Jeffrey Byrne

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Education

CARNEGIE MELLON UNIVERSITY Pittsburgh, PA

Master of Science: Electrical and Computer Engineering .... Jan 1996 - Dec 1997
Bachelor of Science: Electrical and Computer Engineering .... Aug 1992 - Dec 1995

Work Experience

SCIENTIFIC SYSTEMS COMPANY, INC. Woburn, MA .... 2005 - Present
Senior Research Engineer

- *VAMAV:* Visual Awareness/Avoidance for a Micro Air Vehicle: Principle investigator on graph based video segmentation and time to collision estimation for obstacle detection. Rapidly exploring random trees for avoidance. Collaboration with Sarnoff Corp and Brigham Young University.

- *ImageNav2:* Principal investigator in ultra tightly coupled architectures for image aided navigation.

- *ImageNav:* Image aided navigation for UAV operations in GPS denied environments. Principle investigator on sparse feature tracking, egomotion estimation, and terrain aided navigation from stereo DEM matching. Collaboration with Boeing Mission Planning Systems.

- *EVASE:* Extensible Video Analysis of Symbology Events. Principle investigator on symbol tracking and pattern classification in video for the heads up display and multi-function display in the F-16. Collaboration with University of South Florida.

- *ACR:* Stereo based projectile trajectory estimation for UAV surveillance. Principle investigator on stereo video analysis for the SilverFox UAV. Collaboration with Advanced Ceramics Research.

SCIENTIFIC SYSTEMS COMPANY, INC. Woburn, MA .... Nov 2002 - 2005
Research Engineer

- *VISTA:* Visual Threat Awareness for a UAV. Principle investigator on real time, stereo based obstacle detection using foveation, graph cuts, fused image segmentation. Real time flight experiment in 2004. Collaboration with Sarnoff Corp. and Georgia Tech.

- *VISARD:* Model based pose estimation for proximity rendezvous and docking. Consulting on image processing algorithms, stereo reconstruction, and real time data collection.

- *CMARS:* Cruise Missile Auto Routing System. Software engineering and unit test framework for a genetic algorithm based autorouter for the Tomahawk cruise missile. Software is currently live on Tomahawk mission planning system (MPS) for the Navy.

- *Scatterable minefield detection:* Multispectral, generalized likelihood ratio test (GLRT) and boosted classifier for mine detection and moment invariant based minefield detection from an airborne platform. Collaboration with University of Missouri at Columbia

- *K-cut image segmentation:* Perceptual organization based spectral graph partitioning for multiway cuts. Collaboration with MIT and University of South Florida.

- *Constrained Fuzzy Clustering:* Quadratic programming based approach to clustering given nonlinear constraints applied to multi-target tracking in particle filters. Collaboration with Lockheed Martin.

- *Network Intrusion Detection:* Internal consulting for Application Specific Integrated Processor (ASIP) architecture design for real time OC-12 and above SNORT like stateless intrusion detection. Collaboration with RTI.

CMU ROBOTICS INSTITUTE Pittsburgh, PA ————————————— Sep 2002 - Nov 2002
Consultant

- *Micro Vision Engine 2.0:* Hardware redesign of a camera processor board for micro air vehicles to support color NTSC output. Low noise analog PCB layout, debugging, and 100 board prototype run with contract manufacturer.

XPEED NETWORKS, INC. San Jose, CA ————————————— Oct 1998 - Apr 2001
Engineering Manager

- *SDSL product line:* Responsible for development and maintenance of the SDSL product line (total of 4 products).   Organized, scheduled and managed a team of four.

- *X320A:* Lead design engineer for the X320A SDSL ATM Ethernet bridge from architecture to shipping. Design included firmware and PCB hardware design.

Design Engineer

- *X310:* Lead design engineer for the X310 SDSL USB modem from architecture to volume shipping. Designed and debugged hardware, firmware, custom OS and bootstrap code. Worked with Xpeed ASIC team to debug custom ASIC.

- *X300:* Created embedded firmware for the X300 SDSL PCI NIC. Windows 95/98/NT network driver development and testing.

- *Xpeed Networks:* Silicon Valley based start-up company designing low-cost DSL products. First embedded design engineer on board.

CMU ROBOTICS INSTITUTE Pittsburgh, PA ————————————— Jun 1996 - Jun 1998
Research Staff Member - Vision and Autonomous Systems Center

- *Reconfigurable Vision Machine:* Hardware design and testing of VME based 'Host Interface' board. Firmware design of custom OS and drivers for the 'Host Interface'. Prototyped a vision algorithm to classify glass milk bottles in collaboration with Takeo Kanade.

- *Mine Detection:* Short term consulting project to design and test an efficient hardware interface to a spot laser rangefinder for range data collection. Wrote a C API to control rangefinder and gather data over a parallel port.

CMU ROBOTICS INSTITUTE Pittsburgh, PA ————————————— Jan 1995 - Jun 1998
Research Assistant - Field Robotics Center, Vision and Autonomous Systems Center

- *Automated Timber Inventory Project*: Designed prototype 'point-and-click' tree diameter estimation system.   Researched and wrote an image processing algorithm based on texture segmentation. Implemented a prototype using off -the-shelf hardware for proof of concept.

- *Mobius Systems:* Founded with Sanjiv Singh to commercialize an interface to a common inertial navigation system. Hardware and firmware design of embedded 68HC11 to perform protocol translation. UNIX and Windows 95 serial port API and GUI.

- *Transitional Unmanned Ground Vehicle (Navlab IV) Project*: Created and supported CCD camera interface libraries for an autonomous army vehicle. Designed a hardware/firmware interface to an inertial navigation system.

- *Virtualized Reality Project*:   Designed support hardware for a multi-baseline stereo reconstruction. Designed an S-BUS NTSC video time code interpreter board to synchronize multiple video streams. Wrote C API and GUI to easily monitor and control the hardware. Advised by Takeo Kanade for Junior year undergraduate research project (18-332).

CMU COMPUTING SERVICES Pittsburgh, PA ⸺⸺⸺⸺⸺⸺⸺⸺⸺⸺ Aug 1993 - May 1995
Computer Cluster Manager, Computer Consultant - Wean Hall

- Responsible for the maintenance, staffing and security of Wean Hall, the largest computer center on campus in the computer science building.

- Computer consultant: Staffed campus computer centers to answer user questions and troubleshoot PCs.

Publications

Conference Proceedings:

1. J. Byrne, M. Cosgrove, and R. Mehra, "Stereo Based Obstacle Detection for an Unmanned Air Vehicle"**,** *Proceedings of the 2006 IEEE International Conference on Robotics and Automation (ICRA),* Orlando, FL, May 15-19, 2006, pp. 2830-2835.

2. J. Kelsey, J. Byrne, M. Cosgrove, S. Seereeram, and R. Mehra, "Vision-Based Relative Pose Estimation for Autonomous Rendezvous And Docking", *Proceedings of the 2006 IEEE Aerospace Conference*, March 4-1 2006, pp. 1-20.

3. R. Mehra, J. Byrne, J. Boskovic, "Flight Testing of a Fault-Tolerant Control and Vision Based Obstacle Avoidance System for UAVs", *Proceedings of the 2005 Association for Unmanned Vehicle Systems International (AUVSI) Conference, North America*, 2005.

4. R. Mehra, J. Byrne, J. Boskovic, "Intelligent Autonomy and Vision Based Obstacle Avoidance for UAVs", *Proceedings of the Thirteenth Yale Workshop On Adaptive and Learning Systems*, New Haven, CT, May 30-June 1 2005, pp. 59-66.

5. J. Byrne, M. Cosgrove, and R. Mehra, "Real Time Stereo Based Obstacle Detection for UAV Threat Avoidance: Initial Flight Experiment Results"**,** *Proceedings of the 2005 Government Microcircuit Applications and Critical Technology (GOMACTech),* Las Vegas, NV, April 4-7, 2005, Session 2.5 (invited paper).

6. J. Byrne, A. Gandhe, R. Prasanth, B. Ravichandran, M. Huff, R. Mehra, "A k-partition, Graph Theoretic Approach to Perceptual Organization", *Proceedings of the 2003 IEEE conference on integration of knowledge intensive multi agent systems (KIMAS)*, Cambridge MA, September 30-October 4, 2003, pp. 336-342.

Technical Reports:

1. J. Byrne and R. Mehra, "VAMAV: Visual Collision Detection and Avoidance for a Micro Air Vehicle", AFRL/MNGI SBIR Phase I Final Report, Contract FA8651-06-M-0201, 2007.

2. J. Byrne, A. Corrubia, A.Gandhe and R.Mehra, "A Robust Image Based Navigation System", NAVAIR SBIR Phase II Final Report, Contract N68335-05-C-0055, 2007.

3. J. Byrne, B. Ravichandran, R. Mehra, "EVASE: Extensible Video Analysis for Symbology Events", Air Force SBIR Phase I Final Report, 1401 final report, Contract FA9302-05-M-1002, February 2006.

4. J. Byrne, M. Cosgrove, R. Mehra, "VISTA: Visual Threat Awareness for an Unmanned Air Vehicle", DARPA SBIR Phase II, Contract DAAH01-00-C-R187, April 2005.

5. A. Gandhe, J. Byrne, R. Prasanth, M. Huff, B. Ravichandran, R. Mehra "Automatic Target Recognition using Perceptual Organization", Army SBIR Phase II Final Report, Contract DAAD19-01-C-0057, Jan 2004.

6. J. Byrne, A. El Fallah and R. Mehra, "Constrained Fuzzy Clustering for Probability Hypothesis Density (PHD) Tracking", MDA SBIR Phase II progress report 3, Contract DASG60-03-C-0016, September 2003.

7. J. Byrne, S. Yu and R. Mehra, "Robust Detection of Scatterable Minefields", SBIR Phase I Final Report, Army Contract DAAB07-03-C-L201, July 2003.

8. J. Byrne, S. Singh, "Precise Image Segmentation for Forest Survey", *Carnegie Mellon University Robotics Institute Technical Report,* CMU-RI-TR-98-14.

Research Grant Proposals

Proposal Title	Offerer	Collaborators	Submission	Funded?
VAMAV: Phase II	Air Force (AFRL/MNGI) SBIR Phase II (AF06-149)	Brigham Young University, Sarnoff Corporation	Nov 2006	Under Review
ImageNav Phase III	NAVAIR	Boeing, Spatial Tech, Raytheon Missile Sys.	Oct 2006	Under Review
DANAV: A Tightly Coupled System for Obstacle Detection, Collision Avoidance and Video Aided Navigation	Army SBIR Phase I (A06-001)	UC Berkeley	July 2006	N
Stereo Reconstruction for Projectile Trajectory Estimation	Navy SBIR Phase II (N04-253)	Advanced Ceramics Research (subcontract)	June 2006	81K
ImageNav2: A Tightly Coupled System for Image Aided Navigation	Air Force STTR Phase I, (AF06-T032)	University of South Florida, Spatial Technologies	Jan 2006	100K
EVASE: Extensible Video Analysis for Symbology Events	Air Force SBIR Phase II (AF05-309)	University of South Florida	Oct 2005	750K
UGOPS: Unmanned Air Vehicle Ground Operations Positioning System	Air Force SBIR Phase I (AF06-238)	Northrop Grumman, Calspan	Jan 2006	N
VAMAV: Visual Collision Detection and Avoidance for a Micro Air Vehicle	Air Force (AFRL/MNGI) SBIR Phase I (AF06-149)	Brigham Young University, Sarnoff Corporation	Jan 2006	100K
Terrain Sensing for Big Dog	Boston Dynamics RFP		Oct 2005	N
Detect See and Avoid (DSA) Systems and Operational Requirements Analysis for Tactical UAV Operations in Unrestricted Airspace	Army SBIR Phase I (A05-064)	Northrop Grumman, Amphitech, Booz Allen Hamilton	July 2005	N

Multispectral Target Detection and Classification for All Weather Sensing	DARPA SBIR Phase I (SB052-018)	Northeastern University, SAIC	July 2005	N
Visual Collision Detection and Avoidance for a Micro Air Vehicle	Air Force SBIR Phase I (AF05-164)	Honeywell, Sarnoff Corporation	Jan 2005	N
Autonomous Aerial Refueling for an Unmanned Air Vehicle	Northrop Grumman RFP		Sept 2004	N
Integrated Motion Planning, Awareness and Control Technology for an Unmanned Air Vehicle	DARPA SBIR Phase I (SB043-048)	NASA Rotorcraft Division, U of Illinois at Urbana Champaign	Aug 2004	N
VISOA: Visual Obstacle Avoidance for an Unmanned Air Vehicle	Navy SBIR Phase I (N04-178)	Sarnoff Corporation, Georgia Tech	June 2004	N
VISTA: Visual Threat Awareness for an Unmanned Air Vehicle	DARPA SBIR Phase II (SEC Program)	Sarnoff Corporation, Georgia Tech	May 2003	700K

Green = Funded proposal
Yellow = Under evaluation

Patents

1. Jeffrey Byrne and Raman Mehra, "A System and Method for Obstacle Detection using Binocular Stereo", *United States Patent and Trademark Office Provisional Patent Application EV 713248736 US*, April 2006

Skills

COMPUTER VISION: Multiview stereo reconstruction, Egomotion estimation, 2D pattern recognition, 3D model based pose estimation, Bayesian inference with graph cuts, Perceptual organization based image segmentation, Monocular obstacle detection, Clustering, Camera calibration, Sparse feature tracking, IMU aided vision, FLIR processing, Outdoor vision

ROBOTICS: Field and flight experiments with unmanned air vehicles (UAVs) and unmanned ground vehicles (UGVs), Embedded computational architectures for robotics, IMU aiding for visual reconstruction, UAV image rendering for simulation, Navigation filters, Camera specing and vehicle mounting

SOFTWARE: C, C++, Matlab, Python, Cross platform development for Linux and Windows, frame rate computer vision, OpevCV, real time embedded firmware programming in C and Assembly (ARM7 thumb/arm, 8051), Device drivers (Ethernet, USB, ATM SAR, Frame Relay, xDSL), RTOS integration (Nucleus, QNX), embedded microprocessor bootstrap.

NETWORKS: Network stacks (TCP/IP, ATM, Frame relay, Ethernet), Network protocols (FTP, TELNET, HTTP, SNMP, NAT), Learning bridges, Windows 95/98/NT NDIS drivers, sockets

HARDWARE: Embedded digital design, Schematic capture (Orcad, ACCEL), Design and testing for FCC class B compliance, Design for volume manufacturability, Design for in-circuit testing, Networking and communications (USB 1.1, Ethernet, SDSL, ATM, PCI, VME, RS-232C/RS-422, Parallel Port), Design for telco environment, Microprocessors (ARM7 derivatives [KS32C50100, KS8946, KS17C4000], 8051, 68HC11, 68EN360, x86),

Low noise analog layout (video, communications physical layer, switching power supply), PLD layout and coding, ASIC debug.

Honors

Small Business Technology Transfer (STTR) Phase I research grant winner (ImageNav2)	2006
Small Business Innovative Research (SBIR) Phase I research grant winner (VAMAV)	2006
ImageNav project selected to present at Navy TAP forum	2006
Small Business Innovative Research (SBIR) Phase II research grant winner (EVASE)	2006
National Science Foundation (NSF) reviewer for image based sensor networks proposals	2005
Small Business Innovative Research (SBIR) Phase II research grant winner (VISTA)	2003
Graduated with university honors for maintaining a QPA of 3.5 or better	1996
Graduated with ECE college honors for completing a senior honors research project	1996
Member Eta Kappa Nu engineering honor society	1996
3rd Place in CMU undergraduate research symposium	1995
Undergraduate research grant winner	1995
Clifford B. Connolley memorial scholarship for academic excellence	1993 -1995
Francis Ouimet scholarship	1995
Dranetz memorial engineering scholarship	1992

Status

US citizen, Secret Clearance