

# Jong-Han Kim

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| CONTACT<br>INFORMATION | Agency for Defense Development<br>160, Bugyuseong-daero 488beon-gil, Yuseong-gu,<br>Daejeon, South Korea, 34060                                                                                                                                                                                                                                              | jonghank@add.re.kr (official)<br>tojhkim@gmail.com (preferred)<br>+82-10-9056-2543 |
| EDUCATION              | <b>Stanford University</b><br>Ph.D. in Aeronautics and Astronautics<br><i>Information Systems Lab.</i><br>Dissertation: <i>Separable problems in optimal cooperative control of networked systems</i> (Dissertation<br>advisors: Prof. Sanjay Lall, Prof. Stephen Boyd, Prof. Stephen Rock)                                                                  | 2012.6<br><br>Advisor: Prof. Sanjay Lall                                           |
|                        | <b>Korea Advanced Institute of Science and Technology (KAIST)</b><br>M.S. in Aerospace Engineering<br><i>Flight Dynamics and Control Lab.</i><br>Dissertation: <i>An accelerated co-evolutionary algorithm and its application to attitude control design<br/>of flexible satellites</i>                                                                     | 2001.2<br><br>Advisor: Prof. Min-Jea Tahk                                          |
|                        | <b>Korea Advanced Institute of Science and Technology (KAIST)</b><br>B.S. in Aerospace Engineering                                                                                                                                                                                                                                                           | 1999.2                                                                             |
| WORK<br>EXPERIENCE     | <b>Agency for Defense Development (ADD)</b><br>Daejeon, South Korea<br><i>Guidance systems R&amp;D directorate</i>                                                                                                                                                                                                                                           | Researcher / Senior researcher<br>2001.1 - present                                 |
|                        | <b>United Technologies Research Center (UTRC)</b><br>East Hartford, CT, USA<br><i>Systems division</i>                                                                                                                                                                                                                                                       | Summer intern<br>2007.7 - 2007.9                                                   |
|                        | <b>Satellite Technology Research Center (SaTReC), KAIST</b><br>Daejeon, South Korea<br><i>Attitude determination and control group</i>                                                                                                                                                                                                                       | Intern<br>2000.1 - 2001.1                                                          |
| HONORS AND<br>AWARDS   | <b>Ministerial Commendation, Minister of National Defense</b><br>Cited for pivotal roles in applying machine learning and convex optimization techniques for developing<br>cutting-edge missile guidance systems.                                                                                                                                            | 2017.8                                                                             |
|                        | <b>Outstanding Young Researcher Award, ICROS</b><br>Given to outstanding young researchers under 40 with notable research achievements, by the Institute<br>of Control, Robotics and Systems (ICROS).                                                                                                                                                        | 2017.5                                                                             |
| RESEARCH<br>EXPERIENCE | <b>Machine learning based intelligent guidance techniques</b><br>Online $\ell_1$ -regularized optimization for optical misalignment cancellation of strap down seekers.<br>Target shape identification using RF signals based on unsupervised learning.                                                                                                      | ADD                                                                                |
|                        | <b>Integrated guidance and control for constrained precision homing</b><br>Finite horizon integrated guidance and control for constrained terminal homing of high performance<br>missile systems.                                                                                                                                                            | ADD                                                                                |
|                        | <b>Guidance and control designs for full-scale missile development programs</b><br>Highly reliable guidance and control design/implementation for several state-of-the-art missile systems<br>development programs. The works include classical, optimal, or robust control for highly unstable<br>airframes and high-fidelity flight simulation techniques. | ADD                                                                                |
|                        | <b>Optimal decentralized control for large-scale networked systems</b><br>Theoretical studies on optimal decentralized control using convex analysis and convex optimization.                                                                                                                                                                                | Stanford                                                                           |

Characterizes convex problems and explicitly solvable problems in optimal control of networked systems under information constraints.

**Decentralized control for jet engine systems**

Stanford

Suboptimal decentralized  $H_2/H_\infty$  control synthesis. Convex relaxation and convex approximation of nonconvex optimal control problems. Application to jet engine control systems.

**Multiscale/stochastic consensus for decentralized estimation**

Stanford / UTRC

Multiscale concepts to applied to consensus problems, for scalable distributed estimation. Stochastic message passing for convergence acceleration. Application to decentralized estimation problems.

**Tactical missile systems integration**

ADD

Mission profile design, operational performance/effectiveness analysis. Flight performance analysis. Engineering level 6-DOF flight dynamics simulation.

**Attitude control for small satellites**

SaTReC

Design and experiments for attitude control of flexible satellites. Satellite bus development for STSAT-1 program. Developing ground test modules.

**Co-evolutionary algorithms for constrained optimization**

KAIST

Constrained optimization, minimax optimization using evolutionary computation. Applications to design problems or control problems. Convergence acceleration by using artificial neural networks.

SELECTED  
PUBLICATIONS

• INTERNATIONAL JOURNALS

**J.-H. Kim** and S. Lall, "Explicit solutions to separable problems in optimal cooperative control," *IEEE Transactions on Automatic Control*, vol.60, no.5, pp.1304-1319, 2015. [IF: 4.270]

**J.-H. Kim**, I.H. Whang, and B.M. Kim, "Finite horizon integrated guidance and control for terminal homing in vertical plane," *AIAA Journal of Guidance, Control, and Dynamics*, vol.39, no.5, pp.1104-1112, 2016. [IF: 1.856]

**J.-H. Kim** and I.H. Whang, "Augmented three-loop autopilot structure based on mixed sensitivity  $H_\infty$  optimization," *AIAA Journal of Guidance, Control, and Dynamics*, 2017. (Published online with DOI <https://doi.org/10.2514/1.G003119>) [IF: 1.856]

T.H. Kim, **J.-H. Kim**, and P.S. Kim, "New guidance filter structure for homing missiles with strap-down IIR seeker," (*accepted to*) *International Journal of Aeronautical and Space Sciences*, 2017.

**J.-H. Kim**, Y. Han, and I.H. Whang, "Online  $l_1$ -regularized optimization for optical misalignment cancellation of strap down seekers," (*submitted to*) *Mathematical Problems in Engineering*, 2017.

**J.-H. Kim** and M.-J. Tahk, "Accelerated co-evolutionary algorithms," *International Journal of Aeronautical and Space Sciences*, vol.3, no.1, pp.50-60, May 2002.

• INTERNATIONAL CONFERENCES

D. Lee, **J.-H. Kim**, and H.-L. Choi, "Closed-form cooperative guidance law for two missiles with coupled terminal velocity constraints," in *Proc. 30th Congress of the International Council of the Aeronautical Sciences*, Sep. 2016.

**J.-H. Kim**, S. Lall, and C.-K. Ryoo, "Optimal cooperative control of dynamically decoupled systems," in *Proc. 51st IEEE Conference on Decision and Control*, pp.4852-4857, Dec. 2012.

**J.-H. Kim** and S. Lall, "Separable optimal cooperative control problems," in *Proc. 2012 American Control Conference*, pp.5868-5873, June 2012.

**J.-H. Kim** and S. Lall, "A unifying condition for separable two player optimal control problems," in

*Proc. 50th IEEE Conference on Decision and Control*, pp.3818-3823, Dec. 2011.

**J.-H. Kim**, S. Lall, W. Merrill, and A. Behbahani, "A computational approach for decentralized control of turbine engines," in *Proc. 49th IEEE Conference on Decision and Control*, pp.346-351, Dec. 2010.

W. Merrill, **J.-H. Kim**, S. Lall, S. Majerus, D. Howe, and A. Behbahani, "Distributed engine control design considerations," in *Proc. 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*, July 2010.

**J.-H. Kim**, M. West, S. Lall, E. Scholte, and A. Banaszuk, "Stochastic multiscale approaches to consensus problems," in *Proc. 47th IEEE Conference on Decision and Control*, pp.5551-5557, Dec. 2008.

**J.-H. Kim**, M. West, E. Scholte, and S. Narayanan, "Multiscale consensus for decentralized estimation and its application to building systems," in *Proc. 2008 American Control Conference*, pp.888-893, June 2008.

**J.-H. Kim**, C.-S. Park, and M.-J. Tahk, "An accelerated co-evolutionary algorithm using neural networks," in *Proc. 37th JSASS Aircraft Symposium*, Tokyo, Japan, Oct. 1999.

#### • PATENTS

**J.-H. Kim**, I.H. Whang, B.M. Kim, and H.R. Park, *Terminal homing method for flight vehicle and apparatus thereof*, KR Patent KR101602311B1, issued March 10, 2016.

T.H. Kim and **J.-H. Kim**, *Guidance filter model for relative kinematic estimation using two-axes gimbaled RF seeker*, (pending).

#### • DOMESTIC JOURNALS

**J.-H. Kim**, Y. Han, and I.H. Whang, "Optical misalignment cancellation via online  $l_1$  optimization," *Transactions of the Korean Institute of Electrical Engineers*, vol.66, no. 7, pp.1078-1082, July 2017.

**J.-H. Kim**, T.-H. Kim, and B.-E. Jun, "Target shape identification based on unsupervised learning," (submitted to) *Journal of Institute of Control, Robotics and Systems*.

C.-K. Ryoo, M.-J. Tahk, and **J.-H. Kim**, "Trajectory optimization and guidance of terminal velocity constrained missiles," *Journal of the Korean Society for Aeronautical & Space Sciences*, vol.32, no.6, pp.72-80, Aug. 2004.

H.-W. Lee, **J.-H. Kim**, M.-J. Tahk, and D.-J. Park, "Verification and validation of attitude control subsystems of KITSAT series satellites," *ICASE Magazine*, vol.6, no.5, pp.31-37, Sep. 2000.

#### • DOMESTIC CONFERENCES

B.M. Kim, H.-S. Kim, **J.-H. Kim**, and I.H. Whang, "Adaptive controller for the uniformization of time response," in *Proc. 2017 KIEE Summer Conference*, pp.1422-1423, July 2017.

I.H. Whang, H.R. Park, B.M. Kim, **J.-H. Kim**, and H.-S. Kim "Optimal initialization for roll controller," in *Proc. 2017 KIEE Summer Conference*, pp.1420-1421, July 2017.

I.H. Whang, H.R. Park, B.M. Kim, and **J.-H. Kim**, "Optimal initiation for 3-loop roll regulator," in *Proc. 32nd ICROS Annual Conference*, pp.95-96, May 2017.

I.S. Kim, **J.-H. Kim**, and H.-L. Choi "Nonclassical Optimal guidance laws based on nonclassical penalty functions," in *Proc. 2017 KSAS Spring Conference*, pp.242-243, April 2017.

- I.H. Whang, **J.-H. Kim**, B.M. Kim, and H.R. Park, "Statistical decision making for random fault correction," in *Proc. 2016 KIEE Summer Conference*, pp.1450-1451, July 2016.
- B.M. Kim, **J.-H. Kim**, D.K. Sang, and I.H. Whang, "Performance comparison of the PI roll attitude controller and the 3-loop roll attitude controller," in *Proc. 2014 KSAS Autumn Conference*, pp.1414-1417, Nov. 2014.
- I.H. Whang, **J.-H. Kim**, and B.M. Kim, "A study on performance degradation due to measurement mismatches," in *Proc. 2014 KIEE Summer Conference*, pp.1482-1483, July 2014.
- J.-H. Kim**, I.H. Whang, and B.M. Kim, "Finite horizon integrated guidance and control for terminal homing," in *Proc. 2013 Conference on Information and Control Systems*, pp.135-136, Oct. 2013.
- I.H. Whang, S.J. Kim, **J.-H. Kim**, and B.M. Kim, "Speed-height target curve following controller design," in *Proc. 2013 Conference on Information and Control Systems*, pp.131-132, Oct. 2013.
- B.M. Kim, I.H. Whang, and **J.-H. Kim**, "Mixed aerodynamic and thrust vector control design using the dual PCH logic," in *Proc. 2013 Conference on Information and Control Systems*, pp.129-130, Oct. 2013.
- I.H. Whang, B.M. Kim, and **J.-H. Kim**, "Terminal guidance design using adaptive biased proportional navigation law," in *Proc. 2013 KIEE Summer Conference*, pp.1639-1630, July 2013.
- J.-H. Kim**, S. Lall, and C.-K. Ryoo, "Optimal salvo guidance under fixed communication topology," in *Proc. 16th Missile Systems Conference*, Oct. 2012.
- K.-R. Choi, **J.-H. Kim**, J.-Y. Ahn, and M.-J. Tahk, "Controller design by using CEALM optimization techniques," in *Proc. 11th Missile Systems Conference*, Oct. 2001.