Raees Ahmad

Computational Physicist / Navigation Algorithm Designer
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Profile

A highly motivated and research oriented Computational Physicist with interest in Inertial & Integrated Navigation Algorithm Design & Development, Kalman Filtering & Nonlinear State Estimation, Fault Detection & Isolation, Satellite Navigation and Flight Vehicle Navigation, Guidance and Control. Passionate and committed to continuous personal development, embracing challenges, and contributing innovative solutions to advance organizational goals.

Research Directions

- Inertial/GNSS (GPS, BeiDou)/astronomical integrated navigation and information fusion technology
- Airborne and Spacecraft Autonomous Navigation
- Advance Filtering techniques (higher order EKF, UKF, CDF, Particle filter) for INS/GNSS/VNS/CNS integrated navigation
- Application technology of artificial intelligence in navigation and guidance systems
- Neural network aided Kalman filtering for Navigation in challenging conditions and GNSS denied environment

Education

Master of Philosophy in Physics — 12/2011 – 11/2013
PIEAS, Islamabad — Islamabad, Pakistan
CGPA: 3.96/4.0, Cum Laude
Thesis title: Attitude and Heading Refrence System (AHRS) aided by magnetometer

Bachelor of Study in Physics — 09/2007 – 12/2011
University of Gujrat — Gujrat, Pakistan
CGPA: 3.62/4.0 (78.67 %)

FSc. Pre-Engineering — 2005 – 2007
Government Science College, Gujrat — Gujrat, Pakistan
Division: 1st

Matric (Science) 2003 – 2005
Government High School Hajiwala Gujrat Gujrat, Pakistan
Division: 1st

Professional Experience

Navigation Algorithm Designer/Developer 11/2013 – present
A public sector R&D organization Islamabad, Pakistan

- Designed & Developed INS/GNSS Integration Algorithm using 15-States Extended Kalman Filter (EKF)
- Designed & Developed an Outlier rejection scheme to handle GNSS vulnerabilities
- Designed & Developed INS/GNSS Integration Algorithm using 13-States Linearized Kalman Filter (KF)
- Designed & Developed 3rd Order Vertical Channel damping loops for Integration of ADS and INS for Altitude
- Designed & Developed Attitude and Heading Reference System (AHRS) Algorithm for MEMS based inertial sensors aided by Magnetometers
- Design & Developed an In-Motion Alignment Algorithm for Strapdown INS for Surfaced/ Submercible platforms
- Developed a Fine Alignment Algorithm of Strapdown INS in Static/Oscilating Base Environment

Publications

A Robust Attitude and Heading Reference System (AHRS) Algorithm for MEMS-Based inertial sensors aided by Magnetometers Using EKF 2013
A paper submitted to PIEAS administration along with Thesis

A Density Functional Theory Study of Raman Modes of Cadmium Sulphide Nanoparticles 2012
Nanomaterials and Nanotechnology
DOI: 10.5772/51565

Courses

Applied Kalman Filtering (Specialization) 12/2024
- *University of Colorado System through Coursera*

87 Classroom Hours (Non-Credit Specialization with 4 Courses)

- Course 01: Kalman Filter Boot Camp (and State Estimation)
- Course 02: Linear Kalman Filter Deep Dive (and Target Tracking)
- Course 03: Nonlinear Kalman Filters (and Parameters Estimation)
- Course 04: Particle Filters (and Navigation)

MATLAB Programming for Engineers and Scientists (Specialization) 09/2024

- *Vanderbilt University through Coursera*

113 Classroom Hours (Non-Credit Specialization with 3 Courses)

- Course 01: Introduction to Programming with MATLAB
- Course 02: Mastering Programming with MATLAB
- Course 03: Introduction to Data, Signal and Image Analysis

Fundamentals of Flight Mechanics (Specialization) 09/2024

- *ISAE-SUPAERO through Coursera*

25 Classroom Hours (Non-Credit Specialization with 4 Courses)

- Course 01: Flight Mechanics - The Basis
- Course 02: Flight Mechanics – Anemobarometry
- Course 03: Flight Mechanics - Lift and Trajectory
- Course 04: Flight Mechanics - Propulsive Balance & Energy

Introduction to Artificial Intelligence (AI) 11/2021

IBM course through Coursera

13 Classroom Hours (Non-Credit)

MATLAB Fundamentals 10/2025

MathWorks Training Services

- MATLAB Onramp
- SIMULINK Onramp

AI Enabling with Predictive Analytics Inference Workshop for Industry Applications 10/2025

5 Days Course by AITech National Center for Physics (NCP)

Projects

INS/GNSS integrated Algorithm using Linearized and Extended Kalman Filters

Designed & developed a loosely coupled INS/GNSS integration algorith with 15-states EKF

Attitude and Heading Reference System (AHRS) aided by magnetometers

Design and development of AHRS using 9-DOF MPU-9250 IMU with optimal gains in C/C++

Oscilating/Moving base transfer alignment scheme for Strapdown Navigation Systems

Developed and tested oscilated/moving base transfer alignment scheme over real time data.

GNSS Outliers Rejection Strategy for relaiable Integrated Navigation

Designed & developed GNSS outliers rejection scheme based on comparison of differential changes of INS/GNSS and state covariances

Computatoin of GNSS receiver position using Satellites pseudo ranges and ephemeris data

Developed an algorithm to estimate the GNSS receiver position using simulated Satellites pseudo ranges and ephemeris data.

3rd Order Vertical Channel damping loop algorithm for integration of INS/ADS/RA.

Developed a vertical channel damping loop for INS integration with ADS to provide smooth and reliable altitude.

Awards

Gold Medal — 2013
Pakistan Institute of Enginering & Applied Sciences — Islamabad Pakistan
For securing 1st Postion in batch of M.Phil Physics (2011-2013)

Certificate of Apperciation — 2013
Pakistan Institute of Enginering & Applied Sciences — Islamabad Pakistan
For outstanding performance in Thesis Project

Certificate of Merit — 2013
Pakistan Institute of Enginering & Applied Sciences — Islamabad Pakistan
For maintaining CGPA higher than 3.75 i.e. (3.96/4.0)

Merit Scholarship — 2011
NESCOM Scholarship for 2 years M.Phil Physics at PIEAS — Islamabad Pakistan

Skills

Softwares
(MATLAB / SIMULINK, Mathematica, Lab Windows/CVI, LabView, MS Office, System Toolkit STK, Microsoft Visual Studio)
Programming Languages
(MATLAB, C/C++,Python,Latex)

Languages

Mother tounge(s): **Urdu | Punjabi**

	Understanding		Speaking		Writing
	Listening	Reading	Spoken Production	Spoken Interaction	
English	**C1**	**C2**	**C1**	**C1**	**C1**

Interests

- Sports: Cricket (Amateur), Badminton (Amateur), Table Tennis (Beginner)
- E-Gaming: Project IGI, Need4Speed

Recommendations

Name: **Dr. Shakeel Ur Rehman |** Professor | Head, Department of Physics and Applied Mathematics
Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad.
E-mail: shakeel@pieas.edu.pk

Name: **Dr. Aman Ur Rehman |** Professor | Dean, Faculty of Applied Sciences
Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad.
E-mail: aman@pieas.edu.pk