

BRIEF BIODATA

DR. VINOD KARAR

PRESENT POSITION & ORGANISATION: Chief Scientist & Hon. Professor-AcSIR, Traffic Engineering and Safety Division, CSIR - Central Road Research Institute, CRRI, PO CRRI, Delhi, Mathura Road, New Delhi – 110025



Chief Scientist (Scientist G) from 09.07.2014 to till date (from 09.07.2014 to 08.12.2022 at CSIR-CSIO Chandigarh and from 09.12.2022 to till date at CSIR-CRRI Delhi)

CONTACTS DETAILS

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PROFESSIONAL QUALIFICATION

- B.E. (Electronics), 1992, Maulana Azad National Institute of Technology, Bhopal
- M.E. (Electronics), 1999, Punjab Engg. College, Chandigarh
- PhD (Electrical & Instrumentation Engg.), 2014; Thesis title: Tunneling effect mitigation through artificial neural network-based head up display switching system from Thapar University Patiala

AREA OF INTEREST

Augmented and Virtual Reality, Cockpit Displays, Traffic Engineering and Safety, Situation Awareness, Attention Capture, Cockpit Instrumentation, Visual Landing and Navigation Aids, Sensors and Sensor Fusion, Image Processing, Artificial Intelligence, Opto-Electronics, System Engineering, Thermal Analysis, and Reliability Analysis

MEMBER OF PROFESSIONAL/ ACADEMIC BODIES

- IEEE
- IEEE Aerospace and Electronic Systems Society
- IEEE Vehicular Technology Society
- OSA
- IETE -Fellow
- IEI -Fellow
- OSI -Fellow
- Advanced Computing and Communications Society (ACCS)
- Indian Society of Systems for Science & Engineering
- Society for EMC Engineer (India)
- IEEE Technology and Engineering Management Society
- IEEE Industrial Electronics Society

POSITIONS HELD/IMPORTANT ASSIGNMENTS

- **Chief Scientist:** 09.07.2014 to till date (*09 July'14 to 08 Dec'22 at CSIR-CSIO Chandigarh & 09 Dec'22 to till date at CSIR-CRRI Delhi*)
- **Head,** Optical Devices & Systems Unit, CSIR-CSIO Chandigarh from 01 Nov'12 to 06 Jun'21
- **Hon. Professor,** Academy of Scientific & Innovative Research (An Institution of National Importance) from Aug'11 to till date
- **Coordinator, AcSIR-CSIO** from 27 Jan'17 to 23 May'22
- **Sr. Principal Scientist** (Merit Promotion), CSIR-CSIO Chandigarh from 09 Jul'09 to 08 Jun'14
- **Principal Scientist** (Merit Promotion), CSIR-CSIO Chandigarh from 09 Jul'05 to 08 Jun'09
- **Scientist E1,** CSIR-CSIO Chandigarh from 09 Jul'02 to 08 Jun'05
- **Scientist C,** CSIR-CSIO Chandigarh from 09 Jul'1998 to 08 Jun'02
- **Scientist B,** CSIR-CSIO Chandigarh from 09 Jul'1993 to 08 Jul'1998
- **Other Important Assignments:**
 - *Chairman, Optics & Photonics Sectional Committee, BIS*
 - *Member, Experts Advisory Group of DST - Device Development Programme*
 - *Member, Working & Core Group for DPR document for Semiconductor R&D Centre for India*
 - *Member, Joint Working Group for Mission Mode Project on "Aerospace Materials and Technologies" of CSIR*
 - *Expert Member - Raman Fellowship*
 - *Guest Editor in Special Issue 'Distributed Secure Computing for Smart Mobile IoT Networks' – Hindawi*
 - *CSIR Assessment Committee Core Member, Engineering Sciences & Technology*
 - *Senate Member, IIT Una*
 - *Member Board of Studies, AcSIR – Engineering Sciences*
 - *Chairman for committee on design reviews of two Indigenous line replacement units for MI-25/35 Helicopter*
 - *PI/Co-PI for several external funded large projects on design and development of various line replacement units (LRUs) for National Programmes on LCA Mk1 (AF), LCA Mk1 (Naval variant), LCA Mk2 (AF), LCA Mk2 (Navy), LCA-NP, HJT-36, Jaguar Upgrade, SARAS-MKII A/c, Hansa-NG A/c, Dornier-DO-228 A/c Upgradation, P17A Frigate Class Ships, & other Indian Naval Ship Upgradation Programmes*
 - *Project Coordinator for major project (HCP0036) under Aerospace Materials & Technologies theme comprising 3 projects*
 - *Nodal Coordinator for CSIR-CSIO for CSIR's Aerospace, Electronics & Instrumentation & Strategic Sector Program comprising 11 projects*
 - *Alternate Nodal Officer for CSIO's main lab project: Opto-Mechatronic Technology for Next Generation Sensors & Applications*

- **Participation and contribution in relevant areas in higher education** as Senate Member, Research Advisory Committee Members, Convener of programs, Coordinator- AcSIR, etc. for IIIT Una, AcSIR, PTU, PEC, UIET, NITTTR, AcSIR-CSIO: Subject Expert in Electrical, Electronics & Communication Engineering, Instrumentation & Controls, Opto- Electronics, etc.; Details of engagements:
 - Senate Member, IIIT Una
 - Member, JRF-SRF-RA Selection Committee, HRDG-CSIR few times
 - Member, Faculty Selection Committee, PEC Chandigarh on one occasion
 - Member, Faculty Selection Committee, Punjab Technical University Jalandhar and INST Mohali
 - Coordinator, AcSIR-CSIO
 - Convener, PhD/M.Tech scholars selection of AcSIR-CSIO; Key role in start of Students Chapters for IEEE, SPIE and IEEE-NTC at CSIO; Course Coordinator for two courses - Computer Aided Design, and Opto-mechatronics Systems
 - Expert for PhD selection at NITTTR Chandigarh on one occasion; M.Tech external expert for PEC & UIET, Chandigarh on few occasions
 - Key role in formulation of MoU for 5 years, broadly include faculty exchange, student's internship, joint research projects, joint supervision, etc. with 4 NITs.

PROJECTS HANDELD/WORKED ON:

- **Large Lab Projects/Programmes executed as Nodal Officer/Alternate Nodal Officer/Lab Theme Coordinator/Project Coordinator: 03**
- **Projects executed as as Principal Investigator/Co – Principal Investigator: 21**
- **Projects executed as as Principal Investigator/Co – Principal Investigator: 03**

FIELDS/AREA OF PROJECTS/PROGRAMMES/WORK ON:

- Prime flight avionics cockpit display technologies namely head up displays, pilot display unit and variants for aircraft (9 variants)
- Night vision imaging system compatible visual landing aid systems for helicopter and fixed-wing aircraft landing on naval ships & aircraft carrier (4 variants)
- Marine bearing sights for naval ships and submarines (2 variants)
- Aviation head up display Test Rig/Setups including Bore Sighting Systems (5 types)
- Aircraft exterior lighting units for Aircraft (4 types)
- Aircraft exterior lighting units for Aircraft test equipment: 3 types
- Opto-mechatronic technologies for next generation sensors & applications – OMEGA comprising 14 projects
- Major project under Aerospace, electronics, instrumentation & strategic sector of CSIR during 2018-20 comprising 11 projects
- Project Coordinator for major project (HCP0036) under Aerospace Materials and Technologies theme comprising 3 projects
- Nausena Paridarshi
- Aviation lights for HANSA and SARAS aircrafts (15 types)
- Attention tunneling mitigation, situation awareness, optical fabrication, augmented reality display, visual landing and navigation aid systems, etc. for defence applications

TECHNOLOGY COMMERCIALIZED/TRANSFERRED/FIELD TRIALED

- *Taxi & Landing Lights for LCA-AF: Technology transfer to BEL Panchkula*
- *NVG compatible Aircraft Left Wing, Right Wing & Fin Navigation Lights (03 types) for LCA-AF: Technology transfer to BEL Panchkula*
- *Test Rigs for Aircraft Exterior LED Lights (i) Integrated Taxi Landing Lights Measurement Setup (ITLLMS) for Indoor TLL Light Measurements, (ii) Integrated Taxi Landing Lights Measurement Setup (ITLLMS) for Outdoor TLL Light Measurements, (iii) NVG compatible Wing and Fin Navigation Lights Measurement Setup for LCA Airforce: Technology transfer to BEL Panchkula*
- *Head Up Display HUD Mk1 for LCA-AF (2020): ToT Extension with BEL Panchkula*
- *Wide Field of View Head Up Display in 02 configurations - Head Up Display Type HUD Mk1N & Head Up Display Type HUD Mk-1NP with Mounting Tray & Rear Camera Module for Naval LCA variants: 11 Airworthy (& Qualification) Units supplied to ADA Bangalore*
- *Marine Bearing Sight for Naval Warships & Submarines: ToT to Elcome Integrated Systems Pvt. Ltd. Mumbai*
- *NVG Compatible Helo Deck Visual Landing Aid System for Aircraft Carrier Ships: Elcome Integrated Systems Pvt. Ltd. Mumbai*
- *Military Aviation Head Up Display Test Platform for LCA: ToT to BEL Panchkula*
- *Bore Sighting System customized for LCA-AF: ToT to BEL Panchkula*
- *Diffraction Lloyd Mirror Interferometer: ToT to Maffick Instruments, Ambala, Haryana*
- *Head Up Display HUD Mk1 for LCA-AF: ToT BEL Panchkula*
- *Foot Operated Water Dispenser: ToT to Jupiter Aqua Lines Ltd., SAS Nagar, Punjab*
- *Safety Goggle for Healthcare Professional (2020): ToT to M/s SARK Industries, Chandigarh*

LAB PROTOTYPES DEVELOPED

- *LSO Operated Standby Visual Landing Aid System for Aircraft Carriers: Functional Lab Prototype*
- *CRT based Digital Head Up Display for LCA Mk2-Navy: Functional Lab Prototype*
- *Smart Low-Profile Head Up Display for LCA Mk2-AF: Mockup Unit*
- *Head Up Display based on Active-Matrix Liquid Crystal Display for Automobile application: Functional Lab Prototype*
- *HUD based on Digital Light Engine for Surface Transport: Functional Lab Prototype*
- *Air Field Ground Lighting System: Functional Lab Prototypes*
- *Meat Ball Unit/System of Precision Optical Landing System as Visual Landing Aid for Aircraft in Aircraft Carrier Ships: Functional Lab Prototype.*

PUBLICATIONS

- **Technology Documents & Technical Reports: 240**
- **Journal Publications: 69**
- **Books Chapters: 12**
- **Conference Publications/Presentations: 159**
- **Patent filed/granted: 02**

INVITED TALKS DELIVERED: 52

SUPERVISION OF STUDENTS

- **PhD Completed/Submitted: 11**

- Divya Agrawal (AcSIR), PhD thesis titled "Multispectral image fusion for enhancing situation awareness".
- Aman Kataria (Thapar University), PhD thesis titled "Development of artificial intelligence-based technique for minimization of errors and response time in head tracking for head worn systems".
- Shikha Tuteja (AcSIR), PhD thesis titled "Vehicle detection & tracking for vehicles under occlusion".
- Vipran Kumar (AcSIR), PhD thesis titled "Thermal and electromagnetic interference analysis of electronic systems using ferro-fluid based cooling".
- Rahul Kottath (AcSIR), PhD thesis titled "Inertial and visual sensor-based motion estimation techniques for vehicle navigation".
- Shambo Roy Chowdhury (AcSIR), PhD thesis titled "Signal acquisition and processing strategies for e-nose sensor arrays".
- Jhulan Kumar (AcSIR), PhD thesis titled "Study of human factors of aircraft pilot while using cockpit displays during low ambient light conditions".
- Raj K Pal (AcSIR), PhD thesis titled "Study of material removal for glass during optical polishing process".
- Mukesh Kumar (AcSIR), PhD thesis titled "Design and fabrication of multilayer reflective notch filter for beam folding applications".
- Neha Khatri (AcSIR), PhD thesis titled "Micromachining process chain for optical finish of smooth silicon mirrors for X-rays applications".
- Rohit Sharma (AcSIR), PhD thesis titled "Investigation on surface finish and subsurface damage in brittle materials for optical applications".

- **PhD in Progress: 06**

- Neha Yadav (AcSIR), PhD thesis titled "Design of technique for identification and coordinates determination of foreign object debris on airstrip".
- Prerita Kalra (AcSIR), "Analysis of Visual Fatigue while using Augmented Reality Displays in Aviation Environments".
- Raghav Sardana, AcSIR, "Visual-Inertial Navigation for autonomous UAV operations in GPSdenied environment".
- Vatsal Garg (IDDP), AcSIR, "Study of Augmented Reality Devices".
- Aparajita Parashar (IDDP), AcSIR, "Study deterministic machining for polishing of optical substrates".
- Kriti Arya, "Study Of Remote Augmented Reality Collaboration In Digital Twin-Driven Intelligent Predictive Maintenance Investigation on virtual reality imaging".

- PG: 30

- Vatsal Garg (IDDP), AcSIR, "Study of Parametric Characteristics of OLED Display for Deployment in Augmented Reality Devices".
- Aparajita Parashar (IDDP), AcSIR, "Study and Analysis of Material Removal Behavior during Polishing of Fused Silica Optical Glass".
- Raghav Sardana, AcSIR, "Joint Forward-Backward Visual Odometry with Feedback using MultiCamera Systems".
- Prerita Kalra, AcSIR, "Analysis of Visual Fatigue while using Augmented Reality Displays".
- Chintha Sri Pothu Raju, VIT University, Vellore: "Symbology generation for LCOS based see-through displays".
- Palwinder Kaur, UIET Kurukshetra University: "Development of model for evaluation of organic light emitting diodes performance parameters based on varying environmental conditions for avionic applications".
- Rasna, UIET Kurukshetra University: "Extraction of synthetic symbology information from the composite images captured by CCD camera through a see-through display"
- Arindam Singha, Thapar University: "Algorithm for Fusion of multi sensors in real time for automobiles".
- Ishaan Ravish, Department of Electronic Science, Kurukshetra University, Kurukshetra: "Study of grating light valves for cockpit display applications".
- Dharendra Jha, National Institute of technology (NIT), Agartala: "Image processing-based characterization of optical thin film coatings".
- Paramjit Kaur, Punjab Technical University: "Characterization of charged coupled device camera image features based on ambient lighting".
- Ritu Rani, Department of Instrumentation, Kurukshetra University, Kurukshetra: "Adaptive display intensity control".
- Manasvini Setia from Kurukshetra University, Kurukshetra: "FPGA based high precision digital geometric correction in CRT display system".
- Amandeep Moddal, AcSIR: "Development of dual scan for optimization of the stroke symbology maximization".
- Neeraj Singh, NIT Kurukshetra: "Characterization of factors governing geometric distortions patterns in scanned laser displays".
- Kamal Kumar, NIT Kurukshetra: "Adaptive display intensity control for varying ambient intensity conditions".
- Parul Goyal, Kurukshetra University: "Enhancement of the flyback time for stroke symbology in avionics display system using FPGA".
- Harjot Singh, Panjab University: "Characterization of magnetic head tracking in helmet mounted displays".
- Manpreet Singh, Chandigarh University: "Generation of graphical signal at various writing speed on flat CRT".
- Pankaj Kumar, Kurukshetra University: "FPGA based generation of programmable blanking and raster ramp signal".
- Mukesh Kumar, AcSIR: "Template matching and image enhancement to improve HUD images".

- Vivek Kaundal, Panjab University: “Performance, characterization and analysis of DMD for see-through display application”.
 - Shashi Poddar, AcSIR: “Performance study of digital light engine-based display technology”.
 - Deewakar Sharma, AcSIR: “Analysis of Microchannels for micro-scale cooling using liquid metals”.
 - Shardanand Prabhakar, NIT Kurukshetra: “Extraction of synthetic symbol information from aircraft display images under wide range of ambient brightness”.
 - Ajmer Singh, Thapar University: “Offline Testing Protocol software for display systems”.
 - Lalit Kumar, Thapar University: “Bug Tracker”.
 - MV Suman, Kurukshetra University: “ADSP based signal monitoring in multimode operation”.
 - Sharad Gupta, NIT, Kurukshetra: “Development of symbol processor for augmented driver vision for motor vehicles”
 - Mooninder Singh, Panjab University: “Development of cursive test pattern generator based on ADUc812”.
- **UG: ~70**

Supervision to UG Students from various colleges like Indian Institute of Technology Delhi, Indian Institute of Technology Madras, National Institute of Technology Kurukshetra, NIT Warangal, NIT Jalandhar, Panjab University, Punjab Engineering College, University Institute of Technology Chandigarh, UIET Kurukshetra, Amity University, Punjabi University Patiala, GNDE Ludhiana, Maharishi Dayanand University Rohtak, Guru Jambheshwar University Hisar, NIT Hamirpur, VIT Vellore, etc. Broad topics covered:

- Head mounted displays, head up displays, Augmented reality displays and head racking techniques
- Enhanced vision systems
- Visual Odometry
- Display devices
- Automobile displays and interfaces
- Situational awareness, Attention tunneling
- Display simulators based on ADSP 2181
- FPGA based generation of programmable blanking and raster ramp signals
- Signal monitoring of display simulator
- Interfacing of stepping stepper motor with microprocessor
- Generation of composite image patterns for vehicle control using DSP techniques
- Offline testing of avionics displays
- Facial recognition-based access control
- Automobile sensor interfacing with graphical LCD
- ADSP based signal simulator
- Programmable pattern generator using microcontroller

ACHIEVEMENTS/AWARDS/RECOGNITIONS

- ***Airworthy certifications (MIL-STD 704D-F, MIL-STD 461C-E, MIL-STD 810D-F)***
 - Head Up Display Type HUD Mk1 for LCA-AF Mk1
 - Head Up Display Type HUD Mk1N for LCA-Navy
 - Head Up Display Type HUD Mk-1NP for LCA-NP
 - Head Up Display Type HUD H-Series for Hindustan Jet Trainer Aircraft
 - Optical Gun Sight for Dornier DO-228 Aircraft
 - Taxi & Landing Lights Unit for LCA
 - NVG compatible Left-Wing Navigation Lights: LCA
 - NVG compatible Right-Wing Navigation Lights: LCA
 - NVG compatible Fin Navigation Lighting Unit: LCA
- ***Type approval and Full Operational Clearance for HUD Mk1 for LCA-Tejas-AF Mk1***
- ***CEMILAC/ADAQA Approval***
 - Bore Sighting System: LCA
 - Military Head Up Display Test Platform: LCA
 - Bore Sighting Tool: LCA-Navy
 - Bore Sighting Tool: LCA-NP
 - Integrated Taxi Landing Lights Measurement Setup for Indoor Measurements: LCA
 - Integrated Taxi Landing Lights Measurement Setup for Outdoor Measurements: LCA
 - NVG compatible Wing & Fin Navigation Lights Measurement Setup for LCA
- ***Awards/Recognitions***
 - IEEE Technologist of the Year (Male) Award 2022 - IEEE Delhi Section
 - IEEE India Council Technologist of the Year Award 2021
 - IEEE-TEMS India Engineering Manager of the Year Award 2021
 - CSIR Most Significant Technology of the Plan Period - 2020
 - Defence Gold Skoch Award (2020)
 - CSIR Technology Award Certificate of Merit for Physical Sciences Including Engineering (2018)
 - Gold Skoch Transformational Innovation Award (2017)
 - CSIR@70: Head Up Display led recognized as amongst top 70 technologies during last 70 years (2012)
 - SIATI Award of Excellence for Indigenization of Aerospace Technology (2011)
 - IETE 34th Hariramji Toshniwal Award for the year 2011
 - Award of Merit in Leadership Development by Groman International, South Africa & HRDC, Ghaziabad (2009)
 - Certificate of Appreciation from Director, CSIO: Outstanding Contribution in Electronics of Head Up Display for LCA (2002) – on being part of HUD team, which was awarded CSIR Technology Shield in Engg. Technology
 - Best Paper Awards (author/co-authored)