K. P. (Kip) Haggerty, Consulting Engineer

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Summary of Qualifications

- Provides practical applications of systems theory
- Ph.D. in Electrical Engineering
- Twenty years of experience in control, communication, and sensor systems
- Broad technical background in algorithms, digital signal processing, and Kalman Filtering

Employment History

Dates	Position
8/94 to Present	**Consulting Engineer:** H&A System Engineering, El Segundo, CA – He leads the control, communication, and sensor systems engineering consulting portion of the business. He has provided requirements and analysis for a variety of RF sensors, including resolution of signal processing, tracking, and phenomenology issues. He also led the requirements and architecture model development for a multiple-unit parallel solid-state power conversion system, including specification of digital signal processing and control algorithms for execution on multiple embedded processors.
6/88 to 8/94	**Senior Staff Engineer:** Hughes Aircraft Company, El Segundo, CA – He developed, simulated, and analyzed avionic system concepts that included spread spectrum data communications, radar, and air traffic control communications. He used CASE tools to specify top-level system requirements for two avionic systems. He led the cooperative engagement system concept study for the AAAES program. He participated in a demonstration of the first high resolution radar range profiles from a new waveform.
1990	**Instructor:** Advanced Technical Education Program, Hughes Aircraft Company, El Segundo, CA – He developed and taught a course in Kalman Filtering.
9/84 to 6/88	**Systems Engineer:** Hughes Aircraft Company, El Segundo, CA – He designed, simulated, analyzed and verified radar signal processing, tracking, and calibration algorithms.
7/80 to 9/84	**Member of the Technical Staff:** Hughes Aircraft Company, El Segundo, CA – He designed, simulated, analyzed and verified radar signal processing and tracking algorithms.

Education

Degrees

- M.S. in System Science, ENGR. and Ph.D. in Electrical Engineering, UCLA, 1983, 86, and 88 respectively. Major: Control Systems, Minors: Communication Systems and Applied Mathematics
- B.S.E. in Electrical Engineering, University of Michigan, Ann Arbor, 1980 (Cum Laude). Emphasis: Control Systems and Computer Engineering.

Doctoral Thesis

Chair: Richard E. Mortensen, Professor Emeritus of Electrical Engineering

Title: *Aggregation and Validation of Random Square Wave Load Models for Electric Power Utility Load Control of Residential Cooling and Heating*

Synopsis: Simulation experiments and computer-based statistical analysis of utility data were performed to establish models of load behavior conducive to applying intelligent control techniques to the load management problem. Systems engineering recommendations were made, including recommendations for a new data collection methodology for improved model validation. The ultimate goal of the research effort that included my thesis was to provide intelligent control methods that would permit meeting load demand by improving the operating efficiency of the power grid.

Honors Received

- Tau Beta Pi National Engineering Honor Society
- Hughes Aircraft Company Graduate Fellowships

Continuing Education

- Self-taught: Mathematica, Simulink, Matlab 1995-2000
- *Fundamentals and Applications of Object-Oriented Programming Using C++*, UCLA Extension 1996
- *Systems Engineering with Models and Objects*, Instructor: David W. Oliver, 1994
- *Structured System Development*, Instructor: Imtiaz A. Pirbhai, 1991

Summary of Professional Experience

CASE Methods and Tools

- Developed Hatley-Pirbhai Methodology (HPM) requirements and architecture models for a multiple-unit parallel solid-state power conversion system.
- Developed HPM requirements and architecture models for an avionics subsystem.
- Developed HPM requirements and architecture models for a cooperative engagement system.

Communication Systems

- Specified communication requirements for cooperative multiplatform weapon guidance against ground targets.
- Analyzed requirements for multifrequency shared apertures for satellite communications.
- Specified requirements for advanced covert communication networks and determined data capacity requirements for cooperative engagement networks.

Control Systems and Estimation

- Standardized and simplified digital controllers used in multiple-unit parallel solid-state power conversion system.
- Proved that the state of the power sharing power among the multiple-units of the power conversion system can enter the uncontrollable subspace when a unit goes off line and proved that algorithm reinitialization solves the problem.
- Studied position and orientation location concepts, including global positioning system (GPS), spread spectrum time-of-arrival measurements, and radar mapping of known features.
- Assessed the applicability of fuzzy logic to scheduling of agile-beam radars.
- Designed and verified radar tracking control loops, including responses to jamming (intelligent control).
- Designed and verified Kalman filters used in radar tracking.

Modeling and Simulation

- Developed Matlab simulation model of multipath returns at each element of an interferometer.
- Developed Simulink, Matlab and C simulations of a pulse width modulation controlled DC-to-DC solid-state power converter.
- Wrote computer simulations of Kalman filters, track loops, and signal processing for radar track modes.
- Wrote numerically intensive Monte Carlo simulations of populations of cycling air conditioner electric loads on a vectorized supercomputer.
- Developed load models conducive to applying intelligent control techniques to load management.

RF Sensors

- Analyzed monopulse antenna performance for radar and electronic support.
- Performed monopulse processing architecture trade-off study.
- Developed receiver sensitivity budgets for radar and electronic support.
- Performed radar detection performance trade-off study of antenna concepts.
- Verified models with test data and solved problems discovered during test for fighter to surveillance size antennas.
- Modeled atmospheric refraction on elevation angle and reconciled with test data to define an accurate real-time refraction correction algorithm for long-rage airborne radar.
- Resolved GPS integration, timing, and performance issues.

Signal Processing

- Defined requirements for adding passive ranging to an electronic support receiver.
- Helped produce the first range profile of an airborne target using the multifrequency phase code waveform (see publication 1).
- Analyzed spread spectrum waveforms.
- Analyzed radar, signal intercept, and communication receiver performance.
- Developed signal exploitation technologies and methodologies for radar and signal intercept receivers.
- Designed digital filters and calibration for radar angle estimation.

Software Engineering

- Estimated software sizing for EW and radar software.
- Developed scripts in FileMaker Pro to remove duplicates from a law firm evidence database.
- Provided expert software consulting for a legal case.
- Supported the proposal team on original and revised SBIR proposal for virtual science lab software.
- Designed and implemented relational database systems for the LAACN online directory, electronic warfare system configurations, cooperative engagement network capacity requirements, and test accuracy tracking and analysis.

Teaching and Public Speaking

- Developed and taught course in Kalman filtering. Included setting course objectives, selecting a textbook, preparing lectures, developing course materials, and grading homework.
- Developed and taught 3 days of a hands-on Kalman Filtering short course using Matlab.
- Presented paper at the Innovative Anti-Air Weapon Systems Conference (see publication 2).
- Gave tutorials on HTML, accessing the Internet, and using the Internet for business at IEEE meetings.
- Led workshop sessions at IEEE networking and professional engineering licensing workshops.
- Spoke at IEEE meetings and a college seminar on the consulting business.

Technical Leadership

- Led proposal efforts on 5 small business innovation research (SBIR) proposals and 2 information technology proposals resulting in the award of a two-year master services agreement for the state of California.
- Led system/subsystem technical volume writing on 7 Hughes proposals with 4 winners.
- Led AAAES concept study, a 5-month 1-million dollar study involving about 15 engineers (see publication 2).
- Coordinated interdisciplinary analysis activities and led numerous concept studies in the areas of radar, electronic warfare, and cooperative engagement.
- Recommended changes in departmental computer utilization that saved $83,000 in computing expenses.

Professional Activities and Honors

Professional Affiliations

- Licensed professional electrical and control system engineer (CA)
- Senior Member, Institute of Electrical and Electronics Engineers (IEEE)
- IEEE Los Angeles Area Consultants' Network (LAACN)

Service

- Electronic Conventions Inc. (ECI) Director (2000-2002)
- Second Vice President, California Legislative Council for Professional Engineers (CLCPE) (1997-1998)
- IEEE Region 6 Southern Area Chair (1999)
- IEEE Los Angeles Council Chair (1998), Past Chair (1999), Webmaster www.ewh.ieee.org/r6/lac/ (1998-1999), Legislative Coordinator (1995-1997), CLCPE Delegate (1995-1998)
- IEEE LAACN Webmaster www.laacn.org (1996-1998), Chair (1997-1998)
- IEEE South Bay Harbor Section Educational Activities Chair (1996-1998), Tellers Committee Chair (1999)
- Electrical engineering, mathematics, and artificial intelligence reader for Recording for the Blind and Dyslexic (1991-1998)
- University of California Academic Senate Computing Policy Committee and Academic Computing Council (student member)

IEEE Awards

- Millennium Medal (2000)
- Regional Activities Board Achievement Award (1999)
- Region 6 Special Achievement Award (1998)

Hughes Awards

- 1992 Group Achievement Award, Advancement of Hughes in Tactical Airborne EW
- 1992 Achievement Award
- 1990 Superior Team Award, APG-71 FSD Software Development
- 1989 Achievement Award and Bonus
- 1989 Superior Performance Award
- 1988 Approved Cost Savings: $83,000 for Efficient Utilization of Department Computing Resources

Publications

1. W. F. Butler, K. P. Haggerty, W. B. Kessler, Jr., R. K. Klinger, and J. M. Ziel, "Ultra High Range Resolution Waveform Development and Demonstration," presented at the *37th Annual Triservice Radar Symposium*, Peterson Air Force Base, Colorado Springs, CO, June 25-27, 1991 (Secret).

2. K. P. Haggerty, "The Navy/Hughes Advanced Airborne Anti-Air Warfare Engagement System (AAAES): An Overview," presented at the *Innovative Anti-Air Weapon Systems Conf.*, Johns Hopkins APL, Laurel, MD, June 26-28, 1990 (Secret).

3. K. P. Haggerty and R. E. Mortensen, "Simulation and Analysis of Air Conditioning Load for Individual Unit and Aggregate Load Model Development," participating paper *1989 IBM 3090 Supercomputing Competition*, Gainesville, FL, April 23-25, 1990.

4. R. E. Mortensen and K. P. Haggerty, "Dynamics of Heating and Cooling Loads: Models, Simulation, and Actual Utility Data," *IEEE Trans. Power Syst.*, vol. PWRS-5, pp. 243-249, Feb. 1990.

5. R. E. Mortensen and K. P. Haggerty, "A Stochastic Model for Heating and Cooling Loads," *IEEE Trans. Power Syst.*, vol. PWRS-3, pp. 1213-1219, Aug. 1988.