Baro Hyun

University of Michigan, Ann Arbor
Department of Aerospace Engineering
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Research Interests

Modeling, analysis, control, and optimization of

Classification systems

Human-machine systems

Planning and navigation of unmanned vehicles

Estimation and signal processing in

Spacecraft attitude determination

Unmanned aerial vehicles

Education

University of Michigan, Ann Arbor, Michigan USA

Ph.D., Aerospace Engineering, Aug 2011.

Dissertation: "Optimal Information-based Classification"

Advisors: Anouck R. Girard and Pierre T. Kabamba

Committee: A. Galip Ulsoy, Mary L. Cummings, Mariam Faied

University at Buffalo, SUNY, Amherst, New York USA

M.S., Aerospace Engineering, Aug 2008.

Thesis: "State Estimation for Vision-based Simultaneous Localization and Mapping of Unmanned Vehicles"

Advisors: John L. Crassidis and Puneet Singla

Committee: Tarunraj Singh

Kyunghee University, South Korea

B.S., Astronomy & Space Science, Aug 2006.

Thesis: "A Time-Dependent Particle Approach for the non-LTE Radiative Transfer Problem"

Undergraduate Research Advisor: Sungsoo S. Kim

Positions

Senior Researcher, Hyundai Motors, Aug. 2012 - present

Postdoctoral Research Fellow, University of Michigan, Sep. 2011 - Aug. 2012

Hosts: Anouck R. Girard and Pierre T. Kabamba

Graduate Student Research Assistant, University of Michigan, Sep. 2008 - Aug. 2011

Graduate Student Instructor, University of Michigan, Fall 2010

Research Assistant, University at Buffalo, Summer 2008

Teaching Assistant, University at Buffalo, Spring 2008

Publications

Journal Articles

1. B. Hyun, P. Kabamba, A. Girard, Optimally-Informative Path Planning for Dynamic Bayesian Classification, Optimization Letters, Springers, 2011, (DOI) 10.1007/s11590-011-0354-7, In press.

2. M.S. Andrle, J.L. Crassidis, R. Linares, Y. Cheng, B. Hyun, Deterministic Relative Attitude Determination of Three-Vehicle Formations, *AIAA Journal of Guidance, Control and Dynamics*, 32(4):1077-1088, 2009.

Under Reviews

1. B. Hyun, M. Faied, P. Kabamba, A. Girard, On Minimizing Classification Error by Maximizing Information, *IEEE Signal Processing Letters,* 2012, Submitted.

2. B. Hyun, M. Faied, P. Kabamba, A. Girard, Optimal Classification by Mixed-Initiative Nested Thresholding, *IEEE Transactions on Systems, Man, and Cybernetics - Part A,* 2012, Resubmitted.

3. Y. Chang, B. Hyun, A.R. Girard, Bond-energy Algorithm: A Path Planning Heuristics for Information Collection Tasks, *Optimization Letters,* 2012, Submitted.

4. A. Klesh, B. Hyun, T. Huntsberger, G. Woodward, P. Kabamba, A. Girard, Tactical Area Search with Strapped-Down Anisotropic Sensors, *Journal of Advanced Robotics,* 2011, Conditionally accepted.

5. B. Hyun, P. Singla, State Estimation for Vision-based Simultaneous Localization and Mapping of Unmanned Vehicles, *AAS Journal of the Astronautical Sciences,* 2011, Conditionally accepted.

Working Papers (drafts available upon request)

1. B. Hyun, W. Wang, A.R. Girard, Modeling and Supervisory Control of a Human Operator in Classification Tasks using Discrete Event Systems

2. B. Hyun, M. Faied, P. Kabamba, A. Girard, Synergistic Fusion Rules for Team Classification

Conference Proceedings

1. J. Kasa-Vubu, B. Hyun, J. Seok, A. Girard, Automated Classification System for Bone Age Images: a Thresholding Approach to Assess the Impact of Sex-Steroid Exposure on Skeletal Maturation During Puberty, *Androgen Excess & PCOS Society*, 2012, Accepted.

2. J.W. Seok, B. Hyun, J. Kasa-Vubu, A. Girard, Automated Classification System for Bone Age X-ray Images, *IEEE International Conference on Systems, Man, and Cybernetics*, 2012, Submitted.

3. J. Las Fargeas, B. Hyun, P. Kabamba, A. Girard, Persistent Visitation with Fuel Constraints, *15th Meeting of the Euro Working Group on Transportation (Energy Efficient Transportation Systems 2012), Paris, France*, 2012, Submitted.

4. J. Las Fargeas, B. Hyun, P. Kabamba, A. Girard, Persistent Visitation with Heterogeneous Revisit Rate Requirements, *IEEE Conference on Decision and Control, Maui, HI*, 2012, Submitted. (*invited paper*)

5. M. Faied, P. Kabamba, B. Hyun, A. Girard, Path Planning for Optimal Classification, *IEEE Conference on Decision and Control, Maui, HI*, 2012, Submitted.

6. B. Hyun, M. Faied, P. Kabamba, A. Girard, Mixed-Initiative Nested Classification for *n* Team Members, *IEEE Conference on Decision and Control, Maui, HI*, 2012, Submitted.

7. B. Hyun, D. Kim, Z. Kang, Robust Doppler Effect-Accommodated Distance Tracking for Intelligent Cruise Control under High Vehicle Velocity, *IFAC 11th International Symposium on Advanced Vehicle Control*, 2012, Accepted.

8. B. Hyun, Optimal Strategy for Deploying Buoys with Ocean Dynamics, *OCEANS'12 MTS/IEEE Yeosu*, 2012, Accepted.

9. C.K. Nebelecky, J.L. Crassidis, B. Hyun, Y. Cheng, Fisher Information Based Analysis of Deterministic Relative Attitude Observability in Planar Vehicle Formations, *AIAA Guidance, Navigation and Control Conference and Exhibit*, 2012, Accepted.

10. S. Spangelo, J. Dahm, B. Hyun, Optimal User-Specific Guidance for Outdoor Fitness Routes, *AIAA Guidance, Navigation and Control Conference and Exhibit*, 2012, Accepted.

11. Y. Chang, B. Hyun, A.R. Girard, Path Planning for Information Collection Tasks using Bond-energy Algorithm, *American Control Conference, Montreal, Canada*, 2012.

12. B. Hyun, M. Faied, P. Kabamba, A. Girard, Optimal Multivariate Classification by Linear Thresholding, *American Control Conference, Montreal, Canada*, 2012. (*invited paper*)

13. B. Hyun, M. Faied, P. Kabamba, A. Girard, Mixed-Initiative Nested Classification by Optimal Thresholding, *IEEE Conference on Decision and Control, Orlando, FL*, 2011.

14. B. Hyun, M. Faied, P. Kabamba, A. Girard, Classification with Synergistic Teams, *18th World Congress of the International Federation of Automatic Control (IFAC), Milano, Italy*, 2011.

15. B. Hyun, P. Kabamba, W. Wang, A. Girard, Sequential Bayesian Classification Decisions for Mobile Sensors, *IEEE Conference on Decision and Control, Atlanta, GA.*, 2010.

16. B. Hyun, C.J. Park, W. Wang, A.R. Girard, Discrete Event Modeling of Heterogeneous Human Operator Team in Classification Task, *American Control Conference, Baltimore, MD.*, 2010. (*invited paper*)

17. B. Hyun, J. Jackson, A. Klesh, A. Girard, P. Kabamba, Robotic Exploration with Non-Isotropic Sensors, *AIAA Guidance, Navigation and Control Conference and Exhibit, Chicago, IL.*, 2009.

18. M.S. Andrle, B. Hyun, J.L. Crassidis, R. Linares, Deterministic Relative Attitude Determination of Formation Flying Spacecraft, *AIAA Guidance, Navigation and Control Conference and Exhibit, Honolulu, HI.*, 2008.

19. B. Hyun, P. Singla, Autonomous Navigation Algorithm for Precision Landing on Unknown Planetary Surface, *the 18th AAS/AIAA Space Flight Mechanics Meeting, Galveston, TX.*, 2008.

Miscellaneous

1. A. Klesh, B. Hyun, T. Huntsberger, G. Woodward, P. Kabamba, A. Girard, Tactical Area Search with Strapped-Down Anisotropic Sensors, *Control Group Report CGR 10-05,* University of Michigan, 2010.

2. B. Hyun, S.S. Kim, A time-dependent particle approach for the non-LTE radiative transfer problem, *Kyung Hee Journal of Natural Sciences*, Dec 2006.

Talks

Invited and Seminar Talks

Hyundai Motors, San Diego, CA, Nov 2011.

LMS International, Troy, MI, Sep 2011.

Flight Dynamics & Controls Seminar, Department of Aerospace Engineering, University of Michigan, Ann Arbor

"On the Independence of Information and Classification Performance", Winter 2011.

"Optimal Path Planning with Bayesian Classification", Winter 2010.

"State Estimation for Vision-based Simultaneous Localization and Mapping of Unmanned Vehicles", Fall 2008.

Conference Talks

IEEE Conference on Decision and Control, 2011, Orlando, FL, Dec 2011, "Mixed-Initiative Nested Classification by Optimal Thresholding".

18th World Congress of the International Federation of Automatic Control (IFAC), Milano, Italy, 2011, "Classification with Synergistic Teams".

IEEE Conference on Decision and Control, 2010, Atlanta, GA, Dec 2010, "Sequential Bayesian Classification Decisions for Mobile Sensors".

2010 HFES Student Research Conference, New England Chapter, Cambridge, MA, Oct 2010, "Workload Assessment in Search Scheduling using Blink Rate".

9th IEEE International Conference on Development and Learning, Ann Arbor, MI, Aug 2010, "Learning-to-Grasp: from an Infant to a Troublemaker". *(poster)*

American Control Conference 2010, Baltimore, MD, Jun 2010, "Robust Fault Detection and Isolation for Stochastic Systems".

American Control Conference 2010, Baltimore, MD, Jun 2010, "Discrete Event Modeling of Heterogeneous Human Operator Team in Classification Task".

2nd International Conference on the Dynamics of Information Systems, Destin, FL, Feb 3-5, 2010, "Optimal Path Planning with Bayesian Classification".

AIAA Guidance, Navigation and Control Conference and Exhibit, Chicago, Illinois, Aug 2009. "Robotic Exploration with Non-Isotropic Sensors".

18th AAS/AIAA Space Flight Mechanics Meeting, Galveston, Texas, Jan 2008, "Autonomous navigation algorithm for precision landing on unknown planetary surface".

Other Talks

Mixed-Initiative Nested Classification for n Team Members, MACCCS Semi-Annual Review Meetings, Ann Arbor, MI, Apr 2012.

Optimal Information-based Classification, Michigan/AFRL Collaborative Center in Control Science (MACCCS) Annual Review Meeting, Ann Arbor, MI, Sep 2011. *(briefing the board)*

Classification with Synergistic Teams, MACCCS Annual Review Meeting, Ann Arbor, MI, Sep 2011. *(poster)*

An Overview of Michigan/Air Force Research Lab Collaborative Center in Control Science, Air Force Office of Scientific Research (AFOSR) Dynamics and Control Program Review, Arlington, VA, Jun 2011.

On the Independence of Information and Classification Performance, MACCCS Semi-Annual Review Meetings, MIT, Cambridge, MA, Apr 2011.

Sequential Bayesian Classification Decisions for Mobile Sensors, MACCCS Annual Review Meeting, Ann Arbor, MI, Aug 2010. *(poster)*

Discrete Event Modeling of Heterogeneous Human Operator Team in Classification Task, MACCCS Semi-Annual Review Meetings, MIT, Cambridge, MA, Apr 2010.

Optimal Exploration, MACCCS Semi-Annual Review Meetings, University of Michigan, Ann Arbor, MI, Apr 2009.

Teaching

Invited lecturer, AE 201 (Introduction to aerospace engineering), AE 285 (Aerospace engineering seminar), AE 348 (Aircraft dynamics & control), AE 551 (Nonlinear systems and control), University of Michigan, 2010-2012.

Certificate of Completion, Postdoctoral Short-Course on College Teaching in Science and Engineering (PSC), Center for Research on Learning and Teaching (CRLT), University of Michigan, Fall 2011.

Graduate Student Instructor, AE345 (Flight dynamics and control), University of Michigan, Fall 2010

Duty includes creating homework solutions and holding office hours

Teaching Assistant, MAE444/544 (Digital control systems), SUNY Buffalo, Spring 2008.

Duty includes writing experiment manuals, assisting students conducting laboratory experiments, creating homework assignemnts, and grading

Professional Activities

Program Committee member, Robotics: Science and Systems (RSS), 2012.

Co-organizer and chair, Invited session on "information collection and classification decision-making", American Control Conference, Montreal, Canada, 2012.

Summer Researcher, Human and Automation Laboratory (HAL) led by Missy L. Cummings, Massachusetts Institute of Technology, Cambridge, MA, Jun 2010.

Session chairs or co-chairs:

American Control Conference

Reviewed for

Journals: IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans; AIAA Journal of Guidance, Control, and Dynamics; Acta Astronautica

Conferences: IEEE Conference on Decision and Control; IFAC Workshop on Navigation, Guidance and Control of Underwater Vehicle; Robotics: Science and Systems; IEEE International Conference on Robotics and Automation; IEEE/RSJ International Conference on Intelligent Robots and Systems; American Control Conference; AIAA Guidance, Navigation, and Control Conference

Member of AIAA, IEEE

Awards

Student Travel Support Award, IEEE Conference on Decision and Control, Atlanta, GA, Dec 2010.

Rackham Travel Grant, Horace H. Rackham School of Graduate Studies, University of Michigan, 2010, 2011

Departmental Fellowship, University of Michigan, Sep 2008 - Aug 2009

Grant Proposals

Synergistic Decision-Making Strategies in Distributed Heterogeneous Systems, *In response to the National Science Foundation Control Systems (NSF CS)*, Full proposal, Sep 2012, In preparation.

Automated Classification System for Bone Age X-ray Images, *In response to the National Science Foundation Smart Health and Wellbeing (NSF SHW)*, Full proposal, Feb 2012, Submitted.

Efficient Modeling and Algorithms for Dynamic Force-level Resource Management, *In response to A-Force Level Radar Resource Management for IAMD Broad Agency Announcement, Department of the Navy*, Full proposal, Jan 2012 – Project funded ($170,000), Start date: May 2012, Co-PIs: Anouck Girard and Pierre Kabamba, Postdoctoral Researcher: Baro Hyun.

Efficient Modeling and Algorithms for Dynamic Force-level Resource Management, *In response to A-Force Level Radar Resource Management for IAMD Broad Agency Announcement, Department of the Navy*, White paper, Aug 2011, Invited for full proposal.

Personal

Born on January 4, 1984.

South Korean Citizen.

One-year Exchange Student Program, University of Oslo, Oslo, Norway, Jul 2003

References

Anouck R. Girard, Assistant Professor, Department of Aerospace Engineering, University of Michigan, Ann Arbor, anouck@umich.edu, +1) 734-647-4692

Pierre T. Kabamba, Professor, Department of Aerospace Engineering, University of Michigan, Ann Arbor, kabamba@umich.edu, +1) 734-643-6728

A. Galip Ulsoy, C. Mote Jr. Distinguished University Professor, Department of Mechanical Engineering, University of Michigan, Ann Arbor, ulsoy@umich.edu, Tel: +1) 734-936-0407

Mary L. Cummings, Associate Professor, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, missyc@mit.edu,Tel: +1) 617-252-1512

John L. Crassidis, Professor, Department of Mechanical and Aerospace Engineering, University at Buffalo, johnc@buffalo.edu, Tel: +1) 716-645-1426

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