1. Joseph L. Mundy
Professor of Engineering (research)
Division of Engineering, Computer Engineering

2. ….. Deleted…..

3. Education

B. Eng.	Rensselaer Polytechnic Institute – June 1963
M.Eng.	Rensselaer Polytechnic Institute – June 1966
Ph.D.	Rensselaer Polytechnic Institute – June 1969

Dissertation topic: The electro-dynamic properties of superconducting indium in the intermediate state.

4. Professional appointments

August 1, 2002 – Present	Professor of Engineering (research)	Brown
1989-August 1, 2002	Coolidge Fellow	General Electric Research
1988-1989	Visiting Fellow	Oxford University
1982-1988	Computer Scientist	General Electric Research
1975-1982	Manager, Visual Information Processing	General Electric Research
1972-1975	Computer Scientist	General Electric Research
1969-1972	Solid State Physicist	General Electric Research
1966-1969	Graduate Student	Rensselaer
1963-1966	Microwave Engineer	GE Microwave Dept.
1975-2000	Adjunct Professor of Computer Science	Rensselaer

5. Publications

a. Books

Geometric Reasoning, Kapur, D. and Mundy, J.L., editors, MIT Press, 1989.

Symbolic and Numerical Computation for Artificial Intelligence, Donald, B., Kapur, D., and Mundy, J.L., editors, Academic Press, 1992

Applications of Invariance in Computer Vision, Mundy, J.L., Zisserman, A. and Forsyth D., editors, LNCS 825, Springer Verlag, 1994.

Shape, contour and grouping in Computer Vision, D. Forsyth, J. Mundy, V. Di Gesú, R. Cipolla, LNCS 1681, 1999.

b. Book Chapters

Automatic Visual Inspection, Mundy, J.L.,

in **Applications of Pattern Recognition**, K.S. Fu,
Editor, CRC Press, 1982.

Robotic Vision, Mundy, J.L. in **Advances in Automation and Robotics**, Vol 1 pp 141-208, JAI Press, 1985.

A Three Dimensional Sensor Based on Structured Light,
Mundy, J.L. and Porter, G.B, in **3D Vision**, edited by T. Kanade, 1987.

Experiments in Using at Theorem Prover to Prove and Develop Geometrical Theorems in Computer Vision, Mundy, J.L. and Swain, M., **Proc. IEEE Conference on Robotics and Automation**, p280, 1986.
Reprinted in **Readings in Computer Vision** M. Fischler and O. Ferschein, Eds., Morgan-Kaufmann, 1987.

Industrial Machine Vision - Is It Practical?, Mundy, J. L.,
in **Machine Vision, Algorithms, Architectures and Systems**, H. Freeman, Ed. Academic Press, 1988.

Applications of Range Image Sensing and Processing, in
Analysis and Interpretation of Range Images}, R.Jain and
A.Jain Eds, Springer-Verlag, 1990.

Applications of Invariant Theory in Vision, Forsyth, D.A., Mundy, J.L., Zisserman, A. and Rothwell, C.A., in **Integrating Symbolic and Numerical Methods for Artificial Intelligence**, Academic Press, 1992.

Symbolic Representation of Object Models, in
Active Perception and Robotic Vision, A. Sood and H. Wexler Eds.,
Springer Verlag, 1992.

Object recognition in the geometric era: a retrospective, in **Towards Category-level object recognition**, J. Ponce and M. Hebert and C. Schmid and A.Zisserman, eds., Springer Verlag, 2007.

c. Refereed and invited articles

Thermodynamical Systems Involving Magnetic Fields, Mundy, J. and Newhouse, V., **American Journal of Physics**, Vol. 34, 1966, p.1198.

Multicrossover Cryotron - A High Gain Single Stage Amplifier, Mundy, J.L. and Newhouse, V., Joynson, R.E. and Meicklejohn, W., **Review of Scientific Instruments**, Vol. 38, 1967, p.798.

A New Cryogenic Memory System, Mundy, J.L. and Newhouse, V., **IEEE Transactions on Magnetics**, Vol. MAG-4, 1968, p.705.

Direct Measurement of Strain on Tc in Thin Films, Mundy, J.L. and Friday, B., **Journal of Applied Physics**, Vol. 40, 1969, p. 2162.

Shortening in MOS Transistors during Junction Walk-Out, Neugebauer, C., Burgess, J., Joynson, R.E. and Mundy, J.L., **Applied Physics Letters**, Vol. 19, 1971, p. 287.

Eliminating Threshold Losses in MOS Circuits by Varactor Bootstrapping, Joynson, R.E., Mundy, J.L., Burgess, J. and Neugebauer, C., **Proc. IEEE**, Vol. 59, 1971 p.1365.

Eliminating Threshold Losses in MOS Circuits by Bootstrapping Using Varactor Coupling, Joynson, R.E., Mundy, J.L., Burgess, J. and Neugebauer, C. **IEEE Journal of Solid State Circuits**, Vol SC-7, 1972, p. 217.

Low Cost Associative Memory, Mundy, J.L, Burgess, J., Joynson, R.E., Neugebauer, C**., IEEE Journal of Solid State Circuits**, Vol. SC-7, p364, 1972.

The Application of Unitary Transforms to Visual Pattern Recognition, Mundy, J.L. and Joynson, R.E., **Proc. 1st International Joint Conference on Pattern Recognition**, p390, 1973.

A Line Description System Based on Hadamard Features, Joynson, R.E., Mundy, J.L., and Banerji, R., **Proc. 2nd International Joint Conference on Pattern Recognition**, p204, 1974.

One Pass Contouring of Images Through Planar Approximation, Sommerville, C. and Mundy, J.L., **Proc. 3rd International Joint Conference on Pattern Recognition**, p 745, 1976.

Automatic Visual Inspection Using Syntactic Analysis, Mundy, J.L. and Joynson, R.E., **Proc. IEEE Conference on Pattern Recognition and Image Processing**, p144, 1977.

Web Representation of Image Data, Hsu, S. and Mundy, J.L,, **Proc. 4th International Joint Conference on Pattern Recognition**, p 675, 1978.

Automatic Visual Inspection of Blind Holes in Metal Surfaces, Porter, G.B., Cipolla, T.M. and Mundy, J.L., **Proc IEEE Conference on Pattern Recognition and Image Processing**, p83, 1979.

Regionization of Image Data Using Surface Approximation, Hsu, S. and Mundy, J.L., **Proc IEEE Conference on Pattern Recognition and Image Processing**, p314, 1979.

Visual Inspection of Metal Surfaces, Mundy, J.L. and Porter, G.B. **Proc. 5th International Joint Conference on Pattern Recognition,** p232, 1980.

Parameter Selection of Network Approximation of Images, Hsu, S. and Mundy, J.L., **Proc. 5th International Joint Conference on Pattern Recognition**, p943, 1980.

A Table Driven Visual Inspection Module, Porter, G. and Mundy, J.L., **Proc. 1st Symposium of Robotic Research**, Bretton Woods, 1983.

Reasoning About Three Dimensional Space, Mundy J.L., **Proc. IEEE International Conference on Robotics and Automation**, 1985.

Reasoning About 3-D Space With Algebraic Deduction, Mundy, J.L., **Proc. 3rd International Symposium on Robotics Research**, p117, 1986.

3D Object Recognition From an Unconstrained Viewpoint, Thompson, D. and Mundy, J., **Proc. IEEE Conf. on Robotics and Automation**, April, 1987.

Model-Based Motion Analysis - Motion From Motion, Thompson, D. and Mundy, J., **Proc. 4th International Symposium on Robotics Research**, p. 299, 1987.

Matching from 3-d Range Models into 2-d Intensity Scenes, Connoly, C.I., Mundy, J.L., Stenstrom, R. and Thompson, D. **Proc. Ist International Conference on Computer Vision**, 1987.

Wu's Method and Its Application to Perspective Viewing, Kapur, D. and Mundy J., **Artificial Intelligence**, Vol. 37, p.15, Dec. 1988.

A Multi-Level Geometric Reasoning System For Vision, **Artificial Intelligence**, Barry, M. and Mundy, J., Vol. 37, p. 275, Dec. 1988.

Projectively Invariant Representations Using Implicit Algebraic Curves, Rothwell, C. , Forsyth, D., Mundy, J. and Zisserman, A., **Proc. 1st European Conference on Computer Vision**, p. 427, 1990.

Benchmark Evaluation of a Model-Based Object Recognition System, Heller A. and Mundy, J.L. **Proc. 3rd International Conference on Computer Vision**, p. 268, 1990.

Invariance - A New Framework for Vision, Forsyth, D., Mundy, J.L., Zisserman, A. and Brown, C., **Proc. 3rd International Conference on Computer Vision**, , p. 268, 1990.

Relative Motion and Pose from Invariants , Zisserman, A., Marinos, C., Forsyth, D., Mundy J.L. and Rothwell, C.A., **Proc. British Machine Vision Association Conference**, 1990.

Projectively Invariant Representations Using Implicit Algebraic Curves, Forsyth, D., Mundy, J.L., Zisserman, A. and Brown, C., **Image and Vision Computing**, 9, 2, 130-136, 1991.

Modeling Polyhedra with Constraints, J.L. Mundy **Proc. Computer Vision and Pattern Recognition**, p479, 1991.

Invariant Descriptors for 3D Object Recognition and Pose **IEEE Trans. on Pattern Analysis and Machine Intelligence**, p.971, Oct., 1991

Projectively Invariant Representations Using Implicit Algebraic Curves**, Image and Vision Computing**, Vol. 9, No. 2, p. 130, 1991.

Transformational Invariance - a Primer, Forsyth, D., Mundy, J.L. and Zisserman, A., **Image and Vision Computing**, 10, 1992

Recognizing Rotationally Symmetric Surfaces From Their Outlines, **Proc. European Conference on Computer Vision**, p.639, 1992.

Template Guided Visual Inspection, Noble, A., Nguyen, V.D., Marinos, C., Tran, A.T., Farley, J., Hedengren, K and Mundy, J., **Proc. European Conference on Computer Vision**, p. 893, 1992.

An Object-Oriented Approach to Template-Guided Visual Inspection, Mundy, J., Noble, A., Marinos, C., Nguyen, V.D. , Heller, A. Farley, J. and Tran, A.T., **Proc. Computer Vision and Pattern Recognition**,
p. 386, 1992.

Efficient Model Library Access by Projectively Invariant Indexing Functions, Rothwell, C., Zissserman, A, Forsyth, D. and J.L. Mundy, **Proc. Computer Vision and Pattern Recognition**, p. 109, 1992.

Efficient recognition of rotationally symmetric surface and straight homogeneous generalized cylinders, **Proc. Computer Vision and Pattern Recognition**, 1993.

Extracting Projective Structure From Single Perspective Views of 3D Pointsets, Rothwell, C. Zisserman, A, Forsyth, D. and Mundy, J.L., **Proc**. **4th International Conference on Computer Vision**, 1993.

Planar Object Recognition Using Projective Shape Representation , C.A. Rothwell, A. Zisserman, D.A. Forsyth, J.L. Mundy, **International Journal of Computer Vision**, 16, 1995, invited.

Toward Template-Based Tolerancing from a Bayesian Viewpoint, Noble, J.A. and Mundy, J.L. **Proc. Computer Vision and Pattern Recognition**, 1993.

Applications of Computer Vision , Grimson, W.E.L and Mundy, J.L., **Comm. ACM**, 37, 45-51, 1994, invited.

The Development of the Image Understanding Environment, Kohl, C. and Mundy, J.L. , **Proc. Computer Vision and Pattern Recognition**, 1994.

Driving Vision by Topology, C. Rothwell, J. Mundy, W. Hoffman, and V.-D. Nguyen, In **Proceedings IEEE Symposium on Computer Vision**, 1995

3D Object Recognition Using Invariance, Zisserman, A., Forsyth, D., Mundy, J.L., Rothwell, C., Liu, J., **Special Issue on Computer Vision, Artificial Intelligence**, 1995.

The Image Understanding Environment Program, J.L. Mundy and the IUE Committee, **IEEE Expert/Intelligent Systems & Their Applications**, 1995, invited.

Representing objects using topology, C. Rothwell, J. Mundy, and W. Hoffman. In **Proceedings International Workshop on Object Representations in Computer Vision**, 1996.

An Experimental Comparison of Appearance and Geometric Model Based Recognition, J. Mundy and A. Liu and N. Pillow and A. Zisserman and S. Abdallah and Sven Utcke and S. Nayar and C. Rothwell, **Proceedings International Workshop on Object Representations in Computer Vision**, 1996

Object Recognition Based on Geometry: Progress over Three Decades, J.L. Mundy, **Philosophical Transactions:Mathematical, Physical and**

Engineering Sciences, of the Royal Society, Vol 356, pp 1213-1231, 1998, invited.

An Integrated Boundary and Region Approach to Perceptual Grouping, A. Hoogs and J.L. Mundy, **Proc. International Conf on Pattern Recognition**, 2000, p 284.

A Common Set of Perceptual Observables for Grouping Figure-Ground Discrimination and 3-d Texture Classification, A. Hoogs, R. Collins, R. Kaucic and J. Mundy, **IEEE Transactions on Pattern Analysis and Machine Intelligence**, April 2003.

A Probabilistic Approach to Nano-computing, J. Chen, J. Mundy, Y. Bai, S. M. Chan, P. Petrica and I. R. Bahar, **IEEE Workshop on Non-silicon Computing**, San Diego, CA, 2003.

A Probabilistic-based Design Methodology for Nanoscale Computation, I. R. Bahar, J. Mundy and J. Chen**, IEEE ICCAD**, San Jose,
CA, Nov. 2003.

A Probabilistic-based Design Methodology for Nanoscale Computer Architecture, J. Chen, J. Mundy, and I. R.Bahar, **International Workshop on Logic and Synthesis**, Laguna Beach, CA, May 2003.

Object Recognition in the Geometric Era: A Retrospective, J. Mundy, **International Workshop on Recognition and Learning**, Sicily Italy, Sept. 2003.

Video Surveillance Research in Support of Port Security, J. Mundy, **IEEE Homeland Security Technology Workshop**, Warwick RI, Nov. 2003.

Figure-ground Segmentation and Object Tracking in Video using Curve Matching, V. Jain, B. Kimia and J. Mundy, **Proc. European Conference on Computer Vision**, Workshop on Spatial Coherence in Visual Motion Analysis, May 2004.
,
Fusion of intensity, texture, and color in video tracking based on mutual information, J. Mundy and C-F. Chang, **Proc. IEEE Conf. AIPR**, 2004.

A Probabilistic-Based Design for Nanoscale Computation, Chapter 5 in, **Nano, Quantum and Molecular Computing: Implications to High Level Design and Validation**, R. I. Bahar, J. Chen, and J. Mundy, S. Shukla and R.I. Bahar, eds, Kluwer Academic Publishers, 2004

Designing Logic Circuits for Probabilistic Computation in the Presence of Noise, K. Nepal , R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky, **IEEE/ACM Design Automation Conference**, June 2005.

Designing MRF based Error Correcting Circuits for Memory Elements, K. Nepal , R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky, **IEEE/ACM Design Automation and Test in Europe Conference**. to appear March 2006.
K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky, "The MRF Reinforcer: A Probabilistic Element for Space Redundancy in Nanoscale Circuits," IEEE MICRO, Vol. 26, No. 5, September/October 2006., pp. 19–27.

Designing Nanoscale Logic Circuits based on Markov Random Fields, K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky,
Journal of Electronic Testing: Theory and Applications, accepted for publication.

Designing MRF based Error Correcting Circuits for Memory Elements, K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky,
IEEE/ACM Design Automation and Test in Europe Conference,
March 2006, interactive presentation. Acceptance rate approx. 25%

A Model for Soft Errors in the Subthreshold CMOS Inverter, H. Li, J. Mundy, W. Patterson, D. Kazazis, A. Zaslavsky and R. I. Bahar, **Workshop on SELSE 2, System Effects of Logic Soft Errors**, April 2006.

,
Optimizing Noise-Immune Logic Circuits using Principles of Markov Random Fields, K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky,
IEEE/ACM Great Lakes Symposium on VLSI, May 2006. Acceptance rate approx. 30%.

Techniques for MRF based implementation of multi-level combinational circuits, K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky,
IEEE Workshop on Defect and Fault Tolerant Nanoscale Architectures (NANOARCH 2006), held in conjunction with the
International Symposium on Computer Architecture, June 2006.

Techniques for Designing Noise-Tolerant Multi-level Combinational Circuits,K. Nepal, R. I. Bahar, J. Mundy, W. R. Patterson, and A. Zaslavsky,
IEEE/ACM Design Automation and Test in Europe Conference,
April 2007 (to appear). Acceptance rate approx. 25%

Learning Background and Shadow Appearance with 3-D Vehicle Models, M. J. Leotta and J. L. Mundy. **Proc. British Machine Vision Conference (BMVC)**. Sept 2006. Vol 2, pp. 649-658

Automated Change Detection Based on Multi-modal Fusion, Pollard, T. , Mundy, J. L., Cooper, D., Proc. **National Geospatial Intelligence Agency Symposium, Proc.**, October,2006.

Automated Change Detection Based on
Multi-modal Fusion, Pollard, T. , Mundy, J. L., Cooper, D. **Intelligence Agency Academic Summit, Proc.**, June ,2007.

Epipolar Curve Tracking in 3-D., M. J. Leotta and J. L. Mundy.
In **IEEE International Conference on Image Processing 2007 (ICIP).** Sept 2007. Vol. 6, pp. 325-328

Thermally-induced soft errors in nanoscale CMOS circuits ,Li, H. Mundy, J. Patterson, W. Kazazis, D. Zaslavsky, A. Bahar, R. I. ,
IEEE International Symposium on Nanoscale Architectures, NANOSARCH, Oct. 2007

Change detection in a 3-d world, T. Pollard and J. Mundy.. In **Proc. IEEE Computer Vision and Pattern Recognition Conference**, June 2007.

Automated Change Detection Based on Multi-modal Fusion (Geospatial Registration) ," Eden, I , Mundy, J. L., Cooper, D. , **Intelligence Agency Academic Summit**, Proc., June ,2008.

Image and Video Registration in a 3-d World, Mundy, J.L., **Proc. NGA Geopositioning Workshop**, August, 2008.

Parallax-Free Video Registration, Crispell, D., Mundy, J. and Taubin, G., **Proc. British Machine Vision Conf.**, Sept. 2008.

Automated Change Detection Based on Multi-modal Fusion, Mundy, J.L., Invited Keynote Address at **United States Geospatial Intelligence Foundation Symposium**, October, 2008.

Lie Group distance based generic 3-d Vehicle Classification, Yarlagadda, P. Ozcanli, O., Mundy, J.L., **Proc. International Conference on Pattern Recognition**, December, 2008.

NorMaL: Non-compact Markovian Likelihood for Change Detection, Sezer, O., Mundy, J.L., Altunbasak, Y. and Cooper, D., **Proc. International Conference on Pattern Recognition**, December, 2008.

Markov Chain Analysis of Thermally Induced Soft Errors in Sub-threshold Nanoscale CMOS Circuits, Sabou, F., Kazazis, D. Bahar, R., Mundy, J., Patterson, W., Zaslavsky, A. **IEEE Transactions on Device and Materials Reliability**, to appear 2010.

A Volumetric Approach to Change Detection in Satellite Images, Pollard, T. , Eden, I. , Mundy, J. , and Cooper, D. , **Photogrammetric Engineering and Remote Sensing Journa**l, to appear 2010.

Uncertain Geometry: A New Approach to Modeling for Recognition, Mundy, J.L., Ozcanli, O.C., **Proceedings of SPIE Defense, Security and Sensing Conference**, April 2009. (Received Automatic Target Recognition (ATR) 2009 Best Paper Award)

d. Non-refereed journal articles

Data Models For Automatic Inspection, Mundy, J.L., **Proc. COMSAC**, p256, 1979.

Visual Inspection of Metal Surfaces, Mundy, J.L., **Proc**. **AFIPS Conference**, p 227, 1979.

A Non-Contact Profile Sensing System for Visual Inspection, Conference Record 1982 Workshop on Industrial Applications of Machine Vision, **1982**.

Bayesian Part Tolerancing with Measurement Uncertainty, Noble, J.A. and Mundy, J., **SPIE** Vol. 2032., 1993

Object Recognition: The Search for Representation, J.L. Mundy, **Lecture Notes in Computer Science**, 994, 1995

MORSE: An Architecture for 3D Object Recognition based on Invariants , J. Mundy, R. Curwen, J. Liu **Lecture Notes in Computer Science**, 1035, 1996

Towards the Integration of Geometric and Appearance-Based Object Recognition, Joseph L. Mundy, Tushar Saxena. **Lecture Notes in Computer Science**, 1681, 1999

A Formal-Physical Agenda for Recognition, J.L. Mundy, **Lecture Notes in Computer Science**, 1681, 1999

i. Work in progress

Uncertain geometry: a new approach to object recognition

Thermal noise theory for nano-architectures

6. Research Grants

a. Current grants

Y-shaped Nanotube-based Computer Devices and Architectures, NSF
DARPA SBIR – Wide Area Video Collection : Data compression
Video Tracking and Modeling (Lockheed-Martin)
National Geospatial Intelligence Agency (NGA) NGA University Research Initiative

b. Completed grants

c. Proposals Submitted

DARPA	SBIR for video-based modeling PHASE II
DARPA	SBIR for dismount tracking PHASE II
Lockheed-Martin	Voxel-based image registration to LIDAR

7. Service

i. to the University

I have served as the secretatary to the ABET review board providing minutes of our meetings as well as participating in ABET certification visits.

I am currently mentoring Asst. Prof. Sherief Reda on matters of funding and proposal writing.

ii. to the profession

- Co-chairman of the workshop on industrial applications of machine vision that resulted in a special issue of the IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 1980.

- Chairman, International Workshop on Geometric Reasoning, Oxford, 1986.

- Co-Chairman, International Workshop on the Integration of Symbolic and Numeric Computing, Saratoga 1990.

- Co-Chairman, 1st International Workshop on Geometric Invariants, Reykjavik, Iceland, 1991.

- Co-Chairman, 2nd International Workshop on Geometric Invariants, Ponta Delgada, Azores, 1993.

- Co-chairman of the IEEE workshop on Context-Based Vision held in conjunction with ICCV, Cambridge MA, 1995.

- Co-chairman DARPA workshop on Shape, Contour and Grouping in Computer Vision, Palermo, Sicily, 1999.

- Co-chairman IEEE workshop on the Integration of Appearance and Geometry in Object Recognition, Fort Collins, CO, 1999.

- Member, Editorial Board, IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI) 1987-90

- Member, Editorial Board, International Journal of Computer Vision, 1989-present.

- Member, advisory board of NSF for artificial intelligence and robotics (IRIS) 1986-1998.

- Area Chair, 2001 Conference on Computer Vision and Pattern Recognition.

- Reviewer for the 2006 Computer Vision and Pattern Recognition Conference

- Program committee of the 2006 European Conference on Computer Vision.

- Area chair - 2008 European Conference on Computer Vision

- Reviewer - 2009 IEEE Conference on Computer Vision and Pattern Recognition

8. Academic honors

- Eta Kappa Nu, honors fraternity (1963-66)

- Elected a General Electric Coolidge Fellow 1987

- Best Paper Award, British Machine Vision Conference, 1991.

- Co-recipient of the Marr Prize, 1993. The Marr Prize is awarded for the best paper at the International Conference on Computer Vision, and is considered a major honor in computer vision.

9. Teaching

Developed and executed a special topics graduate course on video analysis, in spring 2003. This course is now a regular offering, which fills a gap in the current computer vision curriculum.

I have created a new course on scientific programming in C++. This graduate course provides in-depth knowledge of the C++ language with emphasis on programming numerical computing algorithms such as optimization and differential equations. The course was offered for the first time in fall 2007 and attracted a broad population of students across physics, applied math and engineering. The course continues to be popular with 13 enrolled students and 5 auditors in 2008 and will be taught again in the fall semester, 2010.