Muhammad Zargham Ali

Control / System Engineer

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PERSONAL STATEMENT

I'm a problem-solver at heart, thriving on engineering challenges and delivering results where it matters most. With over five years of experience in control systems, UAV avionics integration, and automotive software, I bring a unique combination of hardware integration expertise and software algorithm development skills.
From developing custom flight control algorithms for unmanned systems to implementing SIL-tested ADAS features for OEMs like BYD and GM, my work bridges innovation and reliability. I have deep experience in embedded C++ development, real-world data debugging, and safety-critical software validation, along with a strong command of tools like MATLAB/Simulink, Git, and AUTOSAR.
I thrive in demanding environments, take ownership of challenges, and believe excellence comes from commitment and persistence rather than comfort zones.

EXPERIENCE

National Center for Unmanned Aerial Systems (NCUAS) — **Islamabad, Pakistan**

Manager (Senior System Engineer) — **Dec 2021 – Present**

- Led design, testing, and deployment of autonomous multirotor platforms with custom ArduPilot firmware for advanced targeting and payload delivery.
  - Oversaw UAV avionics manufacturing lines, ensuring integration consistency, system robustness, and compliance with operational requirements.
  - Engineered custom control algorithms for precision payload delivery to designated target areas using multirotor UAVs.
  - Developed and integrated auto-target locking functionality using image processing, camera gimbal control, and custom ArduPilot firmware enhancements.
  - Designed and implemented dive maneuver algorithms in ArduPilot for mission-specific autonomous descent and targeting applications.
  - Executed and supervised live flight trials across varied terrains and environmental conditions to validate mission readiness.
  - Delivered production-grade UAV platforms currently operational in military applications.
  - Functioned as the key bridge between control software, embedded avionics, and testing teams.

Assistant Manager (System Engineer) — **Nov 2019 – Dec 2021**

- Developed and tested UAV avionics systems, integrated payloads, and ensured platform readiness through calibration, validation, and pre-mission checks.
  - Integrated diverse camera payloads with multirotor UAV platforms using custom MAVLink protocols and extended ArduPilot open-source flight stack.
  - Developed and embedded custom libraries for real-time data transmission from UAV to Ground Control Station (GCS).
  - Led Avionics manufacturing oversight: validated and inspected flight-critical modules, including Flight Controllers (Cube Orange, Pixhawk4, etc.), Companion Computers (Raspberry Pi, Arduino Boards, etc.), Power Management Units (PMU), Radio Links, and Camera systems.
  - Executed pre-flight calibration and tuning, including compass offsets, level alignment, and sensor configuration.
  - Performed bench-level avionics validation and full-stack UAV system tests, ensuring signal integrity, redundancy, and uninterrupted power distribution.
  - Delivered field-ready surveillance UAVs currently deployed by the military for aerial monitoring.

Software Motion — **(Remote, Part-Time) Shanghai, China**

Control Engineer — **Dec 2024 – Present**

- Delivering production-grade ADAS features in C++ with SIL testing, unit validation, and real-world data debugging for top automotive OEMs.
  - Design and implement ADAS functionalities in C++, including: Front Collision Warning (FCW), Autonomous Emergency Braking (AEB), Adaptive Cruise Control (ACC), Lane Keep Assist (LKA), Traffic Sign Recognition (TSR)
  - Develop unit tests using the Google Test framework (gTest) to verify software functionality against defined requirements and safety use cases.
  - Perform Software-in-the-Loop (SIL) testing using real-world driving data to evaluate and refine algorithm performance.
  - Analyze real vehicle test data using tools such as TS Master to debug abnormal behavior of ADAS functions (e.g., missed or false triggers), and implement corrective logic in the embedded software.

- Maintain and manage GitLab code repositories for different ADAS modules, with full command-line expertise in Git version control, branching strategies, and CI workflows.
- Simulate and validate control strategies in MATLAB/Simulink, followed by integration with AUTOSAR-compliant systems for production readiness.
- Collaborate with cross-functional teams to deliver solutions for major OEMs, including BYD, GM, and Ford.
- Support technical onboarding of new employees, assist in technical interviews, and mentor junior engineers.

EDUCATION

Pakistan Institute of Engineering and Applied Sciences (PIEAS) — **Islamabad, Pakistan**

M.S. Systems Engineering — **2017 - 2019**

- GPA: *3.77 / 4.0* | [Transcript Link] | [Thesis Link]
  - Received Second Best Thesis Award for Master's research.
  - Research published at IFAC World Congress 2020.
  - Volunteered as Teaching Assistant for Control Systems Lab under Dr. M. Abid.

National University of Sciences & Technology (NUST) — **Islamabad, Pakistan**

B.E. Electrical Engineering — **2013 - 2017**

- GPA: *3.68 / 4.0* | [Transcript Link]
  - Awarded Silver Medal for second-highest GPA in the batch.
  - Won a fully funded merit-based scholarship for top entrance test performance.
  - Designed an electronic nose prototype for gas detection using nanofilm-based sensor arrays.

TECHNICAL SKILLS

Programming & Tools

- C++, Embedded C, Python, MATLAB/Simulink, Git, GitLab, Google Test, TS Master, LaTeX

Embedded & Control Systems

- PID, LQR, adaptive/nonlinear control, real-time systems, SIL testing, unit validation, algorithm development, AUTOSAR integration

UAV Systems & Robotics

- Flight control (ArduPilot, Pixhawk, Cube Orange), MAVLink, UAV dynamics, payload integration (LiDAR, cameras, companion computers), mission-specific maneuver design, field trials

ADAS & Automotive Software

- Feature development (FCW, AEB, ACC, LKA, TSR), vehicle dynamics, motion planning, model-based design, debugging with real-world data, OEM collaboration (BYD, GM, Ford)

Electronics & Hardware Integration

- PCB design, circuit simulation (LTSpice, PSpice, Proteus), microcontrollers (STM32, Arduino, PIC), sensors & protocols (CAN, UART, RS-485)

Systems & Project Delivery

- Systems integration, product development, avionics QA, team leadership, field testing, technical onboarding & mentoring

Other Skills

- AutoCAD, MS Office, Adobe Photoshop

PUBLICATION

Ali, M. Z., Ahmed, A., & Afridi, H. K. (2020). Control system analysis and design of quadcopter in the presence of unmodelled dynamics and disturbances. IFAC-PapersOnLine, 53(2), 8840–8846 [Link]

STANDARDIZED TESTS

• GRE: *319 (Quantitative: 162, Verbal: 157)*
• IELTS: *8.0 Bands*

EXTRACURRICULAR ACTIVITIES & VOLUNTEERING

• Competitive swimmer; winner of inter-university championships
• Volunteer for blood donation drives and scholarship fundraising initiatives at NUST

REFERENCES

- Erfan Nejabat (Supervisor, Email: *erfan.nejabat@sw-motion.cn*)
- Prof. Dr. M. Abid (Thesis Supervisor, Email: *mabid@pieas.edu.pk*)