxas, F.P. Primiano, Jr.</i>	

<b>Design considerations for a computer-vision-enabled ophthalmic augmented reality environment (oral)</b>	399
<i>J.W. Berger, M.E. Leventon, N. Hata, W. Wells, R. Kikinis</i>	
<b>Clinical assessment of a training simulator for retinal photocoagulation (poster)</b>	409
<i>F. Peugnet, P. Dubois, J.F. Rouland</i>	
<b>Freeflight: a virtual endoscopy system (poster)</b>	413
<i>D.J. Vining, D.R. Stelts, D.K. Ahn, P.F. Hemler, Y. Ge, G.W. Hunt, C. Siege, D.B. McCorquodale, M.E. Saroak, G.R. Ferretti</i>	
<b>A fast morphology-based registration - application to computer-assisted bronchoscopy (poster)</b>	417
<i>I. Bricault</i>	
<b>Interactive virtualized display system for intravascular neurosurgery (poster)</b>	427
<i>Y. Masutani, T. Dohi, F. Yamane, H. Iseki, K. Takakura</i>	
<b>8. Brain models and neurosurgery</b>	
<b>Differential features of cortical folds (poster)</b>	439
<i>A. Manceaux-Demiau, J.-F. Mangin, J. Régis, O. Pizzato, V. Frouin</i>	
<b>Estimation of intraoperative brain surface movement (poster)</b>	449
<i>D.L.G. Hill, C.R. Maurer, Jr, M.Y. Wang, R.J. Maciunas, J.A. Barwise, J.M. Fitzpatrick</i>	
<b>The correction of stereotactic inaccuracy caused by brain shift using an intraoperative ultrasound device (oral)</b>	459
<i>R.D. Bucholz, D.D. Yeh, J. Trobaugh, L.L. McDermont, C.D. Sturm, C. Baumann, J.M. Henderson, A. Levy, P. Kessman</i>	
<b>A path-planning algorithm for image-guided neurosurgery (oral)</b>	467
<i>M. Vaillant, C. Davatzikos, R.H. Taylor, R.N. Bryan</i>	
<b>Experimentation with a transcranial magnetic stimulation system for functional brain mapping (oral)</b>	477
<i>G.J. Ettinger, M.E. Leventon, W.E.L. Grimson, R. Kikinis, V. Gugino, W. Cote, L. Sprung, L. Aglio, M. Shenton, G. Potts, E. Alexander</i>	
<b>SPECT memory activation studies thanks to non-rigid automated 3D image registration (oral)</b>	487
<i>O. Migneco, J.-P. Thirion, M. Benoit, G. Malandain, P. Robert, N. Ayache, J. Darcourt</i>	

- A priori registration of SPECT projections and MR/CT images for SPECT reconstruction improvement (poster) . . . . .** 491  
*V. Bouchard, P. Cinquin, L. Desbat, A. François Joubert, S. Lavallée, O. Péria*

- Comparison of phantom target localization by frame-based stereotaxy and using the VISLAN system (poster) . . . . .** 501  
*A.C.F. Colchester, J. Zhao, N. Dorward, G. Subsol, D.G.T. Thomas*

- Three dimensional tracking with ultrasound for augmented reality applications in skull base surgery (poster) . . . . .** 511  
*G. Alusi, A.C. Tan, A.D. Linney, K. Raoof, A. Wright*

## 9. Basic tools and applications in spine surgery

- A novel method for digital X-ray imaging of the complete spine (poster) . . . . .** 521  
*A.H.W. van Eeuwijk, S. Lobregt, F.A. Gerritsen*

- Effects of tracking adjacent vertebral bodies during image guided pedicle screw surgery (oral) . . . . .** 531  
*N. Glossop, R. Hu*

- Computer-assisted versus manual spine surgery: clinical report (oral) . . . . .** 541  
*P. Merloz, J. Tonetti, A. Eid, C. Faure, L. Pittet, M. Coulomb, P. Sautot, O. Raoult*

## 10. Basic tools and applications in hip and pelvis surgery

- Automatic determination of the newborn's femoral head from three-dimensional ultrasound image data (poster) . . . . .** 547  
*H.M. Overhoff, D. Lazovic, J. Franke, U. von Jan*

- Experiences with an image-guided planning system (ORTHODOC) for cementless hip replacement (poster) . . . . .** 557  
*A. Lahmer, M. Börner, A. Bauer*

- Robodoc – animal experiment and clinical evaluation (oral) . . . . .** 561  
*A. Bauer, M. Börner, A. Lahmer*

- Evaluation of a computer integrated surgical technique for percutaneous fixation of transverse acetabular fractures (oral) . . . . .** 565  
*D.M. Kahler, R. Zura*

- Range of motion after total hip arthroplasty: experimental verification of the analytical simulator (oral) . . . . .** 573  
*B. Jaramaz, C. Nikou, D.A. Simon, A.M. DiGioia III*

<b>Development and validation of a navigational guidance system for acetabular implant placement (poster) . . . . .</b>	583
<i>D.A. Simon, B. Jaramaz, M. Blackwell, F. Morgan, A.M. DiGioia III, E. Kischell, B. Colgan, T. Kanade</i>	
<b>Accuracy of image guided placement of iliosacral lag screws (poster) . . . . .</b>	593
<i>R. Hu, N. Glossop, D. Steven, J. Randle</i>	
<b>Restricted surface matching: a new approach to registration in computer assisted surgery (poster) . . . . .</b>	597
<i>J. Gong, R. Bächler, M. Sati, L.-P. Nolte</i>	
<b>Image-guided orthopedic surgery using individual templates – experimental results and aspects of the development of a demonstrator for pelvis surgery (poster) . . . . .</b>	606
<i>K. Radermacher, F. Portheine, A. Zimolong, Ch. Eichhorn, H.-W. Staudte, G. Rau</i>	
<b>11. Basic tools and applications in knee surgery</b>	
<b>Computer assisted planning for total knee arthroplasty (oral) . . . . .</b>	619
<i>M. Fadda, D. Bertelli, S. Martelli, M. Marcacci, P. Dario, C. Paggetti, D. Caramella, D. Trippi</i>	
<b>Computer-assisted knee surgical total replacement (oral) . . . . .</b>	629
<i>F. Leitner, F. Picard, R. Minfelde, H.-J. Schulz, P. Cinquin, D. Saragaglia</i>	
<b>A simple fluoroscopy based technique for assessing 3D knee kinematics before, during, and after surgery (oral) . . . . .</b>	639
<i>S.A. Banks, A.Z. Banks, T.V.S. Klos, F.F. Cook</i>	
<b>Development and validation of a fiber-based ACL model for surgical simulations (poster) . . . . .</b>	644
<i>S. Martelli, A. Joukhadar, S. Zaffagnini, M. Marcacci</i>	
<b>A system for computer assisted arthroscopy (poster) . . . . .</b>	653
<i>C. Paggetti, T. Ciucci, E. Papa, B. Allotta, P. Dario</i>	
<b>A minimally-invasive 3D data registration protocol for computer and robot-assisted total knee arthroplasty (poster) . . . . .</b>	663
<i>P.F. LaPalombara, M. Fadda, S. Martelli, L. Nofrini, M. Marcacci</i>	

## 12. Basic tools and applications in radiotherapy

- External radiotherapy of prostatic carcinoma : a quadratic optimization of the dose distribution (oral) . . . . .** 675  
*Y. Menguy, P. Cinquin, J. Troccaz, P. Vassal, J.-Y. Giraud, A. Dusserre, M. Bolla*
- A user-guided tool for efficient segmentation of medical image data (oral) . . . . .** 685  
*T. Vehkomäki, G. Gerig, G. Székely*
- Computer-controled non-invasive patient positioning in fractionated radiotherapy - a videogrammetric system for automatic patient set-up, fast detection of patient motion and online correction of target point misalignment during therapy (oral) . . . . .** 695  
*C. Lappe, M. Braun, S. Helfert, F. Hirschfeld, M. Menke, O. Pastyr, V. Sturm, W. Schlegel*
- Eye reconstruction and CT-retinography fusion for proton treatment planning of ocular diseases (oral) . . . . .** 705  
*P.-Y. Bondiau, G. Malandain*

- The effect of image artifacts, organ motion and poor segmentation on the reliability and accuracy of 3D chamfer matching (poster) . . . . .** 715  
*M. van Herk, K.G.A. Gilhuijs, J.C. de Munck, A. Touw*

## 13. Robotic systems in Computer-Integrated Surgery

- The use of localizers, robots and synergistic devices in CAS (oral) . . . . .** 727  
*J. Troccaz, M. Peshkin, B.L. Davies*
- Development of an automatic surgical holding system based on ergonomic analysis (oral) . . . . .** 737  
*S. Erbse, K. Radermacher, M. Anton, G. Rau, W. Boeckmann, G. Jakse, H.-W. Staudte*
- A system for percutaneous delivery of treatment with a fluoroscopically-guided robot (oral) . . . . .** 747  
*S. Schreiner, J.H. Anderson, R.H. Taylor, J. Funda, A. Bzostek, A.C. Barnes*
- Experiences with robotic systems for knee surgery (oral) . . . . .** 757  
*S.J. Harris, W.J. Lin, K.L. Fan, R.D. Hibberd, J. Cobb, R. Middleton, B.L. Davies*
- A compact robot for image-guided orthopedic surgery: concept and preliminary results (poster) . . . . .** 767  
*G. Brandt, K. Radermacher, S. Lavallée, H.-W. Staudte, G. Rau*

<b>14. Basic tools and applications in tele- and micro-surgery</b>	
<b>The development of a microrobot system for colonoscopy (oral)</b>	779
<i>M.C. Carrozza, L. Lencioni, B. Magnani, S. D'Attanasio, P. Dario</i>	
<b>Performance measurement in scaled teleoperation for microsurgery (oral)</b>	789
<i>S.E. Salcudean, S. Ku, G. Bell</i>	
<b>An integrated remote neurosurgical system (oral)</b>	799
<i>B. Sean Graves, J. Tullio, M. Shi, J. Hunter Downs III</i>	
<b>Feasability of laparoscopic telesurgery (oral)</b>	809
<i>P.G. Schulam, S.G. Docimo, J.A. Cadeddu, W. Saleh, C. Brietenbach, R.G. Moore, L.R. Kavoussi</i>	
<b>Image guided surgery extended by remote stereotactic visualization (oral)</b>	813
<i>W. Millesi, M.J. Truppe, F. Watzinger, A. Wagner, R. Ewers</i>	
<b>Interactive telepresence and augmented reality in ENT surgery: interventional video tomography (poster)</b>	817
<i>W. Freysinger, M.J. Truppe, A.R. Gunkel, W.L. Thumfart, F. Pongracz, J. Maierbaeuerl</i>	
<b>Dexterity enhancement for a tele-micro-surgery system with multiple macro-micro co-located operation point manipulators and understanding of the operator's intention (poster)</b>	821
<i>M. Mitsuishi, H. Watanabe, H. Nakanishi, H. Kubota, Y. Iizuka</i>	
<b>Author Index</b>	831