

Curriculum Vitae

GENYA ISHIGAMI

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Education:

Bachelor's course in Tohoku University, JAPAN [1999 - 2003]

B.S., Aerospace Engineering, March 25th 2003

Thesis: *Study on Dead reckoning and GPS-based Navigation for Rough Terrain Rover*

- Developed on-board sensor acquisition system and autonomous GPS navigation system.
- Conducted error estimation of dead reckoning based on simple Kalman filtering method.

Master's course in Tohoku University, JAPAN [2003 - 2005]

M.S., Aerospace Engineering, March 24th 2005.

Thesis: *Locomotion Mechanics for Planetary Exploration Rovers based on Steering Characteristics*

- Developed dynamics simulator for rover with taking into account wheel-soil interaction.
- Designed single wheel test bed to analyze wheel characteristics.

Doctoral course in Tohoku University, JAPAN [2005 - 2008]

Ph.D., Aerospace Engineering, March 25th 2008

Thesis: *Terramechanics-based Analysis and Control for Lunar/Planetary Exploration Robots*

- Mobility analysis and evaluation, path planning algorithm, path following control, and vision-based localization under high-slip environment, for lunar/planetary exploration rover.
- Developed autonomous system on rover test bed including:
 - Scanning system to acquire environment map using laser range finder.
 - Path planning algorithm to find appropriate path to arbitrary target.
 - Path following controller to travel along with planned path.

Research areas and interests:

- Wheel/vehicle-soil interaction mechanism (Terramechanics), path/motion planning, path following/trajectory control, dynamics, kinematics, perception, system integration, sensing systems, and autonomous systems.
- Lunar/Planetary Exploration Rovers, Rescue robotics, Field robotics.

Skill Summary:

- Strong skills in the areas of autonomous systems, mobile robotics, electronic circuit design, and several microprocessor, micro controller architectures, sensor systems.
- Expertise in control systems, robotics, dynamics, physics, computer science, mechanism design, and mechatronics.
- Familiar with entire integration of robot H/D and S/W systems.
- Fundamental skill for vision system.
- Fluent in C/C++, JAVA/JAVA3D and MATLAB
- Fluent in CAD (SolidWorks), Computer graphics (3dsmax)
- Fluent in Windows and UNIX/LINUX

Honors & Scholarships:

- Selected as Research Fellow of the Murata Overseas Scholarship Foundation [04/2008 – 03/2009]
- Selected as Research fellow of the Japan Society for the Promotion of Science [04/2006 – 03/2008]
- Research fund from the Japan Society for the Promotion of Science (1,900 k JPY = \$19k).
- Awarded from Japan Society of Mechanical Engineers for the best student in master course of the department [2005].
- IEEE Robotics and Automation Society (IEEE-RAS) Scholarship to attend the IEEE-RAS/IFRR International School of Robotics Science 2005 (ISRS2005) [2005].

Activities:

- Participated in an international competition of autonomous control, called ARLISS, in 2002 and 2003. In 2003, in charge of the project leader..
- Participated in an international symposium for Japanese and U.S university students, called USSS. Actively engaged to discuss the possibility of international collaborative research projects.
- Participated IEEE-RAS/IFRR International School of Robotics Science 2005: Robot Design (ISRS2005). Won first prize in the robot design contest.
- Membership of nonprofit organization for Japanese university space engineering consortium.
- Satellite Design Contest

Publications (as of September 2009)

Theses

Ishigami, G., *Terramechanics-based Analysis and Control for Lunar/Planetary Exploration Robots*, Ph.D. Thesis, Tohoku University, Japan, 2008

Ishigami, G., *Locomotion Mechanics for Planetary Exploration Rovers based on Steering Characteristics* (Japanese), Master's. Thesis, Tohoku University, Japan, 2005

Journal publications

Ishigami, G., Kewlani, G., and Iagnemma, K., "A Statistical Approach to Mobility Prediction for Planetary Surface Exploration Rovers in Uncertain Terrain," *IEEE Robotics and Automation Magazine* (in press)

Reina, G., **Ishigami, G.**, Nagatani, K., Yoshida, K., "Odometry Correction Using Visual Slip-Angle Estimation for Planetary," *Advanced Robotics*, in press

Ishigami, G., Nagatani, K., and Yoshida, K., "Slope Traversal Controls for Planetary Exploration Rover on Sandy Terrain," *Journal of Field Robotics*, Vol. 26, Issue 3, pp. 264-286, March, 2009

Ishigami, G., Miwa, A., Nagatani, K., and Yoshida, K., "Terramechanics-Based Model for Steering Maneuver of Planetary Exploration Rovers on Loose Soil," *Journal of Field Robotics*, Vol. 24, Issue 3, pp. 233-250, March, 2007

International conference proceeding publications

Kewlani, G., **Ishigami, G.**, and Iagnemma, K., "Stochastic Mobility-based Path Planning in Uncertain Environments," submitted to the *2009 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2009)*, 2009 (Accepted)

Mora, A., **Ishigami, G.**, Nagatani, K., and Yoshida, K., "Sensing Position Planning for Lunar Exploration Rovers," *Proceedings of the 2008 IEEE International Conference on Mechatronics and Automation (ICMA 2008)*, pp. 732-737, 2008

Iagnemma, K., Udengaard, M., **Ishigami, G.**, Spenko, M., Oncu, S., Khan, I., Overholt, J., and Hudak, G., "Design and Development of an Agile, Man Portable Unmanned Ground Vehicle," *Proceedings of the 26th Annual Army Science Conference*, 2008

Ishigami, G., Nagatani, K., and Yoshida, K., "Trafficability Analysis for Lunar/Planetary Exploration Rover using Thrust-Cornering Characteristic Diagram," Proceedings of the *2008 IEEE/RSJ International Conference on Robots and Systems (IROS 2008)*, 2008

Rohmer, E., Reina, G., **Ishigami, G.**, Nagatani, K., and Yoshida, K., "Action Planner of Hybrid Leg-Wheel Robots for Lunar and Planetary Exploration," Proceedings of the *2008 IEEE/RSJ International Conference on Robots and Systems (IROS 2008)*, pp. 3902-3907, 2008

Ishigami, G., Nagatani, K., and Yoshida, K., "Slope Traversal Experiments with Slip Compensation Control for Lunar/Planetary Exploration Rover," Proceedings of the *2008 IEEE International Conference on Robotics and Automation (ICRA 2008)*, pp. 2295-2300, 2008

Reina, G., **Ishigami, G.**, Nagatani, K., and Yoshida, K., "Vision-Based Estimation of Slip Angle for Mobile Robots and Planetary Rovers," Proceedings of the *2008 IEEE International Conference on Robotics and Automation (ICRA 2008)*, pp. 486-491, 2008

Ishigami, G., Nagatani, K., and Yoshida, K., "Path Planning for Planetary Exploration Rovers and Its Evaluation based on Wheel Slip Dynamics," Proceedings of the *2007 IEEE International Conference on Robotics and Automation (ICRA 2007)*, pp. 2361-2366, 2007

Yoshida, K., Nagatani, K., **Ishigami, G.**, Shimizu, S., Sekimoto, K., Miyahara, A., and Yokoyama, T., "Soil Mechanics of Lunar Regolith Simulants for Probe Landing and Rover Locomotion," Preprints of the *Space Resources Roundtable VIII*, 2006

Ishigami, G., Nagatani, K., and Yoshida, K., "Path Following Control with Slip Compensation on Loose Soil for Exploration Rover," Proceedings of the *2006 IEEE/RSJ International Conference on Robots and Systems (IROS 2006)*, pp. 5552-5557, 2006

Ishigami, G., Miwa, A., Nagatani, K., and Yoshida, K., "Terramechanics-Based Analysis on Slope Traversability for a Planetary Exploration Rover," Proceeding of the *25th International Symposium on Space Technology and Science (ISTS 2006)*, pp. 1025-1030, 2006

Ishigami, G., Miwa, A., and Yoshida, K., "Steering Trajectory Analysis of Planetary Exploration Rovers Based on All-Wheel Dynamics Model," Proceedings of the *8th Int. symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS 2005)*, 2005

Ishigami, G., and Yoshida, K., "Steering Characteristics of an Exploration Rover on Loose Soil Based on All-Wheel Dynamics Model", Proceedings of the *2005 IEEE/RSJ International Conference on Robots and Systems (IROS 2005)*, pp. 2041-2046, 2005

Yoshida, K., and **Ishigami, G.**, "Steering Characteristics of a Rigid Wheel for Exploration on Loose Soil," Proceedings of the *2004 IEEE/RSJ International Conference on Robots and Systems (IROS 2004)*, pp. 3995-4000, 2004

Ishigami, G., Mizuno, N., Miwa, A., and Yoshida, K., "Long Range Navigation on Desert by a Dual-Wheel Micro Rover, " Proceedings of the *24th International Symposium on Space Technology and Science (ISTS 2004)*, 2004

Yoshida, K., Mizuno, N., **Ishigami, G.**, and Miwa, A., "Terramechanics-Based Analysis for Slope Climbing Capability of a Lunar/Planetary Rover," Proceeding of the *24th International Symposium on Space Technology and Science (ISTS 2004)*, 2004

Yoshida, K., Watanabe, T., Mizuno, N., and **Ishigami, G.**, "Terramechanics-Based Analysis and Traction Control of a Lunar / Planetary Rover," Proceedings of the *4th International Conference on Field and Service Robotics (FSR 2003)*, 2003

Yoshida, K., Watanabe, T., Mizuno, N., and **Ishigami, G.**, "Slip, Traction Control, and Navigation of a Lunar Rover," Proceedings of the *6th Int. Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS 2003)*, 2003