

# Terrence W. Fong

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## EXPERIENCE

**Director, Intelligent Robotics Group** **June 2004 - present**  
**NASA Ames Research Center, Moffett Field, California, USA**

Director of the Intelligent Robotics Group. Responsible for managing 27 full-time researchers and \$6M yearly budget. NASA Ames project leader for Exploration Technology Development Program (ETDP) "Human-Robotic Systems" and "Lunar Mapping and Modeling". Principal investigator for NASA "Peer-to-Peer Human Robot Interaction for Assembly and Maintenance". Project leader for "Google/NASA Disaster Response Project". Chair (2006) of AAAI Spring Symposium on Human-Robot Interaction in space. Program co-chair (2007) and general co-chair (2008) for the ACM/IEEE Human-Robot Interaction conference. Guest editor of *Journal of Field Robots* (February 2009). Technical monitor for numerous grants and cooperative agreements. Additional responsibilities include strategic and technical planning, resource and budget management, scientific and technical direction, and inter-center collaboration.

**Post-doctoral Fellow** **March 2002 - August 2004**  
**Swiss Federal Institute of Technology / Lausanne (EPFL)**

Deputy director of the Virtual Reality and Active Interfaces group (<http://vrai-group.epfl.ch>). Co-project leader of ten-member team for a Swiss National Science Foundation research project: "Sensor fusion, visual and active interfaces for minimally invasive surgery" (NCCR CO-ME). Tasks include project administration (budgeting, planning, and reporting), direction of two Ph.D. theses and supervision of seven undergraduate semester projects. Developing vision-based gesture recognition for the "Non-contact Medical User Interface". Co-organizer of 2002 CO-ME networking workshop.

**Post-doctoral Fellow** **January 2002 - March 2003**  
**Carnegie Mellon University (CMU), Pittsburgh, Pennsylvania, USA**

Lead researcher responsible for developing human-computer and robotics systems for DARPA "Mobile Autonomous Robot Software" (MARS). Project work included the development of a PocketPC user interface (Java, wireless networking, and WindowsCE) for teleoperation of field mobile robots (including a Polaris ATV and an autonomous Jeep), system integration at SAIC (Denver) and user testing. Co-chair of "Robot as Partner: An Exploration of Social Robots" workshop at 2002 IEEE IROS conference. Guest editor of *Robotics and Autonomous Systems* journal (March 2003).

Note: joint appointment with the Swiss Federal Institute of Technology from March 2002 to March 2003.

**Vice President** **March 1996 - December 2000**  
**Fourth Planet, Inc., Los Altos, California, USA**

Co-founder and vice president of software development. Fourth Planet was a producer of interactive tools for real-time information visualization. Coordinated and managed requirements analysis, software architecture, systems design and implementation, and testing for all Fourth Planet products. Additional responsibilities included strategic technology assessment, corporate IT management, and oversight of technical publications.

Product manager and lead developer for "Fourth Planet Communicator" (FPC) and license management (FPLM) products. FPC is an interprocess communication toolkit (middleware) that uses "publish and subscribe" with centralized caching for efficient, scalable data distribution. FPLM is a software run-time licensing system (nodelock, floating, demo) for time-locked or permanent use. Both FPC and FPLM support multiple operating systems and languages.

Engineer for support contracts with Lockheed Martin, NASA Ames Research Center, the National Robotics Engineering Consortium, and Fortune 500 companies. Custom application development included use of C++, HTML, Java, OpenGL, Perl, HP OpenView, and Sense8/EAI WorldToolKit.

**Computer Scientist****January 1993 - December 1994****Caelum Research Corporation, NASA Ames Research Center, USA**

Computer scientist for the Computational Sciences Division at the NASA Ames Research Center. Co-investigator for virtual environment teleoperations experiments. Developed and evaluated virtual environment operator interfaces with seven mobile robots including the IKI/Babakin Marsokhod rover (Moscow, May 1993), Stanford ARL air-bearing robots (May 1993), the Ames Telepresence ROV (Antarctica, October 1993), and the CMU Dante II walking robot (Mt. Spurr, Alaska, July 1994).

Co-developer of the NASA Ames "Virtual Environment Vehicle Interface", a virtual-reality user interface for exploration robots. Project included use of C, OpenGL, and Sense8/EAI WorldToolKit. Tasks included integration of display hardware (head-mounted/head-tracked, field-sequential monitors, and projected stereo video) and network communication toolkits (NDDS, TCA/TCX, TelRIP). Developed device drivers for Logitech 6-D mouse and analog hand controllers.

Task manager of Caelum support contract for the Computational Systems Research Branch at NASA Ames. Founded and chaired the international WorldToolKit User's Group (1992-1994) at technical colloquia (Meckler VR 1993 and 1994, SIGGRAPH 1993) on virtual environments.

**Systems Analyst****January 1991 - January 1993****Recom Technologies, Inc., NASA Ames Research Center, USA**

Lead developer of the "Ames Robotic Computational Architecture". Developed embedded real-time and event-driven systems for mobile robot control using C, VxWorks and VME-based hardware.

Lead engineer for the Ames Telepresence ROV (TROV) and Mobile Exploration Land-rover (MEL). Led mobile robot system development including autonomous operations, non-linear control systems, wireless and satellite-based network communications, and embedded processing hardware/software.

Technical lead and task manager for NASA's evaluation of DARPA/Intel iWarp parallel processor. Founded and chaired the iWarp User's Group (1991-1994) at technical colloquia. Representative to the USRA "Advanced Design Program" and mentor for the University of Idaho.

**EDUCATION****Ph.D. Robotics / School of Computer Science****December 2001****Carnegie Mellon University (CMU), Pittsburgh, Pennsylvania, USA**

Research assistant for Dr. Chuck Thorpe (CMU Robotics Institute) and Dr. Charles Baur (EPFL). Performed research at CMU (1994-1997) and EPFL (1997-2001). Thesis: "Collaborative Control: A Robot-Centric Model for Vehicle Teleoperation". Collaborative control enables a robot to ask questions to the human, in order to obtain assistance with cognition and perception as it works.

Created and led joint CMU / EPFL research project on "Advanced Teleoperations Interfaces". This project produced three EPFL Master's theses, 15 publications, a full-day technical workshop, and three industrial collaborations (ActivMedia Robotics LLC, K-Team SA, and SRI International).

Developed *WebPioneer* (Web-based interface for mobile robots) in collaboration with ActivMedia. Project included use of HTML, Java, and JavaScript. Co-developed *VisLib* (open-source vision library for Win32/Linux). Co-chaired technical workshop on "Vehicle Teleoperation Interfaces" at 2000 IEEE Intl. Conf. on Robotics and Automation. Guest editor of *Autonomous Robots* journal (July 2001).

Coursework in artificial intelligence, computer graphics, human-computer interaction, robotic manipulation, computer vision, and wearable computing. Teaching assistant for mobile robotics graduate course. Supervised three EPFL Master's theses and five undergraduate semester projects in Microengineering

**M.S. Aeronautics and Astronautics**

June 1990

**Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA**

Research assistant for Dr. Dave Akin (MIT Space Systems Laboratory). Thesis: "Design and Testing of a Stewart Platform Augmented Manipulator" (a nine degree-of-freedom robot arm for underwater research). Tasks included extensive systems design and engineering of non-linear control, mechanical structures, and software systems. Supervised a team of seven undergraduates.

Coursework in control systems, astrodynamics, space robotics, and strobe photography.

**B.S. Aeronautics and Astronautics**

June 1988

**Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA**

Coursework in fluid dynamics, guidance, structures, materials and space systems engineering. Additional coursework in computer science, discrete mathematics, and economics.

**SKILLS**

Over 20 year experience with UNIX software development and system administration. Computer languages: awk, csh, C/C++, FORTRAN, HTML, Java, JavaScript, Perl, and sed. Operating systems: IRIX, Linux, MacOS, SunOS, Solaris, VxWorks, Windows CE/9x/NT/2K.

Broad expertise in computer graphics including 3D rendering (OpenGL, VRML, WorldToolKit) and augmented/virtual reality. Comprehensive background in data communication protocols, middleware, and network management. Extensive Web design and administration including multi-site deployment. Significant experience in computer and network security.

Other areas of knowledge include 2D/3D computer vision, control systems, embedded processing and real-time operating systems, human-computer interaction (performance evaluation, usability and user interface design), speech systems, sensors (GPS, ladar, ultrasonic), and systems engineering.

**AWARDS**

*NASA Group Achievement Award*: Human Robotics Systems Moses Lake Field Test (2009), Lunar Architecture Team (2008), Human-Robot Site Survey Project Team (2008), 9th Desert Research and Technology Studies, Desert RATS (2006).

*NASA Ames Honor Award* (2006). Global Connection project (group excellence).

*Best paper* (2001, IEEE RO-MAN conference): "Multi-robot remote driving with collaborative control"

Space Act Award for *NASA Software of the Year* (1996, first runner-up). Awarded for the creative development of the "Virtual Environment Vehicle Interface".

*NASA Group Achievement Award* (1995). Pioneering robotic technologies for the exploration of Mars: Intelligent Mechanisms Group (NASA Ames).

**AFFILIATIONS**

Founding Member of IEEE *Space Robotics Technical Committee* (2006 - present).

Member of ACM *Conference on Human-Robot Interaction Steering Committee* (2006 - present)

Member of AIAA *Space Automation and Robotics Technical Committee* (1993 - present).

American Institute of Aeronautics and Astronautics (AIAA) and IEEE (1991 - present).

**ACTIVITIES**

Educational counselor for the Massachusetts Institute of Technology (1998 - 2004). Co-founder and president of Ultimate Frisbee sports club. Amateur photographer (digital and film). NAUI certified scuba diver. Other interests include hiking, reading, and world travel.

**LANGUAGES**

English (native) and French (fluent).

## PUBLICATIONS

### Book chapters

Tunstel, E., Dolan, J., Fong, T., and Schreckenghost, D. 2009. "Mobile robotic surveying performance for planetary surface site characterization". In R. Madhavan, E. Tunstel, and E. Messina (editors), *Performance Evaluation and Benchmarking of Intelligent Systems*. Springer.

Fong, T., Thorpe, C., and Baur, C. 2002. "Robot as partner: vehicle teleoperation with collaborative control". In A. Schultz and L. Parker (editors), *Multi-Robot Systems: From Swarms to Intelligent Automata*. Kluwer.

Fong, T., Thorpe, C., and Baur, C. 2001. "Collaboration, dialogue and human-robot interaction". In *Proc. 10th Intl. Symp. Robotics Research* (Lorne, Victoria, Australia). Springer.

### Journal articles

Graetzel, C., Fong, T., Grange, S., and Baur, C. 2004. A non-contact mouse for surgeon-computer interaction. *Technology and Health Care* 12 (3).

Fong, T., Nourbakhsh, I., and Dautenhahn, K. 2003. A survey of socially interactive robots. *Robotics and Autonomous Systems* 42 (3-4).

Fong, T., Thorpe, C., and Baur, C. 2003. Robot, asker of questions. *Robotics and Auton. Systems* 42 (3-4).

Fong, T., Thorpe, C., and Baur, C. 2003. Multi-robot remote driving with collaborative control. *IEEE Transactions on Industrial Electronics* 50 (4).

Fong, T., Thorpe, C., and Baur, C. 2001. Advanced interfaces for vehicle teleoperation: collaborative control, sensor fusion displays, and remote driving tools. *Autonomous Robots* 11 (1).

Fong, T., and Thorpe, C. 2001. Vehicle teleoperation interfaces. *Autonomous Robots* 11 (1).

### Conference papers

Deans, M., Fong, T., Allan, M., Bouyssounouse, X., Bualat, M., Flueckiger, L., Kobayashi, L., Lee, S., Lees, D., Park, E., Pacis, E., Pedersen, L., Schreckenghost, D., Smith, T., To, V., and Utz, H. 2009. "Robotic scouting for human exploration". AIAA-2009-6781. In Proceedings of AIAA Space 2009, Pasadena, CA.

Fong, T., Abercromby, A., Bualat, M. G., Deans, M. C., Hodges, K. V., Hurtado Jr., J., Landis, R., Lee, P., and Schreckenghost, D. 2009. "Assessment of robotic recon for human exploration of the Moon". IAC-09-A5.2-B3.6.7. In Proceedings of the 60th International Astronautical Congress, Daejeon, Korea.

Schreckenghost, D., Fong, T., Milam, T., and Utz, H. 2009. "Measuring robot performance in real-time for NASA robotic recon operations", In Proceedings of the Performance Metrics for Intelligent Systems Workshop, PERMIS '09, Gaithersburg, MD.

Tunstel, E., Dolan, J., Fong, T., and Schreckenghost, D. 2009. "Mobile robotic surveying performance for planetary surface site characterization". In R. Madhavan, E. Tunstel, and E. Messina (eds.), *Performance Evaluation and Benchmarking of Intelligent Systems*. Springer.

Schreckenghost, D., Fong, T., et al. 2009. "Real-time assessment of robot performance during remote exploration operations". In Proceedings of the IEEE Aerospace Conference, Big Sky, MT.

Heggy E., Fong, T., Kring, D., Deans, M., Anglade, A., Mahiouz, K., Bualat, M., Lee, P., and Horz, F. 2009. "Potential of probing the lunar regolith using rover-mounted ground penetrating radar: Moses Lake Dune Field analog study". In Proceedings of the 40th Lunar and Planetary Science Conference, Abstract 2183, Houston, TX.

Lawrence, D., Elphic, R., Weinberg, J., Delory, G., Dissly, R., Evanyo, J., Crider, D., Lucey, P., Fong, T., Vondrak, R., Zacny, K., and Yachbes, I. 2009. "EXOMOON - A Discovery and Scout mission capabilities expansion concept". In Proceedings of the 40th Lunar and Planetary Science Conference, Abstract 1451, Houston, TX.

Lee, P., Gernhardt, M., Abercromby, A., Braham, S., Chase, T., Comtois, J.-M., Deans, M., Effenhauser, R., Fong, T., Frankel, C., Glass, B., Hodgson, E., Hoffman, S., Jones, J., Nelson, J., Schutt, J., and Vasquez, M. 2009. "Moon/Mars science and exploration in pressurized rovers: early lessons from analog studies at the Haughton-Mars Project site, Devon Island, High Arctic". In Proceedings of the 40th Lunar and Planetary Science Conference, Abstract 2498, Houston, TX.

Fong, T., Broxton, M., Deans, M., Helper, M., Hodges, K., Schaber, G. G., Schmitt, H. H., and Smith, T. 2009. "Traverse planning for robotic recon and human exploration of Hadley Rille". In Proceedings of the 40th Lunar and Planetary Science Conference, Abstract 1233, Houston, TX.

Fong, T., Broxton, M., Deans, M., Helper, M., Hodges, K., Schaber, G. G., Schmitt, H. H., and Smith, T. 2008. "Traverse planning for robotic recon and human exploration of Hadley Rille (report)". NASA Technical Memorandum TM-2008-215367, NASA.

Zacny, K., Wilson, J., et al. 2008. "Geotechnical property tool on NASA Ames K-10 rover". In Proceedings of the Joint Annual Meeting of LEAG-ICEUM-SRR, Abstract 4001, Cape Canaveral, FL.

Lee, P., Abercromby, A., 2008. "Terrestrial analogs for lunar science and exploration: a systematic approach". In Proceedings of the Joint Annual Meeting of LEAG-ICEUM-SRR, Abstract 4126, Cape Canaveral, FL.

Fong, T., Deans, et al. 2008. "Improving lunar surface science with robotic recon". In Proceedings of the Joint Annual Meeting of LEAG-ICEUM-SRR, Abstract 4049, Cape Canaveral, FL.

Fong, T., Bualat, M., et al. 2008. "Field testing of utility robots for lunar surface operations". AIAA-2008-7886. In Proceedings of AIAA Space 2008, San Diego, CA.

Zacny, K., Fong, T., et al. 2008. "Percussive dynamic cone penetrometer for geotechnical surface assessment with a planetary rover". In Proceedings of the NLSI Lunar Science Conference, Abstract 2138, Moffett Field, CA.

Elphic, R., Weinberg, J., et al. 2008. "EXOMOON - A Discovery and Scout mission capabilities expansion concept". In Proceedings of the NLSI Lunar Science Conference, Abstract 2142, Moffett Field, CA.

Fong, T., Deans, M., et al. 2008. "A preliminary examination of science backroom roles and activities for robotic lunar surface science". In Proceedings of the NLSI Lunar Science Conference, Abstract 2142, Moffett Field, CA.

Elphic, R., Utz, H., et al. 2008. "Preliminary results of hydrogen prospecting with a planetary rover". In Proceedings of the 39th Lunar and Planetary Science Conference, Abstract 2400, Houston, TX.

Schreckenghost, D., Fong, T., and Milam, T. 2008. "Human supervision of robotic site surveys". In Proceedings of Conf. on Human/Robotic Tech. and the Vision for Space Exploration, Albuquerque, NM.

Fong, T., Allan, M., et al. 2008. "Robotic site survey at Haughton Crater". In Proceedings of the 9th International Symposium on Artificial Intelligence, Robotics, and Automation in Space, Los Angeles, CA.

Fong, T., Deans, M., et al. 2007. "Analog lunar robotic site survey at Haughton Crater". In Proceedings of the Workshop on Enabling Exploration: The Lunar Outpost and Beyond, Abstract 3058, Lunar Exploration Analysis Group, Houston, TX.

Elphic, R., Kobayashi, L., et al. 2007. "Enabling exploration: robotic site surveys and prospecting for hydrogen". In Proceedings of the Workshop on Enabling Exploration: The Lunar Outpost and Beyond, Abstract 3046, Lunar Exploration Analysis Group, Houston, TX.

Bualat, M., Edwards, L., et al. 2007. "Autonomous robotic inspection for lunar surface operations". In Proceedings of Field and Service Robots, Chamonix, France.

Diftler, M., Ambrose, R., et al. 2007. "Crew/robot coordinated planetary eva operations at a lunar base analog site". In Proceedings of the 38th Lunar and Planetary Science Conference, Abstract 1937, Houston, TX.

Fong, T., Deans, M., Lee, P., and Bualat, M. 2007. "Simulated lunar robotic survey at terrestrial analog sites". In Proceedings of the 38th Lunar and Planetary Science Conference, Abstract 1487, Houston, TX.

Fong, T., Bualat, M., Deans, M., et al. 2006. "Human-robot site survey and sampling for space exploration". AIAA-2006-7425. In Proceedings of AIAA Space 2006, San Jose, CA.

Ferketic, J., Goldblatt, L., Hodgson, E., et al. 2006. "Toward human-robot interface standards II: A closer examination of common elements in human-robot interactions across the space enterprise". AIAA-2006-7388. In Proceedings of AIAA Space 2006, San Jose, CA.

Ferketic, J., Goldblatt, L., Hodgson, E., et al. 2006. "Toward human-robot interface standards I: Use of standardization and intelligent subsystems for advancing human-robotic competency in space exploration". SAE 2006-01-2019. In Proceedings of the SAE 36th International Conference on Environmental Systems, Norfolk, Virginia.

Fong, T., Scholtz, J., Shah, J., et al. 2006. "A preliminary study of peer-to-peer human-robot interaction". In Proceedings of the IEEE Conference on Systems, Man, and Cybernetics (Taipei, Taiwan).

Fong, T., Kunz, C., Hiatt, L. M., and Bugajska, M. 2006. "The Human-Robot Interaction Operating System". In Proceedings of ACM/IEEE Conference on Human-Robot Interaction (Salt Lake City, UT).

Steinfeld, A., Fong, T., Kaber, D., Lewis, M., Scholtz, J., Schultz, A., and Goodrich, M. 2006. "Common metrics for human-robot interaction". In Proceedings of ACM/IEEE Conference on Human-Robot Interaction (Salt Lake City, UT).

Reitsema, J., Chun, W., Fong, T., and Stiles, R. 2005. "Team-Centered Virtual Interactive Presence for Adaptive Autonomy". In *Proc. Aiaa Space 2005*, AIAA-2005-6606 (Long Beach, CA).

Fong, T., Nourbakhsh, I., Kunz, C., Fluckiger, L., Schreiner, J., Ambrose, R., BurrIDGE, R., Simmons, R., Hiatt, L.M., Schultz, A., Trafton, J. G., Bugajska, M., and Scholtz, J. 2005. "The Peer-to-Peer Human-Robot Interaction Project". In *Proc. Aiaa Space 2005*, AIAA-2005-6750 (Long Beach, CA).

Fong, T. and Nourbakhsh, I. 2005. "Interaction challenges in human-robot space exploration". *ACM Interactions* 12 (2).

Avedisyan, A., Wettergreen, D., Fong, T., and Baur, C., 2004. "Far-field terrain evaluation using geometric and toposemantic vision". In *Proc. ESA Workshop on Advanced Space Technologies for Robotics and Automation* (ESTEC-Noordwijk, The Netherlands).

Fong, T. and Nourbakhsh, I. 2004. "Peer-to-peer human-robot interaction for space exploration". In *Proc. AAAI Fall Symp. The Intersection of Cognitive Science and Robotics* (Washington, DC).

Grange, S., Fong, T., and Baur, C. 2004. "M/ORIS: A medical/operating room interaction system". In *Proc. ACM International Conference on Multimodal Interfaces* (State College, PA).

- Grange, S., Fong, T., and Baur, C. 2003. "TLIB: A real-time computer vision library for HCI applications". In *Proc. IAPR/IEEE Digital Image Computing - Techniques and Appl. Conf.* (Sydney, Australia).
- Fong, T., Thorpe, C., and Glass, B. 2003. "PdaDriver: A handheld system for remote driving". In *Proc. IEEE Intl. Conf. Advanced Robotics* (Coimbra, Portugal).
- Grange, S., Casanova, E., Fong, T., and Baur, C. 2002. "Vision-based sensor fusion for human-computer interaction". In *Proc. IEEE Intl. Conf. on Intelligent Robots and Systems* (Lausanne, Switzerland).
- Thorpe, C., Aufrere, R., Carlson, J., Duggins, J., Fong, T., Gowdy, J., Kozar, J., MacLachlan, R., McCabe, C., Mertz, C., Suppe, A., Wang, C., and Yata, T. 2002. "Safe robot driving". In *Proc. IEEE Intl. Conf. Machine Automation* (Tampere, Finland).
- Fong, T., Grange, S., Thorpe, C. and Baur, C. 2001. "Multi-robot remote driving with collaborative control". In *Proc. 10th IEEE Intl. Wksp. Robot-Human Interactive Collaboration* (Bordeaux/Paris, France).
- Fong, T., Thorpe, C., and Baur, C. 2001. "A safeguarded teleoperation controller". In *Proc. 10th IEEE Intl. Conf. Advanced Robotics* (Budapest, Hungary).
- Fong, T., Cabrol, N., Thorpe, C., and Baur, C. 2001. "A personal user interface for collaborative human-robot exploration". In *Proc. Intl. Symp. Artificial Intelligence, Robotics, and Automation in Space* (Montréal, Canada).
- Fong, T., Thorpe, C., and Baur, C. 2001. Active interfaces for vehicle teleoperation. *SPIE Robotics and Machine Perception Working Group Newsletter* 10 (1).
- Fong, T., Conti, F., Grange, S., and Baur, C. 2000. "Novel interfaces for remote driving: gesture, haptic, and PDA". In *Proc. SPIE Telemanipulator and Telepresence Technologies VII* (Boston, MA).
- Terrien, G., Fong, T., Thorpe, C., and Baur, C. 2000. "Remote driving with a multisensor user interface", In *Proc. SAE Intl. Conf. Environmental Systems* (Toulouse, France).
- Grange, S., Fong, T., and Baur, C. 2000. "Effective vehicle teleoperation on the World Wide Web", In *Proc. IEEE Intl. Conf. Robotics and Automation* (San Francisco, CA).
- Meier, R., Fong, T., Thorpe, C., and Baur, C. 1999. "A sensor fusion based user interface for vehicle teleoperation", In *Proc. Field and Service Robotics* (Pittsburgh, PA).
- Fong, T., Thorpe, C., and Baur, C. 1999. "Collaborative Control: A robot-centered model for vehicle teleoperation". In *Proc. AAAI Spring Symp. Agents with Adjustable Autonomy* (Stanford, California). AAAI Tech. Rep. SS-99-06.
- Piguet, L., Hine, B., Hontalas, P., Fong, T., and Nygren, E. 1996. "The Virtual Environment Vehicle Interface: a dynamic, distributed, and flexible virtual environment", In *Proc. IMAGINA* (Monte Carlo).
- Fong, T., Pangels, H., Wettergreen, D., Nygren, E., Hine, B., Hontalas, P., and Fedor, C. 1995. "Operator interfaces and network based participation for Dante II", In *Proc. SAE 25th Intl. Conf. Environmental Systems* (San Diego, CA).
- Hine, B., Hontalas, P., Fong, T., Piguet, L., Nygren, E., and Kline, A. 1995. "VEVI: A virtual environment teleoperations interface for planetary exploration", In *Proc. SAE 25th Intl. Conf. Environmental Systems* (San Diego, CA).
- Piguet, L., Fong, T., Hine, B., Hontalas, P., and Nygren, E. 1995. "VEVI: a virtual reality tool for robotic planetary exploration", In *Proc. Virtual Reality World* (Stuttgart, Germany).

Hine, B., Stoker, C., Sims, M., Rasmussen, D., Hontalas, P., Fong, T., Steele, J., Barch, D., Andersen, D., Miles, E., and Nygren, E. 1994. "The application of telepresence and virtual reality to subsea exploration". In *Proc. IARP 2nd Wksp. Mobile Robots for Subsea Environments* (Monterey, CA).

Fong, T. 1993. "A computational architecture for semi-autonomous robotic vehicles". AIAA 93-4508. In *Proc. AIAA Computing in Aerospace 9* (San Diego, CA).

Fong, T., and Suorsa, R. 1993. "Real-time optical flow range-estimation on the iWarp". In *Proc. SPIE Applications of Artificial Intelligence: Machine Vision and Robotics* (Orlando, FL).

Suorsa, R., Sridhar, B., and Fong, T. 1993. "Real-time computational needs of a multisensor feature-based range-estimation method". In *Proc. SPIE Sensor Fusion and Aerospace Applications* (Orlando, FL).

Hine, B., and Fong, T. 1993. "Evaluation of the Intel iWarp parallel processor for space flight applications". AIAA 93-1133. In *Proc. AIAA Aerospace Design Conf.* (Irvine, CA).

#### **Technical reports**

Fong, T., Nourbakhsh, I., and Dautenhahn, K. 2002. A survey of socially interactive robots: concepts, design, and applications. Tech. Rep. CMU-RI-TR-02-29, Robotics Institute, Carnegie Mellon University.

Fong, T. 2001. Collaborative control: a robot-centric model for vehicle teleoperation. Tech. Rep. CMU-RI-TR-01-34, Ph.D. dissertation, Robotics Institute, Carnegie Mellon University.

Fong, T. 1990. Design and testing of a Stewart Platform Augmented Manipulator for space applications. Tech. Rep. SSL-5-90, M.S. thesis, Aeronautics and Astronautics, Massachusetts Institute of Technology.