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Secret DoD Clearance for 30 years until 2001 (when it lapsed). additional URL: <http://www.google.com/profiles/KalmanFilterMaven>

EDUCATION From '71-Present: has taken several (~95) Continuing Education Courses and Short Courses since his highest degree. **University of Iowa, Iowa City:** Ph.D. in E. E./Stochastic Control and Estimation Theory in Feb. 1971. MSEE in Feb. 1969. **Howard University, Washington, DC:** BSEE (Magna cum Laude)/Electrical Engineering (electronics) in Jun. 1967.

Over 38 years experience as a **Research and Development Systems Engineer** for a variety of airborne and shipborne navigation systems. His prior investigations typically included performing trade-off studies by writing computer programs, where he coded up the algorithms himself and then performs simulation studies using the resulting software. Prior to the 1990's, he coded his prototype implementations in the **FORTRAN 66/77** or in the **PL/1** computer languages and then these programs were later manually converted to **assembly language** (by others) for real-time implementation. He had coded assembly language applications himself while at General Electric R&D Center ('71-'73). Now he codes his initial implementations in higher level languages like **MatLab™ ver. 6.5** or in its **Simulink™ ver. 5.0** adjunct (possessing both from **The Mathworks**) then afterwards sometimes converts select prototypes into C using a **MatLab-to-C** compiler (that he possesses from **The Mathworks**). An alternative that he still frequently uses is to implement parts of the software solution in **Absoft™ ver. 6.3 Fortran** or in **Digit Visual Fortran™ 90/95**. He usually uses **Microsoft Visual Basic™ 3.0-6.0**, or **.Net and M/S Access '97/2K** for implementing Graphical User Interfaces (GUI). He possesses both **Wise Installer ver. 8.12** and **PC-Install ver. 7**. As an experienced consultant, he has received several subcontracts from major aerospace primes to **debug programs written by others** and to **write Software Requirement Specifications** in his specialty area of Kalman Filtering. He presents his findings using **PowerPoint™**. He has published 130+ peer-reviewed journal papers and company reports summarizing new and innovative results. He received 1988 M. Barry Carlton Award and \$2000 honorarium for Outstanding Paper to appear in *IEEE Aerospace and Electronic Systems Transactions* in 1987. He received another \$340 award for his technical writing in a contest sponsored by the U.S. Power Commission in 1967. He's a Senior Member of both IEEE and AIAA and is a 28+ year ION member (also 8 in MSDN level II) and has served as chairman/vice-chairman of Boston section of Control System Society for 8 years.

4/9/07 To 4/8/09
2004 To Present

Google contractor via Kelly Services: Swing Shift Scanner & QA Operator for 2-D images (used Excel).
For TeK Associates: Further developed and refined software for TeK Associates' primary product: TK-MIP™ as we convert from a pure service company to one offering shrink wrap software product.

- Served as Web Master in creating content for company Web Site: www.TeKAssociates.biz
- Wrote four technical papers in the estimation and Kalman filtering area as further advertising of our technical expertise in this same area as our software product. Two are under technical review, two have already been published in *AIAA Journal of Guidance, Control, and Dynamics*. Have had twenty-one research and applications papers published in our specialty since 1991. He founded company in '92.
- Took course in National Instrument's **ATEasy™** that handles many different recent Input/Output protocols including USB, VXI, PXI, Ethernet, RS-232, and GPIB. 17 years as a Windows developer.
- Wrote TeK Associates' Business Plan for 2006 NECINA Business Plan competition.

2003 (6 weeks)

At TeK Associates, with a subcontract from Arête Associates' Navy AROSS program, developed a Kalman filter-based covariance analysis program using MatLab™.

- Used covariance analysis program mentioned above and exercised it in performing a quantitative analysis of the relative pointing accuracy provided by each of several alternative candidate Inertial Navigation System **INS** platforms of varying quality (and cost) by using high quality GPS [P(Y)-code, differential, or kinematic] fixes at a high rate to enhance the INS with frequent updates to compensate for degradations incurred with time due to inherent gyro drift rate characteristic of each of several INS candidates being evaluated.

2002(summer)

At TeK Associates for Boeing Company:

- Prepared a proposal (as specifically solicited) to improve the tracking filter used for National Missile Defense (NMD) in the application below. Published two papers as an outgrowth of that work.

June 1999 To
October 2000

With a direct TeK Associates subcontract from: Raytheon, Sudbury, MA
Served as RADAR SYSYEM CONSULTANT specializing in Tracking Issues

- Wrote specialty "radar target tracking" segments of Software Requirements Spec. for Updated Early Warning Radar (UEWR)
- Participated in the **development** (and **debug**), and **refinement** of parameters in the **implementation** and **test** of various candidate **Extended Kalman Filters (EKF's)** for **UEWR**, as implemented in **Fortran** on several different UNIX platforms and targeted for eventual C implementation. He implemented prototypes in **MatLab™ 5.3** and in **Fortran** on PC for our experiments prior to translation (by others) into C code.
- Wrote an **M/S Word** memo "On use of Lambert algorithm versus use of Levenberg-Marquardt algorithm for Early Warning Radar target Track Initiation (**TI**)".

December 1998
To May 1999

- Participated in the writing (using **M/S Word™**) of the **Software Requirements Specification (SRS)** for Raytheon's Batch Least Squares (BLS) Algorithm, for the following extended Kalman filters: RVCC EKF, RUV EKF, for Interactive Multiple Model (**IMM**) Filter, and for Track Initiation (**TI**).

Performed System Analysis Studies of Updated Early Warning Radar (UEWR)
with a Tek Associates subcontract from: **XonTech, Inc. (Lexington, MA), as**
RADAR SYSYEM CONSULTANT specializing in Tracking Issues:

- Exercised the same **CRLB** evaluator for gauging tracking accuracy that had been previously implemented below for MITRE, and applied it to XonTech's more realistic **TD/SAT™** simulations and compared results to **Extended Kalman Filter (EKF)** results.
- Prepared and delivered **M/S PowerPoint™** presentation of the above results.
- Became familiar with parameter settings of XonTech's software program **TD/SAT** and its associated corresponding UEWR radar performance evaluations.
- Single-handedly wrote the 150 page UEWR Analysis Design Notebook on Tracking, summarizing the tracking behavior established to date for UEWR.

May 1997 To
August 1998

Performed System Analysis Studies of Updated Early Warning Radar (UEWR)
As a contract engineer to: **MITRE (Bedford, MA), via a Gemini Basic Ordering Agreement (BOA) as**
RADAR SYSYEM CONSULTANT specializing in Tracking Issues:

- Designed and developed and coded a **Cramer-Rao Lower Bound (CRLB)** evaluator (an area of my prior published 1974 and 1989-'90 expertise) for gauging tracking accuracy. Personally implemented this evaluation tool in **MatLab™ 4.2**.
- Documented the **CRLB** implementation and its User instructions.
- Exercised this **CRLB** tool to **evaluate** expected performance of best possible tracking algorithms over a variety (40) of specified trajectories, as viewed by different Early Warning Radar locations and their respective characteristics.
- Wrote a Tek Associates' final report (in **LaTeX**) and then as a MITRE final report (in **M/S Word**) summarizing the results of these **CRBL** evaluations.
- Wrote a White Paper (in **M/S Word**) for MITRE considering both **CRLB** and other aspects that affect radar tracking accuracy for UEWR.
- Wrote (in **LaTeX™**) and delivered a published peer-reviewed paper on all the above aspects at *AIAA Ballistic Missile Defense Organization (BMDO) Conference and Workshop* at Colorado Springs in August 1998.

October, 1992
To April 1996

Designed, Developed, Implemented, Tested, and Documented our software product: TK-MIP™
Client: Myself, as CEO/Chief Programmer/acting Advertising & Marketing Manager

- Design of commercial **TK-MIP™** software for the PC as a way to quickly and cost-effectively implement various Kalman filter design options as a prototype so that user avoids the need to do any programming whatsoever.
- Developed and published in several technical conference Proceedings several closed-form test cases to Verify and Validate **TK-MIP™** and that can be similarly used for any other software of this type.
- Implemented **TK-MIP** Graphical User Interface (**GUI**) in **Visual Basic (VB) 3.0**, with other critical portions implemented in **VB 5.0** and **6.0** (as truly compiled modules).
- Performed **unit and integration testing** of **TK-MIP™**. Performed thorough **regression tests** after every major change to confirm that no prior functionality was clobbered as a consequence of change.
- Prepared two levels of a selectable **on-line user guide** for **TK-MIP™** to prompt and support both the novice and experienced user.
- Did publicity and marketing: published successful applications in peer-reviewed professional IEEE, SPIE, AIAA, and Institute of Navigation journals (in GPS use for airborne image collection for mapping; for image enhancement and multi-sensor data fusion; for simplifying iterated EKF implementation). Had a total of 9 technical publications in 2001. Four in 2005. Used Microsoft Word and PCTex LaTeX to prepare these documents. Created his own artwork and graphics, as needed.

Feb. '71 to Aug. '92: Control Engineer, General Electric R&D Center ('71-'73); Member of Technical Staff (MTS) at TASC ('73-'79); Senior Systems Engineer/Senior Analyst at Intermetrics Inc. ('79-'86); **MTS** at Lincoln Lab. of MIT ('86-'92); taught Optimal Control in the evenings for four years ('90-'95) in graduate ECE Dept. of Northeastern Univ. From '73-'92, was exclusively in navigation (INS/Loran/GPS) and Early Warning Radar target tracking work for DoD for a variety of different platforms including submarines: SSBNs, SSNs, aircraft: F-23 ATF (all in an R&D design and/or simulation and/or in a test capacity, as in our DT&E(OR) monitoring of two Phase 2 GPS integrators on attack submarines in '82-'83).

Professional References:

Dr. George Galdos, Computational Solutions, Inc.,
118 Rustic Lane, Reading, MA 01867;
Tel: (781) 942-0416 (Home); (781) 942-0896 (W);
At **CAST** during the day: (978) 667-8720 (work)

Dr. Larry Wiederholt, MITRE,
85 Cedarwood St., Boxboro, MA 01719;
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