

CURRICULUM VITAE

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Education

- Ph.D. in Aerospace Engineering*, West Virginia University, Morgantown, WV, December 2004.
Research Advisor: Dr. Marcello R. Napolitano
Dissertation Title: “Design and Flight Testing Actuator Failure Accommodation Controllers on WVU YF-22 Research UAVs”
Field of Study: Flight Control, Avionics Development, Parameter Identification, Flight Testing, Neural Networks, and Flight Simulation
- M.S. in Control Engineering*, Shanghai JiaoTong University, Shanghai, China, February 1999.
Research Advisor: Dr. Zhiming Wu
Thesis Title: “The Application of Genetic Algorithms in the Design of Fuzzy Model Reference Learning Controller”
Field of Study: Control Theory
- B.S. in Automatic Control*, Shanghai University, Shanghai, China, June 1996.
Research Advisor: Dr. Fengyao Wang
Thesis Title: “Design of a Sliding Mode Controller for a Ship Steering System”
Field of Study: Control System Design

Appointments

- Assistant Director*, Center for Advanced Research in Autonomous Technologies (CARAT), West Virginia University (2007 – present)
- Research Assistant Professor*, Department of Mechanical & Aerospace Engineering, West Virginia University (2005 – present)
- Research Assistant*, Department of Mechanical & Aerospace Engineering, West Virginia University (1999 – 2004)

Research Areas of Interest

Control Theory

- Adaptive Control
- Optimal Control
- Intelligent Control

Aircraft Guidance, Navigation, and Control

- Fault-Tolerant Flight Control
- Formation Flight Control
- Constrained Path Planning
- Vision-Based Navigation

Unmanned Aerial Vehicle (UAV)

- Integrated Avionics System Design
- UAV Flight-Testing Experiments

Research Experiences

Design, Simulation, Validation, and Flight-Testing of Adaptive Fault-Tolerant Flight Control Systems, Sponsor: NASA EPSCoR Program, 2007 - present.

Severing as project manager. The project is currently at its initial stage and the main technical contribution so far includes a “Cascade Control” architecture designed for actuator failure accommodation purpose.

Center for Advanced Research in Autonomous Technologies (CARAT), Sponsor: WVU PSIR Program, 2006 – present.

Severing as Assistant Director of CARAT, have been actively reached out to government agencies, private industries, and faculty members from different research disciplines. Main contributions include proposal writing, communications, and technology developments.

Development of a Small, Ultra Low Cost, and Flexible UAV Test-bed, NASA West Virginia Space Grant Consortium, 2006 – 2007.

Served as Co-PI and project manager. Duties included overseeing small UAV test-bed, avionics hardware, and flight control software development, graduate student interactions and flight-testing managements. Major technical contributions include the development of a miniature autopilot system and a computational efficient GPS/INS sensor-fusion algorithm.

Development of Avionics and Vehicle Prototypes/Systems for SWARM UAV, Sponsor: Augusta Systems, Inc, 2005 – present.

Responsible for overseeing the development of UAV avionics systems, aircraft systems, collision avoidance capabilities, and flight-testing activities. Major technical contribution includes the development of a Curvature-Velocity-Orientation (CVO) method for constrained path planning and UAV collision avoidance.

Design and Flight Testing of Intelligent Control Laws (IFCS) with the WVU YF-22 Research Aircraft Model, Sponsor: NASA Dryden, 2005-2006

Responsible for flight testing operations management of the NASA Dryden program at WVU; duties include overseeing UAV systems and flight-testing services for testing the IFCS control laws on the WVU YF-22 research aircraft.

Development of Formation Flight Control Laws Using 3 YF-22 Models, Sponsor: AFOSR EPSCoR Program, 2001-2004

Responsible for the development of avionics systems, flight control software, part of the formation control laws, and flight-testing protocols. Major technical achievement includes the first autonomous formation flight experiment in the UAV history.

F-16 and YF-22 Scale Models with On-Board On-Line Learning Microprocessor-Based Neural Algorithms for Autopilot and Fault Tolerant Control Systems, Sponsor: AFOSR 1999-2002

Responsible for the development of avionics systems, aircraft parameter identifications, fault-tolerant flight control system design, and flight-testing management. Major

technical contribution includes the design of a neural network based fault-tolerant flight control system.

Airnet: Remotely Controlled B747 and B777 Scale Models Flying With On-Line Learning Microprocessor-Based Neural Network Control, Sponsor: NASA AMES, 1999-2000

Participated in the development of avionics systems and provided flight-testing supports.

Research Proposals

Listed below are related proposals developed during the past two years:

Title	Development of a Small, Ultra Low Cost, and Flexible UAV Test-bed	Date	March 2006
Sponsor	NASA WV Space Grant Consortium	Budget	\$20,000
Role	Co-PI	Status	Funded
Title	Software for Vision-Based UAV Navigation and Control	Date	March 2006
Sponsor	NASA WV Space Grant Consortium	Budget	\$62,804
Role	Co-PI	Status	Not Funded
Title	Development of an On-Board Excitation System for UAV Flight Testing Applications	Date	March 2006
Sponsor	NASA WV Space Grant Consortium	Budget	\$16,330
Role	Co-PI	Status	Not Funded
Title	Behavior Based Formation Flight Control	Date	September 2006
Sponsor	National Science Foundation (NSF)	Budget	\$285,829
Role	PI	Status	Not Funded
Title	Intelligent Vision-Based Aerial Battlefield Surveillance	Date	October 2006
Sponsor	DoD EPSCoR Program	Budget	\$1,029,000
Role	Co-PI	Status	Not Funded
Title	Autonomous Aerial Network For Disaster Response	Date	February 2007
Sponsor	WV EPSCoR Research Challenge Grant	Budget	\$1,850,000
Role	Co-PI	Status	Not Funded
Title	Robust Bubble Detection Algorithm For Decompression Sickness Applications	Date	March 2007
Sponsor	Eyemarker Systems Inc.	Budget	\$48,410
Role	PI	Status	Not Funded
Title	Detection and Risk Mapping of Xylella fastidiosa in Vineyards Using Aerospace and Geospatial Technologies	Date	May 2007
Sponsor	United States Department of Agriculture (USDA)	Budget	\$983,844
Role	Co-PI	Status	Not Funded
Title	Intelligent Aerial System for Highway Data Acquisition	Date	June 2007
Sponsor	Federal Highway Administration (FHWA)	Budget	\$ 1,979,672
Role	Co-PI	Status	Not Funded

Title	Design, Simulation, Validation, and Flight-Testing of Adaptive Fault-Tolerant Flight Control Systems	Date	July 2007
Sponsor	NASA EPSCoR Program	Budget	\$750,000
Role	Senior Personnel	Status	Funded
Title	Curvature-Velocity-Orientation Method for Constrained Flight Planning	Date	July 2007
Sponsor	NASA IRAC program. Topic 1.2	Budget	\$676,668
Role	PI	Status	Not Funded
Title	Airborne Data Acquisition Platform Tool	Date	September 2007
Sponsor	Kutta Consulting (NASA SBIR Topic A1.09)	Budget	\$33,225
Role	PI	Status	Not Funded
Title	Evaluation of Remote Sensing Aerial Systems in Existing Transportation Practices	Date	December 2007
Sponsor	Mid-Atlantic Universities Transportation Center (MAUTC)	Budget	\$250,000
Role	PI	Status	Pending

Invited Presentations

- “*Unmanned Aerial Vehicle Design*”, AeroCopter Inc., Boston, MA, February 2007.
“*Applications of UAVs for Highway Research*”, Turner-Fairbank Highway Research Center, McLean, VA, April 2007.
“*Unmanned Systems Design*”, Terramite Corp., Charleston, WV, October 2007.

Professional Societies

- Member*, Institute of Electrical and Electronics Engineers (IEEE)
Member, American Institute of Aeronautics and Astronautics (AIAA)

Teaching Experiences

- Instructor*, MAE 663, Instrumentation in Engineering, Spring 2008
Substitute Instructor, MAE 460, Automatic Controls, Fall 2006, Fall 2007
Teaching Assistant, C++ Language, Spring 1998
Volunteer Coach, coached high school student teams in attending the China national model airplane competitions, Summer, 1994-1997

Consulting Experience

- Kutta Consulting Inc.*, starting Jan. 2008

Publications: Archival Journals

Campa, G., **Gu, Y.**, Seanor, B., Napolitano, M. R., Pollini, L., Fravolini, M. L., "Design And Flight Testing Of Nonlinear Formation Control Laws", *Control Engineering Practice*, pp 1077-1092, Vol. 15, Issue 9, September 2007.

Gu, Y., Seanor, B., Campa, G., Napolitano, M. R., Rowe, L., Gururajan, S., Perhinschi, M. G., Wan, S., "*Design And Flight Testing Evaluation Of Formation Control Laws*", *IEEE Transactions on Control Systems Technology*, Vol.14, No 6, pp. 1105-1112, November 2006.

Campa, G., Fravolini, M.L., Seanor, B., Napolitano, M.R., Del Gobbo, D., **Gu, Y.**, Gururajan, S., "*On-Line Learning Neural Networks for Sensor Validation for the Flight Control System of a B777 Research Aircraft Model*", *International Journal of Robust Non-Linear Control*, 2002, Vol. 12, pp. 987-1007.

Gu, Y., Wu, Z.M. "*The Rebuilding Process of Hybrid RAID*", *Micro Computer Systems* (in Chinese), April. 1999.

Tang, H.M., Wang, F.Y, **Gu, Y.** "*A sliding-mode variable-structure control method on automatic ship steering*", *Control Theory & Application* (in Chinese), Vol.13, Suppl.1, October, 1996.

Publications: Conference Proceedings

Gu, Y., Seanor, B., Campa, G., Napolitano, M. R., Rowe, L., Gururajan, S., "*Autonomous Formation Flight: Hardware Development*", *Mediterranean Control Conference 2006*, June 28-30, 2006, Ancona, Italy.

Seanor, B., **Gu, Y.**, Napolitano, M. R., Campa, G., Gururajan, S., Rowe, L., "*3 Aircraft Formation Flight Experiment*", *Mediterranean Control Conference 2006*, June 28-30, 2006, Ancona, Italy.

Campa, G., Seanor, B., **Gu, Y.**, Napolitano, M.R., "*NLDI Guidance Control Laws for Close Formation Flight*", *American Control Conference 2005*, Portland, OR, June 2005.

Seanor, B., Campa, G., **Gu, Y.**, Napolitano, M.R., Rowe, L., Perhinschi, M.G., "*Formation Flight Test Results for UAV Research Aircraft Models*", *AIAA 1st Intelligent Systems Technical Conference*, 20-22 September 2004, Chicago, IL, USA.

Wan, S., Campa, G., Napolitano, M., Seanor, B., **Gu, Y.**, "*Design of Formation Control Laws for Research Aircraft Models*", *AIAA Guidance, Navigation, and Control Conference and Exhibit*, August 2003, Austin, TX, AIAA Paper 2003-5730.

Wan, S., Campa, G., **Gu, Y.**, Seanor, B., Gururajan, S., Napolitano, M.R. “*Development of Formation Control Laws for the WVU YF-22 Aircraft Models*”, American Control Conference June 2003, Denver, CO, ACC03-AIAA0041.

Campa, G., Perhinschi M., Seanor, B., Napolitano, M., Del Gobbo, D., **Gu, Y.**, Gururajan, S., “*On-Line Learning Neural Networks for Sensor Validation of a B777 Flying Model*” International Journal of Robust and Nonlinear Control, 12, 2002.

Publications in Progress

Mammarella, M., Campa, G., Fravolini, M. L., **Gu, Y.**, Napolitano, M. R., Seanor, B. “*A comparison of Optical Flow algorithms for use within Real-time applications*”, Submitted to Journal of Real-time Image Processing, November 2007.

Mammarella, M., Campa, G., Napolitano, M. R., Fravolini, M. L., Perhinschi, M. G., **Gu, Y.**, “*Machine Vision / GPS Integration Using EKF for the UAV Aerial Refueling Problem*”, Submitted to the IEEE Transactions on Systems, Man, and Cybernetics, March, 2007.

Gu, Y., Seanor, B., Gururajan, S., Napolitano, M.R., “*Integrated Avionics System for Research UAVs*”, to be submitted to the 2008 AIAA Guidance, Navigation, and Control Conference and Exhibit.

Gu, Y., Campa, G., Seanor, B., Napolitano, M.R., “*A Cascade Control Architecture for Actuator Failure Accommodation*”, to be submitted to the 2008 AIAA Guidance, Navigation, and Control Conference and Exhibit.

Gu, Y., Sagoo, G. K., Seanor, B., Campa, G., Fravolini, M. L., Napolitano, M. R., “*Curvature-Velocity-Orientation Method for UAV Collision Avoidance*”, to be submitted to the 2008 AIAA Guidance, Navigation, and Control Conference and Exhibit.

Extra-Curriculum

Amateur Astronomy – an avid planetary observer and astrophotography. Planetary images have been published on several issues of Sky and Telescope Magazine and Night Sky Magazine.

Telescope Making – Recently finished a 16” F7.2 robotic planetary Newtonian.

Travel and Natural Photography

Personal astrophotography and natural photography website: <http://www.carat.wvu.edu/~gu/>