American GNC Corporation

ABOUT

ADVANCED TECHNOLOGIES FOR CONTEMPORARY PROBLEMS AND CRITICAL APPLICATIONS

AGNC is a dynamic organization that strives for innovations and the infusion of newly emerging technologies within a variety of systems. Starting as a guidance and navigation company, our efforts have expanded into multiple complementary areas with the primary goals of increasing reliability, enhancing autonomy, and obtaining a better understanding of systems. Critical and complex systems are the primary target in AGNC's applications. AGNC's extensive R&D approach blends five areas of work encompassing guidance, navigation, control, and communications; complex systems analysis; unmanned systems and robotics; systems health monitoring and smart sensors; intelligent systems, computer vision, and neurocomputing

MISSION

AGNC dedicates itself to providing advanced & innovative engineering technologies, scientific analysis, applications support, and cost effective products to its customers.

VISION

AGNC is committed to delivering effective, state-of-the-art solutions and meeting technical, cost, and scheduling needs of customers by designing, developing, and manufacturing high quality products, applying the coremicro® series to practical applications with a focus on miniaturization, reliability, and embedded intelligence, and improving the quality of life for the next generation by continuing long-term research and development efforts within diverse fields

VALUES

AGNC strives to build upon a reputation for important contributions in the fields of engineering and science, while constantly improving its products and satisfying both customers and employees. With extensive project management expertise and responsibility, our team is committed to the success of each of its programs.

CORE COMPETENCIES

Guidance, Navigation, Control, and Communications

American GNC Corporation is actively involved in pioneering efforts related to inertial sensors, interruption-free positioning, and INS/GNSS fusion. AGNC produced the world's first MEMS rate integrating gyroscope in 1999, setting the stage for continued development of its coremicro® IMU product series, and is among the very first companies to patent micro-electromechanical (MEMS) Inertial Measurement Unit (IMU) technology, which is commonly found in most handheld consumer electronics such as tablets and smartphones. AGNC has always been aware of the pros and cons of different positioning technologies, and so engaged in breakthrough efforts during the late 90's for the fusion of inertial data with other sources, which is now decades later, being utilized by consumer devices for applications such as indoor or urban navigation.

AGNC continues to develop GNCC technologies and remains involved in technology design and integration for commercial and government systems including autonomous vehicles, aircraft, land vehicles, marine vehicles, missiles, satellites, spacecraft, large space structures, robotics, underwater vehicles, and more.

Unmanned Systems and Robotics

Enhancing the autonomy of unmanned systems and vehicles by infusing technologies in the areas of navigation, control, intelligent processing, and health diagnostics and prognostics is a key focus at AGNC. The company's coremicro® Robots serve as ideal platforms for integrating new technologies that reduce operator workload and increase autonomy. Our capabilities include target detection and tracking, obstacle avoidance, localization, terrain mapping, route formulation, resource allocation, among many others.

Applications of AGNC's robotics technologies include: (i) GPS-denied and unstructured navigation; (ii) UAV and UGV surveillance and reconnaissance; (iii) surgical support by miniaturized robots; (iv) layered sensing architectures for military command and control; and (v) terrain analysis and classification by computer vision.

Systems Health Monitoring and Smart Sensors

Advanced Signal Processing for Vibration Analysis

coremicro Reconfigurable Embedded Smart Sensor Node (CRE-SSN)

Prognostics Health Management (PHM) increases system reliability and supports maintenance operations as well as automated logistics. Depending on the application, PHM technology can involve sensing architectures, system modeling, fault characterization and analysis, signal processing, and pattern recognition. AGNC is enhancing PHM capabilities with: (a) diagnostic reasoning and dynamic learning; (b) new signal processing methods; (c) maintenance support decision software; (d) artificial intelligence and deep learning; (e) standardizing architectures; (f) complex system modeling; (g) networking with mobile technologies; and (h) ruggedizing designs.

The integration of configurable and standardized smart sensors with embedded data acquisition, flexible communications, self-diagnostics, Transducer Electronic Data Sheets (TEDS), evolving learning, and embedded processing facilitates PHM applications. AGNC's "Distributed Intelligent Health Monitoring" framework consists of networks of smart sensors serving as distributed computational platforms with intelligent capabilities for improving monitoring operations. This technology serves as a strategy to ease technological upgrades, increase system reliability, reduce operator workload, and increase modularity, scalability, and extensibility.

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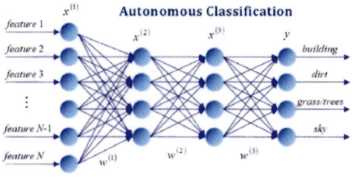
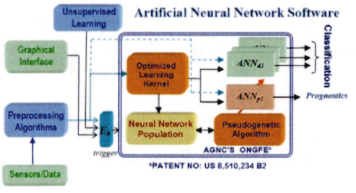
Artificial Intelligence and Machine Learning

Artificial intelligence techniques enable the realization of cognitive systems which have many applications such as automating decision making processes, image scene understanding, diagnostics and prognostics, pattern recognition, resource allocation, intelligent control, forecasting, and many others. Due to the challenges within the neuroscience field, there are numerous areas of opportunity for new innovations that can have a beneficial impact on system autonomy, performance, and reliability. AGNC is actively developing technologies that address the engineering and science aspects of new learning methods (architectures, theory, dynamics, self-organization, genetic algorithms). Our products in the AI/ML fields include:

- Optimized Neuro Genetic Fast Estimator (ONGFE). This software toolset contains a rich set of neural network design tools for diverse architectures, using both traditional and deep learning based networks. Capabilities include pattern recognition, function approximation, unsupervised clustering, pseudogenetic optimization, and a C++ based API.
- Embedded Collaborative Learning Engine (eCLE). This AI-software tool allows for the expansion of knowledge in a cognitive system based on incremental and dynamic collaborative learning. This way a neural network trained on an initial set of data can be retrained as new knowledge is acquired during the lifetime of its deployment.





Computer Vision and Image Processing

Everyday vision-based tasks of humans such as recognizing familiar places, driving a car, or reading another person's expression may seem trivial. However, there are significant technological barriers for implementing such capabilities in computer vision and image processing based systems. These barriers require solutions in both image presentation as well as cognition (image understanding). AGNC is dedicated to developing novel solutions to computer vision problems and has in-depth experience in related areas such as image enhancement, visual odometry, scene understanding, semantic segmentation, and target detection and tracking. Techniques range from the traditional image processing field (such as edge detection, optical flow, noise reduction, morphological operations, etc.) to the newest advances in deep learning (such as convolutional neural networks, region proposal networks, attention-based transformer networks, etc.)

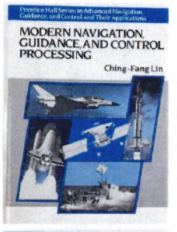
FOUNDER

Dr. Ching-Fang Lin

Dr. Lin is the founder of the American GNC Corporation and the driving force behind AGNC's many accomplishments. As a Taiwanese immigrant, Dr. Lin began his illustrious career at the University of Michigan in Ann Arbor, where he received his Ph.D. degree in Computer, Information, and Control Engineering in 1980. During his teaching career at the University of Michigan in Ann Arbor and at the University of Wisconsin in Madison, he consistently pursued several areas of critical importance to modern technology and carefully evaluated, in both theory and practice, the implications of their development and integration. Dr. Lin authored over 400 technical publications and was responsible for over 100 patents and patent applications. Over the same time period, he was responsible for over 1,000 government contract reports. In the last ten years, he led the effort to introduce over 30 GNCC products. With a rare combination of talents that allowed him to be a leader in creating highly successful products, based on a thorough understanding of advanced technical principles. These talents were manifest in the world's first and still best selling book series by Prentice Hall on GNCC systems and their applications, including GPS in 1990.
Dr. Lin's career spans more than 25 years of teaching, research, industrial applications work, and senior management within the fields of guidance, navigation, control, and Communication (GNCC). He developed a miniature size, coremicro IMU, which is low cost and uses little power. It represents a unique product that has immensely expanded the applicability of navigation systems. The many projects that Dr. Lin has been responsible for have applications encompassing personnel tracking, aircraft, marine vessels, ground transportation vehicles, missiles, spacecraft, armored vehicles, helicopters, submarines, robotics, space structures and uninhabited air/underwater vehicles.

As a world class and prolific researcher, Dr. Lin made fundamental and diverse contributions to GNCC. His work is of the highest quality and is broadly utilized. He addressed and solved many important problems in the development of modern high tech systems. One of the excellent attributes of this research is the proper balance he achieved between theory and its applicability to real world GNCC problems. This work is well known and regarded by his peers. His visionary pursuit of advanced research and technology impacts a broad range of critical areas such as ground/mix air proximity warning systems, spacecraft docking systems, robotics, intelligent autonomous hierarchical information, autonomous decision and control, "Modeling, Design, Analysis, Simulation and Evaluation" (MDASE), and environment recognition and adaptation. He recognized the full potential for current methods and adopted far-sighted approaches to future problems. Dr. Lin developed innovative products and methods, procedures, algorithms, hardware and software tools for the analysis, design, simulation and evaluation of autonomous systems. This multidisciplinary approach to intelligent vehicle control is an integrated GNCC system blending the most powerful elements of modern theory within a practical framework. The system includes several different types of advanced sensors, such as: hyperspectral, visible, infrared, laser ranging, passive millimeterwave imaging devices, and multiple sensor configuration navigation systems, such as AGNC designed Fully-Coupled GPS/INS systems incorporating the coremicro IMU. Dr. Lin developed extensive GNCC techniques which provide effective, reliable, and inexpensive means to enhance flight safety. He also developed the design of collision avoidance systems that detect and react to safe flight/driving threats.

He has been recognized for his exceptional achievements by both business and engineering leaders worldwide. A list of achievements and organizations follows.



Achievements & Awards

- SBA Small Business Person of the Year 2002
- NASA Space Act Award Recognition for Inventions and Scientific and Technical Exceptional Contributions
- Multiple Multiyear NASA Innovative Invention Award
- Donald P. Eckman Award Nominee for Outstanding Control Engineer
- Nominee for the Mechanics and Control of Flight Award
- Who's Who in Leading American Executives
- Five Hundred Leaders of Influence in the World
- The International Who's Who of Intellectuals
- Who's Who in Science and Engineering
- Two Thousand Notable American Men
- "Man of the Year - 1993" of the International Biographical Association
- "Most Admired Man of the Decade" of the American Biographical Institute

Organizations & Memberships

- General Chairman of the First IEEE Conference on Aerospace Control Systems in 1993
- Honorary General Chairman of the 1995 International Conference on Control and Information
- Organizing Committee Chairman of the 1996 International Conference on GPS
- 1987-1995 Special Events Chairman for the American Control Conference
- Eminent Fellow/Research Board of Advisors for the American Biographical Institute
- Fellow of the International Biographical Association, Cambridge, England
- 1992-2000 Member and Awards Chairman of AIAA Guidance, Navigation and Control Technical Committee
- 2001-2005 Member of the AIAA Aerospace Traffic Management Technical Committee
- Sigma Xi & Tau Beta Pi
- Associate Fellow of AIAA
- Senior Member of IEEE & CSS
- Avionics Software Chairman and Committee Member for the IEEE Working Group on Computational Issues
- 1980-2000 Operating Committee Member & Technical Program Chair for AIAA, IEEE, SCS and SAE Sponsored Conferences
- NASA Cross Enterprise Technology Development Program Panel Member and Non-Advocate Reviewer

DIRECTOR OF PRODUCTS

Hiram McCall

Hiram McCall is currently the Director of Products at American GNC Corporation and is an experienced systems engineer in guidance, navigation, control systems, software and algorithms, circuit, and instrument design. Mr. McCall received a BS and MS both in Electrical Science from Georgia Institute of Technology and his previous positions include Principal System Engineer at United Technologies Aerospace Systems, Principal Navigation Systems Engineer at BAE Systems, System Engineer Specialist at Lear Astronics, and Avionics Systems Engineer for Lockheed Aeronautical Systems Company, among others. At United Technologies, he developed algorithms for navigation, guidance, and flight critical controls systems. For example, he was system engineer for the pitch rate sensor replacement for the Boeing 777 flight control system. At BAE Systems, he was the systems architect for the ARES launch vehicle control system and algorithms including pitch, roll, and thrust control loops. During the late 90's through early 2000's, Hiram was a Principal Systems Engineer and the Vice President for New Product Development at AGNC where, side by side with Dr. Ching-Fang Lin, he directed new product development and system design efforts, generated sensor interface analog circuit designs, wrote S/W requirements, test specifications, and test procedures, and also originated patents for a silicon MEMS inertial rate sensor, MEMS interface circuits, inertial sensor assembly, and fire control and stabilization algorithms. From 2015 to the present Hiram has supported the successful licensing of AGNC patents (including but not limited to those patents with him as the inventor) in the areas of silicon MEMS inertial rate sensors and critical interfacing circuits. His efforts are currently in areas related to applying motion sensing/navigational concepts to potential industrial practices and creating innovative ideas towards patentable applications. Additionally, he provides the technical guidance and support to AGNC's research and development efforts in the fields of embedded systems, motion sensing, GPS-denied navigation, multi-sensor fusion, pose localization, MEMS sensors, gyroscope and accelerometer technology, advanced closed-loop control methods, artificial intelligence in GNSS, verification and validation and product qualification.

Mr. McCall has extensive experience in: (a) design, analysis, and simulation of GPS/INS navigation and flight control systems and software using optimal control and linear system techniques; (b) design and analysis of solid state gyros and accelerometers; and (c) silicon accelerometers, silicon MEMS accelerometers, Pulse Rebalance accelerometers, and Specific Force Integrating Receivers. He holds numerous patents for Silicon MEMS rate gyro and sensor electronics and is responsible for the entire life of products from customer discussions, proposal generation with integration and qualification, and transition to production. Simulation work include system modeling with trajectory generation, seeker modeling, target maneuver and target signature modeling, inertial instrument modeling, vehicle aerodynamic modeling and algorithm development with the use of Matlab and Simulink.

Patents with Hiram McCall as the inventor include: US 9668035, US 9611031, US 6311555, US 6415223, US6477465, US 6459990, US 6522992, US 6671648, US 6651027, US 6516283, US 6494093, US 6473713, US 6456939, US 6697758, US 6611170, US 6427131, US 7162367, US 6738714, US 6671622, US 6596976, US 6463357, US 6508122

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