John R. Grindon, D.Sc.
Curriculum Vitae

Professional Summary

Dr. Grindon has more than 40 years of experience in the research, analysis, design and development of electronic systems, devices and software for acquiring, processing, analyzing, communicating and tracking signals and images. He is experienced in both hardware and software for these systems, including digital, analog and RF design. His doctoral research is in signal processing. He holds issued US and foreign patents in these areas.

He holds advanced degrees in Electrical Engineering from M.I.T. and from Washington University in St. Louis.

Summary of Areas of Expertise

- Digital Image and Video Acquisition, Processing and Analysis
- 3D Imaging and Image-Based Depth Mapping
- Digital Signal Processing (DSP)
- Electronics and Electronic Systems
- Wireless Communications
- Radar
- Navigation, Tracking and Position Location
- Pattern Matching and Classification
- RF Systems, Circuitry and Antennas
- Mathematical Modeling and Analytical Sciences

Education

Year	***University***	***Degree***
1970	Washington University in St. Louis	Doctor of Science (D.Sc.), Electrical Engineering.
1962	Massachusetts Institute of Technology	Master of Science (S.M.), Electrical Engineering
1961	University of Missouri at Rolla	Bachelor of Science (B.S.), Electrical Engineering

Continued Education:

- Continued education via credit and noncredit courses, workshops, seminars and self-study.

Professional Experience

From:	1990
To:	Present
Organization:	John R. Grindon & Associates
Title:	Independent Consultant
Summary:	▪ Consultant to 3D3 Solutions of Vancouver, BC, for digital image processing software algorithm development for 3D measurement systems, including optical system calibration, position location and orientation. Consultant to Hoffman Patent

Firm of Scottsdale, AZ, performing patent analyses and evaluations. Consultant to Beroe, Inc., of Chennai, India, on electronic sensors. Engineering consultant to Cyra Technologies, Inc., San Ramon, CA, a division of Leica Geosystems, for laser scanning, imaging and ranging systems to compute depth maps for digitizing the 3D shapes of objects.

- Engineering consultant to [TC]² Corporation of Cary, NC, for development of an optical, electronic imaging system for digitizing the 3D shapes of imaged objects. This system combines data from multiple, spatially-referenced digital video cameras mounted in an enclosing structure surrounding the subject, computing depth maps from the sequence of video image frames based upon illuminating the subject with a sequence of sinusoidal patterns. A patent was awarded for this work.

From: 1987
To: 1990
Organization: Cencit, Inc.
Title: Executive Vice President and Director of Research
Summary:

- Created and led an engineering organization at Cencit, Inc., a startup company engaged in the research and development of 3D electronic imaging systems based upon digital video image processing electronics and software algorithms.
- Developed the concept and led the analysis, design and implementation of a 3D computer vision system for non-contact shape digitization, and a computer-controlled four-axis DNC milling machine to replicate physical models of scanned objects. This equipment acquires video image sequences of an object and generates 3D data without physical contact, employing multiple digital video cameras mounted in an enclosing structure surrounding the object. Depth maps are generated by processing the sequence of video image frames to compute 3D data based upon illuminating the object with a sequence of specific light patterns using angularly-offset projectors. The system then automatically controls the milling machine to produce a scaled three-dimensional replica from the digitized shape data. This work included development of calibration algorithms for determining internal camera parameters, mutual alignment of the cameras, and lens distortion. U.S. and foreign Patents were awarded.

From: 1962
To: 1987
Organization: McDonnell Douglas Corporation
Title: Branch Chief - Electronics, and other positions
Summary:

- Led project teams in digital image processing research and development for Cruise Missile guidance, correlating images acquired by an on-board camera with stored reference images, and algorithm development for automatic target recognition using nearest neighbor classifiers.
- Managed a software development and flight test program to develop mathematical models for statistically predicting tracking and guidance accuracy for the Tomahawk Cruise Missile using an on-board terrain-sensing radar and on-board stored digital terrain maps.

- Led an engineering research and development team to develop scene analysis algorithms for three-dimensional (3D) imagery for advanced autonomous Cruise Missile guidance employing imaging laser radars (LIDAR).
- Conceived an approach and managed a project team to develop automatic target classification and recognition algorithms for anti-ship missiles using an on-board infrared camera, operating to reduce the effects of noise, sea-clutter/glint and countermeasures.
- Performed research and developed a new class of image processing algorithms for autonomous Cruise Missile location and guidance, using infrared (IR) cameras to automatically recognize scenes based upon correlation of the sensed IR images with stored data models, employing an entropy algorithm to handle the variability of IR imagery.
- Invented a new system for detecting and accurately locating the positions of ground-based communications radio frequency (RF) transmitters through a method employing digital signal processing and methods of triangulation and statistical estimation. Similar to GPS but with signal transmission in the reverse direction, this method accurately measures differences in signal arrival times and Doppler frequency shifts of signals received at multiple receivers aboard moving vehicles, which are used to determine the position location of the ground-based transmitter.
- Secured and led a series of research and development projects for the Department of Defense to analyze and develop systems including algorithms and electronics for locating the positions of ground-based communications radio frequency (RF) transmitters based upon signal differential time of arrival (TOA) and Doppler frequency shift.
- Developed a design methodology, computer aided engineering software, and RF hardware design for wide dynamic range, multi-octave, communications signal intercept receivers for defense applications. This receiver design methodology has particular application for use in systems employing time-of-arrival processing methods for position location and tracking wherein signal propagation delay through the recceiving system must be preserved over a wide dynamic range and over a wide range of frequencies.
- Secured R&D grants, performed research and developed a new method to detect and locate covert spread-spectrum radio frequency signals, by correlating signals received at spaced antennas on the wings of an aircraft, wherein the antennas are electromagnetically decoupled from the airframe. These types of signals are used to hide radio communications beneath the noise and clutter of the frequency spectrum.
- Designed electronics for an onboard aircraft collision avoidance system, including the design of signal processing circuitry. This system, which was used to protect multiple fighter aircraft flying in the same airspace, transmits signals using time division multiple access (TDMA) in a coordinated fashion among the aircraft, measuring propagation times and relative Doppler frequency shifts of the signals between aircraft. This information is processed on board to assess collision threats,

warn the pilot, and indicate evasive maneuvers.

- Designed a digital data communication modulator/demodulator (MODEM) for air-to-ground wireless communications using an efficient coding method.
- Developed digital RF frequency synthesizer for wireless communications receiver applications.
- Developed an electronic device for accurate measurement of relative velocities between aircraft by measuring the Doppler frequency shift of microwave signal pulses transmitted between aircraft in allocated time slots.
- Designed a multi-path and clutter-tolerant omni-directional direction finding system for pulsed microwave signals employing a new type of multimode antenna (described following). A patent was awarded on this work.
- Performed pioneering research and co-designed a microwave direction finding antenna employing a waveguide cavity within which multiple electromagnetic field modes are generated by an arriving signal. Parameters of these electromagnetic modes depend in part upon the signal's direction of arrival. Upon receiving a signal pulse transmitted by an aircraft, these electromagnetic modes are sensed by multiple RF probes within the antenna cavity to produce multiple RF outputs, which are electronically resolved and processed in real time to determine and display the position of the aircraft in range and azimuth, while also processing the mode signals to discriminate against interfering multipath signals.
- Performed research and received a patent on a new method of generating single-sideband signals for RF communications transmitters and frequency synthesizers, based upon combining RF signals that are differentially phase shifted in accordance with a modulating signal, thereby suppressing unwanted spectral products, or sidebands.
- Developed a new intermediate frequency (IF) amplifier design for pulsed-signal receivers for preserving radio frequency phase information over a wide dynamic range, for applications in phase-sensitive direction-finding and Doppler frequency shift measurement systems.
- Performed research and developed an electronic solution to the problem of mutual electromagnetic interaction, or unwanted coupling, among multiple antennas on an aircraft, which causes mutual electromagnetic interference. The solution employs modeling the aircraft and antennas as coupled elements in an RF electromagnetic system. Using this mathematical model, designed RF circuitry to decouple the antennas, thereby preventing the mutual interference.

From:	1961
To:	1962
Organization:	Massachusetts Institute of Technology Research Laboratory of Electronics (R.L.E.)
Title:	Graduate Student
Summary:	Designed microwave electronics for M.I.T.'s radio telescope.

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From:	1961
To:	1961
Organization:	Hughes Aircraft Corporation
Title:	Engineer
Summary:	Designed microwave electronics for field testing high-powered ground-based military radars.

From:	1960
To:	1960
Organization:	Westinghouse Electric Corporation
Title:	Engineer
Summary:	Designed RF electronics for military radar systems.

Litigation Support

Matters in which Dr. Grindon is on record, has testified at trial, deposition or in a hearing, or has prepared declarations and/or expert reports, since 2008:

Expert Engagement:

Type of Matter:	Patent infringement and validity litigation
Law Firm:	Sidley Austin LLP, Palo Alto / San Francisco, California
Case Name:	Dynamic Digital Depth Research PTY LTD v. LG Electronics, Inc. et al., United States District Court, Central District of California, Case 2:15-cv-05578-GW-E.
Services Provided:	Expert services on behalf of defendant LG Electronics regarding 3D video/TV technologies. Prepared declaration.
Disposition:	Open
Date:	2016 – Present

Expert Engagement:

Type of Matter:	Patent *Inter Partes* Reviews
Law Firm:	Sterne, Kessler, Goldstein & Fox, PLLC, Washington DC
Case Name:	Google, Inc., *Petitioner*, v. Vedanti Systems Ltd., *Patent Owner*
Services Provided:	Expert services on behalf of petitioner Google regarding camera, image acquisition, image processing and display technologies. Prepared declarations, deposed.
Disposition:	Open
Date:	2015 – Present

Expert Engagement:

Type of Matter:	Patent *Inter Partes* Reviews
Law Firm:	Fish & Richardson, PC, Washington DC
Case Name:	Apple, Inc., *Petitioner*, v. Ericsson, Inc., *Patent Owner*

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