

Research and Publications

Victor Aitken, Ph.D., M.Eng. B.A.Sc., P.Eng.

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Employment History:

2005- Associate Professor, Systems and Computer Engineering, Carleton
2006-09, Chair, Systems and Computer Engineering, Carleton
2002-05, Associate Chair Undergraduate, Systems and Computer Engineering, Carleton
1999-2005, Assistant Professor, Systems and Computer Engineering, Carleton
1997-98, VP, Manager Engineering, Thompson Tech., Sudbury, ON.
1998-2004, President, Vision Control & Aut. Ltd., Ottawa, ON.
1987-1997, Defence Scientist, Dept. National Defence, Suffield, AB.

Academic Honours:

2003 – Teaching Achievement Award, Carleton
2001 – Best Professor Award, International Students' Association, Carleton
1999 – Teaching Excellence Award, Students' Association, Carleton
1995 – Governor General's Medal, Ph.D. Level, Carleton
1995 – University Medal, Ph.D. Level, Carleton
1991 – University Senate Medal, Master's Level, Carleton

Collaborative Research Activities:

- “Advanced Processing of NDE Data for System Condition Monitoring and Assessment: Evaluation of Noise in Eddy Current Data,” Atomic Energy of Canada Limited (AECL), 2012 – present (co-investigator with Prof. El-Tanany, Carleton).
- “Commercial Applications of Micro Electrical Mechanical Sensor (MEMS) Systems”, Emfinity Ltd., Sudbury, ON, 2011 – present.
- “Quad-rotor UAV dynamics and control,” prepared for Emfinity Ltd., Sudbury, ON, ending 2005.
- “Motion Estimation Studies for Landmine Detection”, Defence Research and Development Canada – Suffield, Canadian Centre for Mine Action Technologies, ending 2004.
- “Teleremote Assisted Mining (TRAM) Project”, PRECARN, Cameco Corporation, ending 2002.
- “Robotics, Navigation, and Data Fusion for the Improved Landmine Detection System, L2684”, Computing Devices Canada (CDC), ending 2001.
- “Calibration, Navigation, Spatial Correspondence and Data Fusion for the Improved Landmine Detection Project, D6300”, Defence Research and Development Canada – Suffield, ending 2001.
- “Image Analysis for Automated Laser Treatment of the Eye”, Canadian Space Agency – STEAR, Amtech Aeronautical Ltd AB, ending 2000.

Graduate Student Supervision:

- P. Inder, M.A.Sc., Topic TBD, in progress.
- S. Radhakrishnan, M.A.Sc., “Simultaneous Localization and Mapping”, in progress.
- Shi Wang, M.Eng., course work, 2012..
- L. Smith, “Improved Placement of Local Solver Launch Points for Large-Scale Global Optimization,” Ph.D. Thesis, Co-supervised with Prof. J. Chinneck, Carleton, 2011.
- D. Khan, “Observable Autonomous Simultaneous Localization and Mapping (SLAM) in 2D Dynamic Environments,” Master’s Thesis, 2011.
- D. MacKinnon, “Adaptive Laser Range Scanning Using Quality Metrics,” Ph.D. Thesis, 2008.
- L. Smith, “Sequential Monte Carlo Particle Filtering for State Estimation,” Master’s Thesis, 2006.
- A. Shabrawy, “Sliding Mode Control for Singularly Perturbed Systems,” Ph.D. Thesis, 2004, Co-supervised with Prof. H. Schwartz, Carleton.
- T. Yang, “Mapping and Localization for Mobile Robots,” Master’s Thesis, 2004.
- M.L. Lee, “Comparison of Camera Calibration Methods using Virtual Images and Calibration Environment,” Master’s Thesis, 2004.
- D. MacKinnon, “Development of a Real-time Edge Detection Method for a Laser Range Scanner System,” Master’s Thesis, 2003.
- A. Wykurz, “Evaluation of Camera Calibration Performance with a Computer Based Camera Model,” Master’s Thesis, 2002.

Teaching:

Graduate:

- SYSC 5502, Advanced Linear Systems
- SYSC 5906, Directed Studies

Undergraduate:

- SYSC 3601, Microprocessor Systems
- SYSC 4505, Automatic Control Systems I
- SYSC 3600, Simulation and Modelling
- ECOR 2606, Numerical Methods

Publications and Contributions:

Refereed Journals:

1. L. Smith, J. Chinneck, V. Aitken, "Improved constraint consensus methods for seeking feasibility in nonlinear programs," *Computational Optimization and Applications*, Vol. 54, Issue 3, pp 555-578, 2013, DOI:10.1007/s10589-012-9473-z.
2. L. Smith, J. Chinneck, V. Aitken, "Constraint consensus concentration for identifying disjoint feasible regions in nonlinear programmes," *Optimization Methods and Software*, pp 1-25, 2012, DOI:10.1080/10556788.2011.647818.
3. D.K. MacKinnon, V.C. Aitken, F. Blais, "Measurement quality metrics for rapid laser range scanning," *SPIE Journal of Electronic Imaging*, Vol. 19, No. 1, 2010.
4. D.K. MacKinnon, V.C. Aitken, F. Blais, "A review of metrics for range imaging," *SPIE Journal of Electronic Imaging*, Vol. 17, No. 3, 2009.
5. T. Yang, V.C. Aitken, "Evidential mapping for mobile robots with range sensors," *IEEE Transactions on Instrumentation and Measurement*, Vol. 55, No. 4, Aug. 2006, pp 1422-1429.
6. V.C. Aitken, H.M. Schwartz, "A comparison of rotational representations in structure and motion estimation for manoeuvring objects," *IEEE Transactions on Image Processing*, Vol. 4, No. 4, April 1995, pp. 516-520.
7. V.C. Aitken, H.M. Schwartz, "On the exponential stability of discrete-time systems with applications in observer design," *IEEE Transactions on Automatic Control*, Vol. 39, No. 9, Sept. 1994, pp. 1959-1962.
8. J.R. Simard, V.C. Aitken, "Time averaged speckle reduction in scanning active imaging systems," *Optical Engineering*, Vol. 33, No. 4, April 1994, pp. 1280-1286.

Conference Proceedings:

9. D.K. MacKinnon, V.C. Aitken, F. Blais, "Adaptive laser range scanning," in *Proceedings of the 2008 American Control Conference*, Seattle WA USA, June 11-13, 2008, pp 3857-3862. **(RP)**
10. D.K. MacKinnon, V.C. Aitken, F. Blais, "Adaptive laser range scanning using quality metrics," in *Proceedings of the 2008 IEEE Instrumentation and Measurement Technology Conference*, Victoria BC Canada, May 12-15, 2008, pp 348-353. **(REA)**

11. D.K. MacKinnon, V.C. Aitken, F. Blais, "Using quality metrics with laser range scanners," in *Proceedings of the SPIE IS&T: 3D Data Processing and Algorithms II*, Vol. 6805, San Jose CA USA, Oct. 28-31, 2008. **(RP)**
12. D.K. MacKinnon, V.C. Aitken, F. Blais, F.M. Picard, "Adaptive laser range scanning," in *Proceedings of the 2007 IEEE International Workshop on Robotic and Sensor Environments*, Ottawa Canada, Oct. 12-13, 2007. **(REA)**
13. D.K. MacKinnon, V.C. Aitken, F. Blais, "A comparison of precision and accuracy in triangulation range sensors," in *Proceedings of the 2006 IEEE Canadian Conference on Electrical and Computer Engineering, CCECE*, Ottawa Canada, May 7-10, 2006. **(RA)**
14. L. Smith, V.C. Aitken, "Analysis and comparison of the generic and auxiliary particle filtering frameworks," in *Proceedings of the 2006 IEEE Canadian Conference on Electrical and Computer Engineering, CCECE*, Ottawa Canada, May 7-10, 2006. **(RA)**
15. V.C. Aitken, "Retinal motion and microvascular pulsation measurements from SLO image sequences," in *Proceedings of the 2005 IEEE Instrumentation and Measurement Technology Conference*, Ottawa Canada, May 2005. **(REA)**
16. T. Yang, V.C. Aitken, "Evidential mapping with range sensors," in *Proceedings of the 2005 IEEE Instrumentation and Measurement Technology Conference*, Ottawa Canada, May 2005. **(REA)**
17. D.K. MacKinnon, V.C. Aitken, "A psychometric approach to edge detector calibration in grey-scale images," accepted by the *IEEE Instrumentation and Measurement Technology Conference*, Ottawa Canada, May 2005. **(REA)**
18. T. Yang, V.C. Aitken, "Uniform clustered particle filtering for robot localization," in *Proceedings of the 2005 American Control Conference*, Portland Oregon, 2005. **(RP)**
19. V.C. Aitken, A.B. Markov, "Near-real-time saccade detection with scanning laser ophthalmoscopes," in *Proceedings of the Canadian Medical and Biological Engineering Society, CMBES 28*, Quebec City, Canada, Sept 9-11, 2004. **(RA)**
20. A. Elshabrawy, H.M. Schwartz, V.C. Aitken, "Sliding mode control for singularly perturbed system," in *Proceedings of the IEEE 2004 Asian Control Conference*, Australia, July 2004. **(RP)**
21. D.K. MacKinnon, F. Blais, V.C. Aitken, "Modelling an auto-synchronizing laser range scanner," in *Proceedings of the American Control Conference, ACC 2003*, Denver Colorado, USA, June 4-6, 2003. **(RP)**
22. V.C. Aitken, "Measurement of retinal microvascular pulsation from SLO image sequences," in *Proceedings of the IEEE Canadian Conference on Electrical and Computer Engineering, CCECE 2003*, Montreal Canada, May 4-7, 2003. **(RA)**
23. D. MacKinnon, F. Blais, V.C. Aitken, "Object location using edge-bounded planar surfaces from sparse range data," in *Proceedings of the IEEE Canadian Conference on Electrical and*

Computer Engineering, CCECE 2003, Montreal Canada, May 4-7, 2003. **(RA)**

24. V. Aitken, K. Russell, J. Mcfee, "Geometrical and optical calibration of a vehicle-mounted IR imager for landmine localization," in *Proceedings of the SPIE Conference on Detection and Remediation Technologies for Mine and Mine-like Targets V*, Orlando Florida, April, 2000. **(REA)**
25. R. Attariwala, M.R. Glucksberg, V.C. Aitken, O.E. Cuzzani, H.V. Gimbel, "Evaluation of the spontaneous retinal vein pulse," in *Proceedings of the Biomedical Engineering and Engineering in Medicine and Biology Conference*, Atlanta, Sept. 1999. **(RP)**
26. V.C. Aitken, D. Ballantyne, R. Jackson, "Teleremote mining for the McArthur River Method," in *Proceedings of the International Symposium for Mine Mechanization and Automation, ISMMA*, Sudbury, Ontario, June 14-17, 1999. **(RA)**
27. J. Mcfee, V.C. Aitken, R. Chesney, Y. Das, K. Russell, "A multisensor, vehicle-mounted, teleoperated mine detector with data fusion," in *Proceedings of the SPIE Conference on Detection and Remediation Technologies for Mine and Mine-like Targets III*, Vol. 3392, Orlando Florida, 13-17 April, 1998. **(RP)**
28. D.C. Thomson, V. C. Aitken, "Tele-remote control – it comes of age," *CIM Bulletin*, Jan. 1998, pp 61-67. **(RP)**
29. D.M. Neuburger, V.C. Aitken, D.J. Mackay, D.C. Thomson, "The TRAM project – tele-remote assisted mining," in *Proceedings of the CIM Montreal '98 Conference*, May 3-7, 1998. **(RA)**
30. V.C. Aitken, D.C. Thomson, "Controller Area Networks (CAN) systems for mining vehicles and teleremote control," in *Proceedings of the CIM Montreal '98 Conference*, May 3-7, 1998. **(RA)**
31. V.C. Aitken, H.M. Schwartz, "Towards robust discrete-time sliding mode observers," in *Proceedings of the 1995 American Control Conference*, Seattle Washington, June 21-23, 1995, pp. 3730-3734. **(RP)**
32. V.C. Aitken, H.M. Schwartz, "On the exponential stability of discrete-time systems with applications in observer design," in *Proceedings of the 1994 American Control Conference*, Baltimore, MD, June 29-July 1, 1994, pp. 2196-2201. **(RP)**
33. V.C. Aitken, H.M. Schwartz, "Motion and structure from planar motion in monocular image sequences," in *Proceedings of the 3rd Conference on Military Robotics Applications*, Medicine Hat, AB, Sept. 9-12, 1991, pp. 177-184. **(RA)**
34. V.C. Aitken, "Improving the navigation performance in RPV systems using vehicle airspeed, heading, and tracking data," in *Proceedings of the CRAD Signal Processing Symposium*, Defence Research Establishment Valcartier, Valcartier, Quebec, June, 1988. **(RA)**

Theses:

24. V.C. Aitken, "Sliding Mode State Estimation for Nonlinear Discrete-time Systems: Applications in Image Sequence Analysis," Ph.D. Dissertation, Carleton University, Ottawa Ontario, April, 1995.
25. V.C. Aitken, "Motion and Structure Estimation in Noisy Monocular Image Sequences: Specialization to Planar Motion," Master's Thesis, Carleton University, Ottawa Ontario, 1991.

Patent:

26. J.E. McFee, V.C. Aitken, Y. Das, K.L. Russell, C.A. Brosinsky, R.H. Chesney, P. Church, G. Gundersen, E. Clifford, B. Selkirk, H. Ing, R.O. Ellingson, S.G. Penzes, M Saruwatari, C. Poulsam, "Multisensor Vehicle-Mounted Mine Detector," US Patent 6,026,135, Granted Feb. 15, 2000.

Technical Reports:

27. V.C. Aitken, "Quad-rotor UAV dynamics and control," prepared for Emfinity Ltd., Sudbury, ON, Vision Control and Automation Technical Report VCA-05002-TR1, August, 2005.
28. V.C. Aitken, "Motion Estimation Studies for Mine Clearance – Final Technical Report," prepared for Canadian Centre for Mine Action Technologies under contract PWGSC W7702-01R860, Vision Control and Automation Technical Report VCA-01004-TR2, June, 2004.
29. V.C. Aitken, "Tele-Remote Assisted Mining (TRAM) Project – Final Technical Report," prepared for Cameco Corporation for submission to PRECARN Associates, Vision Control and Automation Technical Report No. VCA-98006-TR3, Feb. 2002.
30. V.C. Aitken, "Motion Estimation Studies for Mine Clearance – Data collection trials with DRES Gopher vehicle," prepared for Canadian Centre for Mine Action Technologies under contract PWGSC W7702-01R860, Vision Control and Automation Technical Report VCA-01002-TR2, Dec., 2001.
31. V.C. Aitken, "Geometrical and optical calibration, navigation, and data fusion algorithms for the Improved Landmine Detection System," prepared for Computing Devices Canada, Calgary, Vision Control and Automation Technical Report VCA-99002-TR4, Nov. 2001.
32. V.C. Aitken, K.L. Russell, C. Milner, "Motion detection and image tracking algorithm detailed design," in, *A system for automated laser treatment of the eye, Phase 2 Part I, Volume 4A*, Amtech Aeronautical Ltd. Technical Report TR990705, June, 1999.
33. V.C. Aitken, D. Thomson, "TeleRemote Assisted Mining Project– Operator interface and control," prepared for Cameco Corporation, Vision Control and Automation Ltd. Technical Report No. VCA-98006-TR1, Feb., 1999.

34. V.C. Aitken, D. Thomson, "TeleRemote Assisted Mining Project– Detailed system electronic component and LHD interface design," prepared for Cameco Corporation, Vision Control and Automation Ltd. Technical Report No. VCA-98006-TR2, Mar., 1999.
35. V.C. Aitken, "Development of an automated laser eye treatment system – Requirements for detection and tracking of eye motion," prepared for Amtech Aeronautical Ltd., Vision Control and Automation Ltd. Technical Report No. VCA 98002-TR1, Nov., 1998.
36. V.C. Aitken, "McArthur River Project, Teleremote control of a modified LHD: Teleremote control detailed design," prepared for Mining Technologies International Inc., Vision Control and Automation Ltd. Technical Report No. VCA-98005-TR2, Dec., 1998.
37. V.C. Aitken, "McArthur River Project, Teleremote control of a modified LHD: Teleremote control requirements," prepared for Mining Technologies International Inc., Vision Control and Automation Ltd. Technical Report No. VCA-98005-TR1, Nov., 1998.
38. C.M. Robin, V.C. Aitken, "Depth perception of a stationary object by a moving camera," Defence Research Establishment Suffield, Ralston Alberta, Suffield Memorandum No. 1469, 1998.
39. V.C. Aitken, "Eye motion detection and estimation in scanning laser ophthalmoscope (SLO) imagery," in, *A system for automated laser treatment of the eye, Volume 4A*, Amtech Aeronautical Ltd. Technical Report 976004, June, 1997.
40. V.C. Aitken *et al.*, "Tele-Remote Assisted Mining (TRAM) Project: Conceptual Design," Defence Research Establishment Suffield, Ralston Alberta, Suffield Memorandum No. 1488, 1996.
41. V.C. Aitken *et al.*, "Tele-Remote Assisted Mining (TRAM) Project: Technology Risk Assessment," Defence Research Establishment Suffield, Ralston Alberta, Suffield Memorandum No. 1489, 1996.
42. V.C. Aitken, "Motion and structure estimation of manoeuvring objects in multiple-camera image sequences," Defence Research Establishment Suffield, Ralston Alberta, Suffield Report 577, Nov. 1992.
43. V.C. Aitken, "A complementary tracking filter for remotely piloted aircraft," Defence Research Establishment Suffield, Ralston AB, Suffield Memorandum No. 1292, 1988.
44. R. Chesney, V.C. Aitken, "Flight profiles for the evaluation of the CL-227 unmanned air vehicle," Defence Research Establishment Suffield, Ralston Alberta, Suffield Memorandum No. 1224, 1988.
45. V.C. Aitken, "Implementation of a complementary tracking filter for remotely piloted aircraft," Defence Research Establishment Suffield, Ralston Alberta, Research Note No. 1035, 1988.

46. R. Chesney, V.C. Aitken, "Joint Canadian/American evaluation of the CL-227 RPV,"
Defence Research Establishment Suffield, Ralston Alberta, Research Note No. 871, FTP 200,
November, 1987.