

## BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.  
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Milan Sonka, Ph.D. <hr/> eRA COMMONS USER NAME msonka	POSITION TITLE Professor and Chair, Electrical & Comp. Engineering Professor of Ophthalmology and Visual Sciences Professor of Radiation Oncology		
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Czech Technical University, Prague, Czechoslovakia	M.Sc.	1979	Electrical Engineering
Czech Technical University, Prague, Czechoslovakia	Ph.D.	1984	Digital Image Analysis

**NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.**

**A. Positions and Honors.** List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

1984-1990 Control Engineering, Assistant Prof., Czech Technical University Prague  
 1990-1994 Elec. and Comp. Eng., Visit. Assist. Prof., The University of Iowa  
 1994-2000 Elec. and Comp. Eng., Associate Prof., The University of Iowa  
 2000-2008 Elec. and Comp. Eng., Professor, The University of Iowa  
 2006-now Ophthalmology and Visual Sciences, Professor, The University of Iowa  
 2006-now Radiation Oncology, Professor, The University of Iowa  
 2007-now Co-director, Iowa Institute for Biomedical Imaging, The University of Iowa  
 2000-now Elec. and Comp. Eng., Professor and Chair, The University of Iowa

IEEE Fellow, Fellow AIMBE

Editor-in-Chief of *IEEE Transactions on Medical Imaging*, Editorial Board Member of the *Medical Image Analysis*

**B. Selected peer-reviewed publications (in chronological order).** Do not include publications submitted or in preparation.

*Selected from 18 books, 11 book chapters, 82 journal papers, 195 conference papers, and 80 abstracts*

**Books and Book chapters**

- Sonka, M., Hlavac, V. Boyle, R.: Image Processing, Analysis, and Machine Vision – 3<sup>rd</sup> Ed. Thomson Engineering, Toronto, Canada, 870 p., 2007 (2<sup>nd</sup> Ed.. PWS, Boston, 1998, 1<sup>st</sup> Ed. Chapman and Hall Publishers, London - New York, 1993).
- Sonka, M., Fitzpatrick, J.M. editors: Handbook of Medical Imaging Volume 2 - Medical Image Processing and Analysis, SPIE, 1250 p., 2000.
- Sonka, M., Hanson, K.M.: Medical Imaging 2001 - Image Processing. Proceedings of SPIE, Vol. 4322 - parts 1,2,3; SPIE, Bellingham WA, 1968 p., 2001.
- Sonka, M., Fitzpatrick, J.M.: Medical Imaging 2002 - Image Processing. Proceedings of SPIE, Vol. 4864 - parts 1,2,3; SPIE, Bellingham WA, 2002.
- Sonka, M., Fitzpatrick, J.M.: Medical Imaging 2003 - Image Processing. Proceedings of SPIE, Vol. 5032 - parts 1,2,3; SPIE, Bellingham WA, 2003.
- Fitzpatrick, J.M., Sonka, M.: Medical Imaging 2004 - Image Processing. Proceedings of SPIE, Vol. 5370 - parts 1,2,3; SPIE, Bellingham WA, 2004.
- Sonka, M., Kakadiaris, I.A., Kybic, J.: Computer Vision and Mathematical Methods in Medical and Biomedical Image Analysis, Lecture Notes in Computer Science Vol. 3117, Springer, Berlin, 2004.
- Christensen, G.E., Sonka, M.: Information Processing in Medical Imaging, Lecture Notes in Computer Science Vol. 3565, Springer, Berlin, 2005.
- Beichel, R., Sonka, M.: Computer Vision Approaches to Medical Image Analysis, Lecture Notes in Computer Science Vol. 4241, Springer, Berlin, 2006.

## Peer-Reviewed Journal Papers

- S.C. Mitchell, J.G. Bosch, B.P.F. Lelieveldt, R. J. van der Geest, J.H.C. Reiber, M. Sonka, 3-D Active Appearance Models: Segmentation of Cardiac MR and Ultrasound Images, *IEEE Transactions on Medical Imaging*, Vol. 21, pp. 1167-1178, Sept. 2002.
- Hoffman EA, Reinhardt JM, Sonka M, Simon BA, Guo J, Saba O, Chon D, Samrah S, Shikata H, Tschirren J, Palagyi K, Beck KC, McLennan G.: Characterization of the interstitial lung diseases via density-based and texture-based analysis of computed tomography images of lung structure and function. *Academic Radiology*. 10(10):1104-18, 2003.
- A. Wahle, M. E. Olszewski, M. Sonka: Interactive Virtual Endoscopy in Coronary Arteries based on Multi-Modality Fusion, *IEEE Transactions on Medical 23* (11), 2004.
- S Ge, L Bu, H Zhang, E Schelbert, M Disterhoft, X Li, X Li, D Sahn, A Stolpen, M Sonka: A Real-time 3-dimensional Digital Doppler Method for Measurement of Flow Rate and Volume Through Mitral Valve in Children: A Validation Study Compared with Magnetic Resonance Imaging. *J Am Soc Echocardiogr* 2005;18:1-7.
- Tschirren, J.; Hoffman, E.A.; McLennan, G.; Sonka, M.: Intrathoracic airway trees: segmentation and airway morphology analysis from low-dose CT scans, *IEEE Transactions on Medical Imaging*, Volume 24: 1529-1539, 2005.
- Tschirren, J.; McLennan, G.; Palagyi, K.; Hoffman, E.A.; Sonka, M.: Matching and anatomical labeling of human airway tree, *IEEE Transactions on Medical Imaging*, Volume 24:1540-1547, 2005.
- Beichel, R.; Bischof, H.; Leberl, F.; Sonka, M.: Robust active appearance models and their application to medical image analysis, *IEEE Transactions on Medical Imaging*, Volume 24, Issue 9, Sept. 2005, Pages:1151 - 1169.
- Bosch JG, Nijland F, Mitchell SC, Lelieveldt BPF, Kamp O, Reiber JHC, Sonka M: Computer-aided diagnosis via model-based shape analysis: Automated classification of wall motion abnormalities in echocardiograms. *Academic Radiology - March 2005* (Vol. 12, Issue 3, Pages 358-367).
- Uzumcu, M.; van der Geest, R, Sonka, M, Lamb, H, Reiber, J. H. C., Lelieveldt, B. P. F.: Multiview Active Appearance Models for Simultaneous Segmentation of Cardiac 2- and 4-Chamber Long-Axis Magnetic Resonance Images. *Investigative Radiology*. 40(4):195-203, April 2005.
- C. L. Feldman, A. U. Coskun, Y. Yeghiazarians, S. Kinlay, A. Wahle, M. E. Olszewski, J. D. Rossen, M. Sonka, J. J. Popma, J. Orav et al., Remodeling Characteristics of Minimally Diseased Coronary Arteries Are Consistent Along the Length of the Artery, *The American Journal of Cardiology*, Volume 97, Issue 1, January 2006, Pages 13-16.
- Kang Li; Xiaodong Wu; Chen, D.Z.; Sonka, M.: Optimal Surface Segmentation in Volumetric Images-A Graph-Theoretic Approach, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Volume 28:119 - 134, 2006.
- Ramaswamy SD, Vigmostad SC, Wahle A, Lai YG, Olszewski ME, Braddy KC, Brennan TMH, Rossen JD, Sonka M, Chandran KB: Comparison of Left Anterior Descending Coronary Artery Hemodynamics before and after Angioplasty. *Trans. American Society of Mechanical Engineers*, Vol. 128, Feb. 2006, pages 40-48.
- Y. Xu, M. Sonka, G. McLennan, J. Guo, E. Hoffman: MDCT-based 3-D texture classification of emphysema and early smoking related pathologies. *IEEE Transactions on Medical Imaging*, Volume 25, Issue 4, 2006, Pages: 464-475.
- K. Palagyi, J. Tschirren, E. A. Hoffman and M. Sonka: Quantitative analysis of pulmonary airway tree structures. *Comput Biol Med*. 36(9) p. 974-96, 2006.
- Wahle A, Lopez J J, Olszewski M E, Vigmostad S C, Chandran K B, Rossen J D, Sonka M: Plaque Development, Vessel Curvature, and Wall Shear Stress in Coronary Arteries assessed by X-ray Angiography and Intravascular Ultrasound. *Medical Image Analysis*, Vol. 10, Number 4, Page 615-631, 2006.
- Chandran K B, Wahle A, Vigmostad S C, Olszewski M E, Rossen J D, Sonka M: Coronary Arteries: Imaging, Reconstruction, and Fluid Dynamic Analysis. *Critical Reviews in Biomedical Engineering*, Begell House, Redding, Volume 34, Number 1, Page 23-103, 2006.
- Oost, E.; Koning, G.; Sonka, M.; Oemrawsingh, P.V.; Reiber, J.H.C.; Lelieveldt, B.P.F.: Automated contour detection in X-ray left ventricular angiograms using multiview active appearance models and dynamic programming. *IEEE Transactions on Medical Imaging*, Volume 25, Issue 9, Pages: 1158 - 1171, 2006.
- M. Haeker, M. D. Abramoff, R. Kardon, and M. Sonka, "Segmentation of the surfaces of the retinal layer from OCT images," in *Proceedings of the 9th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI 2006)*, Part I, vol. 4190 of *Lecture Notes in Computer Science*, pp. 800-807, Springer, 2006.
- M. Haeker, M. Sonka, R. Kardon, V. A. Shah, X. Wu, and M. D. Abramoff, "Automated segmentation of intraretinal layers from macular optical coherence tomography images," in *Proceedings of SPIE Medical Imaging 2007: Image Processing*, vol. 6512, SPIE, 2007.
- M. Haeker, X. Wu, M. D. Abramoff, R. Kardon, and M. Sonka, "Incorporation of regional information in optimal 3-D graph search with application for intraretinal layer segmentation of optical coherence tomography images," in *Information Processing in Medical Imaging (IPMI)*, *Lecture Notes in Computer Science LNCS 4584*, 607-618, Springer Verlag, 2007.

- M.K. Garvin, M.D. Abramoff, R. Kardon, S.R. Russell, X. Wu, and M. Sonka, Intraretinal layer segmentation of macular optical coherence tomography images using optimal 3-D graph search, *IEEE Transactions on Medical Imaging*, Vol. 27, p. 1495–1506, 2008.
- Yin, Y., Zhang, X., Sonka, M.: Optimal Multi-Object Multi-Surface Graph Search Segmentation: Full-Joint Cartilage Delineation in 3D. *Proceedings of Medical Image Understanding and Analysis 2008*, Editors: S. McKenna and J. Hesse, p. 104-108, 2008.
- Dou, X., Wu, X., Wahle, A., and Sonka, M., Globally Optimal Surface Segmentation Using Regional Properties of Segmented Objects, *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, Anchorage, AL, June 2008.
- X. Liu, D.Z. Chen, X. Wu, and M. Sonka, Optimal Graph-based Segmentation of 3D Pulmonary Airway and Vascular Trees across Bifurcations, *Proc. of the 1st Annual Workshop on Pulmonary Image Analysis*, at the 11th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 103-111, 2008.
- M.K. Garvin, M.D. Abramoff, X. Wu, S. Russell, T.L. Burns, M. Sonka: Automated 3-D Intraretinal Layer Segmentation of Macular Spectral-Domain Optical Coherence Tomography Images. *IEEE Transactions on Medical Imaging*, Vol. 28, 10.1109/TMI.2009.2016958, 2009.
- F. Zhao, H. Zhang, A. Wahle, M. T. Thomas, A. H. Stolpen, T. D. Scholz and M. Sonka, Congenital aortic disease: 4D magnetic resonance segmentation and quantitative analysis, *Medical Image Analysis*, 2009, (13), 483–493.
- H.W. van Dijk, P. H. B. Kok, M. K. Garvin, M. Sonka, R. P. J. Michels, R. O. Schlingemann, F. D. Verbraak, and M. D. Abramoff, Selective loss of inner retinal layer thickness in type 1 diabetic patients with minimal diabetic retinopathy, *Investigative Ophthalmology and Visual Science*, 2009, in press.
- J.D. Dawson, M. Sonka, M.B. Blecha, W. Lin, P. H. Davis: Risk Factors Associated With Aortic and Carotid Intima-Media Thickness in Adolescents and Young Adults: The Muscatine Offspring Study, *J Am Coll Cardiol* 2009;53:2273-2279
- M. D. Abramoff, K. Lee, M. Niemeijer, W. L. M. Alward, E. C. Greenlee, M. K. Garvin, M. Sonka, and Y. H. Kwon, "Automated segmentation of the cup and rim from spectral domain OCT of the optic nerve head," *Invest. Ophthalmol. Vis. Sci.*, 2009. in press.
- Dawson JD, Sonka M, Blecha MB, Lin W, Davis PH: Risk factors associated with aortic and carotid intima-media thickness in adolescents and young adults: the Muscatine Offspring Study. *J Am Coll Cardiol*. 2009, 53(24):2273-2279

**C. Research Support.** List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

- R01 HL 63373                      Sonka (PI)                      09/15/1999 – 11/30/2010                      1.8 mo  
NIH/NHLBI                      \$225,000/year  
3-D and 4-D Coronary Hemodynamics and Local Atherosclerosis  
The main goal is to develop methods for geometrically correct identification of coronary vessels in 3D and 4D and investigate relationships between hemodynamic shear stress and plaque severity in coronary arteries in vivo.
- R01 EB004640                      Sonka (PI)                      4/1/2006 – 8/31/2013                      3.0 mo  
NIH/NIBIB                      \$250,000/year  
Graph-Based Medical Image Segmentation in 3D and 4D  
The main goal is to develop methods for automated 3D and 4D image segmentation.
- R01 EY018853                      Sonka (PI – with Abramoff, Kardon MPis)                      8/1/2009 – 6/30/2012                      1.8 mo  
NIH/NEI                      \$250,000/year  
Focal Structure-Function Relationships in Macular Layers from 3D Spectral OCT  
The main goal is to study structure-function relationships between ONH images and visual function in glaucoma.
- R01 HL64368                      Hoffman (PI)                      9/1/2005 – 8/31/2010                      1.2 mo  
NIH/NHLBI                      Sonka's annual direct cost: \$50,000/year                      Role: co-I, participating in image analysis efforts  
Image and Model-Based Analysis of Lung Diseases  
The main goal is to study normal pulmonary physiology and develop a suite of image analysis tools for a complete quantitative analysis of human lungs from MDCT and MR.
- R21AR054015                      Anderson (PI)                      10/1/2009 – 9/30/2011                      0.36 mo  
NIH/NIAMS                      \$70,000/year                      Role: co-I, image analysis development  
Expediting Patient-Specific Assessment of Chronic Contact Stress Exposure  
The main goal is to determine the relationships between chronic contact stress exposures in articular joints and post-traumatic osteoarthritis.