MUHAMMAD FARHAN AHMED

Robotics Researcher/Embedded Systems Engineer

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MFA Muhammad Farhan Ahmed MF-Ahmed

WORK EXPERIENCE

Laboratoire des Sciences du Numérique de Nantes (LS2N)
École Centrale de Nantes, France

Postdoctoral Researcher

March 2025 – Present Nantes, France

- PerCoMa project (ANR), Collaborative Perception Using Drone Fleets for Marine Environment Monitoring
- Working on sensor fusion pipelines and YOLO-based obstacle detection for UAV and ship coordination in marine environments using ROS 2

Ph.D Candidate/Researcher

November 2021 – December 2024 Nantes, France

- Multi-robot active autonomous navigation and mapping (Active SLAM) for efficient environment exploration and mapping (list of publications refer to page 2)

SmartPCBs, Islamabad, Pakistan

Principal Engineer (Plant Automation Group)

December 2019 – July 2021 Islamabad, Pakistan

- **Team leader**. Supervised and guided a team of 2 automation engineers and 4 technicians. Mentored team members, providing training and support to enhance their technical and professional skills
- **Implemented** of QMS and 5S (ISO-9001) to enhance efficiency and safety, conducting audits and training
- **Managed** project planning, timelines, and resource allocation, ensuring milestone completion

Senior Engineer (Embedded control system design)

December 2012 – November 2019 Islamabad, Pakistan

- **Designed and developed** PIC32-based embedded systems for process control, monitoring pneumatic valves, temperature/pressure sensors
- **Developed** control system testing strategies for interlock verification, ensuring alignment with control philosophy
- **Diagnosed and resolved** control system issues, minimizing downtime and ensuring compliance with industry standards
- **Designed and developed** an inverter-based power distribution system for HVAC, CNC, and welding machines
- **Implemented** a 30-channel remote monitoring system for HVAC chiller and pump status logging
- **Designed and implemented** a remote diesel-level monitoring system for four 1000L fuel storage tanks

Assistant Engineer (Maintenance)

July 2007 – November 2012 Islamabad, Pakistan

- **Develop and implement** preventive maintenance schedules of plant process control systems and conduct regular inspections
- **Ensure** all maintenance activities comply with safety standards and regulations. Conduct safety inspections and risk assessments
- **Maintain** records of all maintenance activities, including inspections, repairs, and replacements. Keep technical documentation, such as equipment manuals and maintenance procedures, up to date
- **Identify** opportunities for improving maintenance processes and implement best practices to enhance efficiency.

EDUCATION

École Centrale de Nantes, LS2N, France

Ph.D. in Robotics

Nov 2021 – Dec 2024 Nantes, France

Thesis title: Collaborative active SLAM and distributive navigation strategies for high precision relative localization in heterogeneous fleets of ground and aerial vehicles.

École Centrale de Nantes, France

Masters in Advance Robotics - ROBA

Sept 2014 – Aug 2015 Nantes, France

EMARO (European Master on Advanced Robotics)
University Of Genoa, Italy

Masters in Robotics Engineering

Sept 2013 – July 2014 Genoa, Italy

EMARO (European Master on Advanced Robotics)

Mehran University, Pakistan

B.E (Electronics Engineering)

Sept 2002 – July 2006 Karachi, Pakistan

SKILLS

- Programming
  Python | C++ | Embedded C/C++/Assembly | PyQT5 | ROS1/2 | MatLab/Octave | Ubuntu | Git | Docker | Bash | CMake | PyTorch
- Robotics
  UGV | Drones | Computer Vision | SLAM | Mapping | Path Planning | Deep Learning | MPC | Sensor Fusion | Gazebo | Ceres
- Embedded Systems
  PIC32 | PIC24 | Atmega2560 | I^2C | SPI | CAN | USART | DAC | Timers | Interrupts | Driver Programming | MPLABX | AVR Studio
- Electronics Engineering
  Instrumentation | Sensor interfacing | DC/Stepper Motor control | Maintenance

SUPERVISION & TEACHING

Undergraduate Project Supervision

Comparative study of ORBSLAM2 and CCM SLAM

March-April 2024 ECN, LS2N, Nantes, France

TECHNICAL EXPERIENCE

- Development of **active visual SLAM**, **autonomous navigation**, and **frontier-based path planning** strategies for multi-robot systems
- Implementation of **sensor fusion pipelines** (IMU, LiDAR, camera) and **Deep CNN-based obstacle detection** in ROS 2
- **Instrumentation**, **monitoring**, **control and status** logging of temperature and pressure sensors, pneumatic valves, chiller status, pumps and servo/stepper motors **industrial plant automation**

PEER REVIEWED PUBLICATIONS

Journal Articles

- **M. F. Ahmed**, M. Maragliano, V. Frémont, and C. T. Recchiuto, "Efficient multi-robot active slam," *Journal of Intelligent & Robotic Systems*, vol. 111, no. 2, 2025. DOI: 10.1007/s10846-025-02275-8.
- **M. F. Ahmed**, K. Masood, V. Fremont, and I. Fantoni, "Active slam: A review on last decade," *Sensors*, vol. 23, no. 19, 2023, ISSN: 1424-8220. DOI: 10.3390/s23198097.

Conference Proceedings

- **M. F. Ahmed**, V. Frémont, and I. Fantoni, "Active collaborative visual slam exploiting orb features," in *2024 18th International Conference on Control, Automation, Robotics and Vision (ICARCV)*, 2024, pp. 966–971. DOI: 10.1109/ICARCV63323.2024.10821699.
- **M. F. Ahmed**, M. Maragliano, V. Frémont, C. T. Recchiuto, and A. Sgorbissa, "Efficient frontier management for collaborative active slam," in *2024 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, 2024, pp. 1–7. DOI: 10.1109/MFI62651.2024.10705778.
- **M. F. Ahmed**, V. Frémont, and I. Fantoni, "Active slam utility function exploiting path entropy," in *2023 IEEE International Conference on Service Operations and Logistics, and Informatics (SOLI)*, **Best student paper award**, 2023, pp. 1–7. DOI: 10.1109/SOLI60636.2023.10425063.

COURSES AND WORKSHOPS

- Basic Management Course at PIEAS, Islamabad, Pakistan 2017
- Attended "innorobo" robots workshop at Lyon, France 2015
- Course on"FPGA based Chip Designing Using Verilog HDL" 2012 from Skill Development Council Islamabad, Pakistan
- Workshop "Engineers as Managers" 2009 at CASE Islamabad, Pakistan
- Workshop "FPGA Chip Design" 2008 at NUST Rawalpindi, Pakistan
- Course on "Microcontroller (MCS-51 Family)" 2005. Karachi, Pakistan

OTHER ACTIVITIES

Invited Presentations

"Entropy-Based Multirobot Active SLAM"

October, 2023 — Moliets dans les Landes, France

Journées Nationales de la Recherche en Robotique

Collaborative Active SLAM

April, 2023 — Vannes, France

SIS doctoral school seminar

"Active SLAM and MPC and DRL formulation"

February, 2023 — Nantes, France

ARMEN Team seminar

"Visual Odometry And Its Application to SLAM"

November, 2022 — Nantes, France

Student seminar presentation

- Organiser monthly student seminar of Ph.D students from November 2022 to September 2023
- A comprehensive comparative study was performed between ORBSALM2 and CCM SLAM, two popular single and multi-agent visual SLAM methods

Master M2 Thesis co-supervision

Synchronous and Asynchronous Coordination in Collaborative Active SLAM

April-July 2023 — ECN, LS2N, Nantes, France

- Two navigation strategies along-with efficient frontier sharing strategies are proposed which enhance active exploration and mapping by a team of ground robots.

Master M1 Project supervision

Deep learning-based Distributed UAV Target Detection over Multi-sensor Network

March-May 2022 — ECN, LS2N, Nantes, France

- UAV target detection based on CenterNet (CNN) and sensor fusion using weighted average consensus

Master M2 Lab teaching

Implementation of ICP on nuScenes dataset for AUVE subject

Nov 2022 — ECN, Nantes, France

- Application of ICP algorithm for localization and Occupancy Grid Mapping on real driving data from NuScenes dataset

LANGUAGES

English (Professional)
French (B1)

THINGS I ENJOY

- Hiking, cycling and travelling

REFEREES

To respect privacy of references, the contact details will be provided upon request.

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