

HYUNCHUL SHIM

A.K.A. DAVID HYUNCHUL SHIM

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EDUCATION

Doctor of Philosophy, December 2000.

University of California, Berkeley

Field: Mechanical Engineering

Dissertation Title: **Hierarchical Flight Control System Synthesis for Rotorcraft-based Unmanned Aerial Vehicles**

Dissertation Advisor: Professor S. Shankar Sastry

Major: Control engineering

Minors: Dynamics, Signal Processing and Computer Vision

Master of Science in Engineering, February 1993.

Seoul National University, Seoul, South Korea

Field: Mechanical Engineering

Thesis Title: A Study on the Design of a Hovering Flight Controller for a Model Helicopter

Thesis Supervisor: Professor Kyo-II Lee

Major: Control engineering

Bachelor of Science in Engineering, February 1991.

Seoul National University, Seoul, South Korea

Field: Mechanical Engineering

Project Title: Development of Software for Detection of Surface Irregularities using Reflection Lines

Supervisor: Professor Kunwoo Lee

RESEARCH AND RELATED WORK EXPERIENCE

June 25, 2001 - present

Staff servo engineer, Maxtor Corporation, Milpitas, California

In charge of the development of advanced servo control system design, simulation, and test environment for hard disk drives.

- Design of advanced servo control loop using multi-objective optimization
- Assessment of performance improvement through customized servo controllers
- Development of integrated servo optimization tool
- Development of Servo Firmware Validation Platform in MATLAB
- Narrow-band disturbance rejection using nonlinear filter
- Simulation and experiments on advanced servo systems under vibration
- Reliability tests of advanced disk drive test in the presence of generated particles

Dec. 2000-June 30, 2001

Specialist, Electronics Research Laboratory (ERL), Dept. of EECS, UCB

In charge of the development of a network of UAVs with high-level flight control system, intelligent strategic planner and high QoS wireless communication capabilities, UAV flight control system in the context of Open Control Platform (OCP) in collaboration with Boeing UAV division, and hardware-in-the-loop simulation platform for UAVs

- Design of fully autonomous RUAVs with automatic take-off and landing capabilities.
- Construction of hardware-in-the-loop simulation platform for helicopter-based UAV research using MATLAB/Real-time Workshop and Tornado/VxWorks target.
- Development of new flight control system using Boeing Open-Control Platform for helicopter-based UAVs

Dec. 1997 – Dec.2000

Graduate Student Researcher, with Professor Shankar Sastry, Dept. of Electrical Engineering and Computer Science, UCB

Funded by Office of Naval Research (ONR), Army Research Office (ARO) and Defense Advanced Research Project Agency (DARPA)

Developed a complete procedural methodology to build rotorcraft-based UAVs based on commercially available radio-controlled helicopters. Designed and implemented four rotorcraft-based unmanned aerial vehicles (RUAVs) and control hardware/software. Built UAV base airframes from commercially available small-size helicopters. Derived theoretical and empirical system models for control system design. Designed linear robust controllers as well as classical multi-loop SISO controllers and showed successful results in flight tests. Performed RUAV guidance, navigation and control system hardware integration. Wrote flight control software in C running on QNX real-time OS. Proposed and implemented vehicle control language system for way-point navigation systems.

Sep. 1996 – Nov. 1997

Graduate Student Researcher, with Professor Masayoshi Tomizuka, Dept. of Mechanical Engineering, UCB

Funded by NSK Ltd., Japan

Developed high-speed, high-precision position control system for linear induction motor, assisted by Low-cost accelerometer-based velocity estimation with automatic tuning. Amplifier model is identified using laser interferometer. A MS Windows-based graphic interface for real-time control and development interface is developed.

Jan. 1993 – May 1994

Design Engineer, Hyundai Motor Company, South Korea

Participated in the design of gear shift mechanism of a five-speed manual transmission. Analyzed automatic transmission control software. Derived hydro-mechanical force/displacement model for the improvement of clutch pedal force profile. Participated in the design of synchronizer rings for manual transmissions.

1991-1993

Research Assistant, Department of Mechanical Engineering, Seoul National University, with Dr. Kyo-II Lee

Designed discrete LQG/LTR controller for attitude control of a model helicopter tethered to 3-DOF attitude constraining linkage. Constructed an experimental setup including helicopter constraining linkage, attitude sensors system, and realtime flight control hardware and software. Derived the helicopter model in hover based on full-size helicopter model. Implemented a controller in C on MS-DOS and performed successful experiments.

PROFESSIONAL ACTIVITIES

- Member of AIAA
- Member of IEEE
- Member of ASME
- Reviewer, Automatica, American Control Conference, and International Journal of Robotics Research (IJRR) , IEEE Conference on Decision and Control, etc.
- Participation in Association for unmanned vehicle systems (AUVS) competition in Hanford, Washington, August 1998.
- Invited Presentations
 - Laboratory Seminar, Department of Mechanical and Aerospace Engineering, Seoul National University, Seoul, Korea, August 2002.
 - Laboratory Seminar, Center for Information Storage Devices, Yonsei University, Seoul, Korea, July 2002.
 - Control and Dynamics Seminar, California Institute of Technology, January 2001
 - Department Seminar, Department of Aeronautics and Astronautics, Stanford University, November 2000
 - Department Seminar, Department of Aeronautics and Astronautics, University of Washington, October 2000
 - Software Enabled Control Workshop, Boeing St. Louis Training Center, June 2000.
 - Mobile robotics seminar, Stanford Research Institute International, Stanford, 2000
 - DARPA Open Control Platform Semi-annual meetings (October 2000, May 1999)
 - ONR UCAV1 Semi-annual meetings (Aug. 2000, Jan. 2000, Aug. 1999, Jan. 1999)
 - Special Seminar, NASA Ames Center, Moffett Field, California, July 2000
 - BISC (Berkeley Initiative in Soft Computing) Seminar hosted by Prof. Lotfi Zadeh, February 2000
- Project Reviews Participation and Demonstration
 - UCAV Program Summer Review, Office of Naval Research (ONR), Berkeley, CA, August 2001
Performed ground target tracking demonstration of RUAV aided by onboard vision system.
Performed way-point navigation of RUAV
Demonstrated the world first pursuit-evasion game using multiple autonomous aerial and ground robots
 - Software-Enabled Control Semi-annual program review, DARPA, Annapolis, MD, May 2001
 - Mixed-Initiative Control of Automata-teams (MICA) Kick-off meeting, University of Washington, Seattle, WA, March 2001.
 - UCAV Program Spring Review, ONR, Richmond, CA, March 2001
 - Software-Enabled Control Semi-annual program review, DARPA, Durango, CO, November 2000
 - UCAV Program Review, ONR, Richmond, CA, August 2000
Performed way-point navigation of RUAV implemented on Yamaha R-50 industrial helicopter
 - UCAV Program Review, ONR, Richmond, CA, August 1999
 - MURI-ARO2, Program review, Berkeley, CA, November 1999
Performed autonomous hover of RUAV implemented on a small-size radio-controlled helicopter
 - SEC Kickoff meeting, San Francisco, October 1999
 - SEC pre-kickoff meeting, Georgia Institute of Technology, Atlanta, GA, May 1999
 - MURI-ARO, Program review, Berkeley, CA, November 1998

1 Unmanned Combat Aerial Vehicle

2 Multidisciplinary Research Program of the University Research Initiative- Army Research Office

TEACHING EXPERIENCES

- Engineering 177 (Advanced Programming with MATLAB), Teaching Assistant, Department of Mechanical Engineering, Spring 2001
- Workshop on UAV: Sensing, Coordination and Control, IEEE Conference on Control Application (CCA), Anchorage, Alaska, September 2000
- Workshop on UAV: Sensing, Coordination and Control, IEEE Conference on Decision and Control (CDC), Phoenix, Arizona, December 1999
- Automatic control of mechanical systems, Teaching Assistant, Department of Mechanical Engineering, Seoul National University, 1992

AWARD

The IFAC Congress Applications Paper Prize

Honourable Mention as one of the five finalist papers at XVth IFAC World Congress in Barcelona, Spain, July 2002

PATENT

- Two (2) Patents were Approved by the Korean Intellectual Property Office
 1. Over-cooling protection valve for automatic transmissions
Disclosure # 95-32712, Disclosed on 12/14/1995
 2. Layout and sliding mechanism for Car Stereo Equalizer knobs
Disclosure # 95-20934, Disclosed on 7/25/95
- Suppression of narrow-band disturbance using nonlinear filter, Patent Application is approved by Maxtor Corporation, July 2002. Will be filed to U.S. patent office

COMPUTER/ELECTRONICS SKILLS

Simulation Tools: MATLAB, Simulink (C-MEX functions), Real-time Workshop, Mathematica

Programming skills: C/C++, Realtime-programming in Tornado/VxWorks, QNX RTOS, MS-Windows programming, Texas Instrument DSP programming, Java, Pascal, FORTRAN, BASIC, Prolog, x86 assembly, HTML, LABWindows

OS: Microsoft Windows 98/NT/2000, MS-DOS, QNX real-time OS, UNIX/LINUX

Graphics: OpenGL

Design Software: AutoCAD, OrCAD, 3D Studio MAX

Communication: TCP/IP, Wireless LAN, RS-232/422 serial communication,

Tools: Microsoft Word, PowerPoint, Excel

Electronics: logic circuit design, schematic and layout using OrCAD

Others: Inertial Navigation System, Global positioning system, INS/GPS integration, PC104 systems, Model helicopter flying

LANGUAGE SKILLS

English, Korean, Japanese (reading/writing technical literature, basic conversation)

HONORS

Scholarship in Seoul National University, 1990

Graduated with Honors from Seoul National University, 1991