MUHAMMAD FARHAN AHMED

Ph.D. in Robotics and having experience in designing Embedded systems for Industrial Automation

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🔗 MFA 🎓 Muhammad Farhan Ahmed ⭘ MF-Ahmed

💼 WORK EXPERIENCE

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

📅 March 2025 – Present 📍 Nantes, France

- PerCoMa project (ANR), Collaborative Perception Using Drone Fleets for Marine Environment Monitoring

Ph.D Candidate/Researcher
Laboratoire des Sciences du Numérique de Nantes (LS2N)
École Centrale de Nantes, France

📅 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)

Principal Engineer (Plant Automation Group)
SmartPCBs

📅 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

🎓 EDUCATION

Ph.D. in Robotics
École Centrale de Nantes, LS2N, France

📅 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.

Masters in Advance Robotics - ROBA
École Centrale de Nantes, France

📅 Sept 2014 – Aug 2015 📍 Nantes, France

EMARO (European Master on Advanced Robotics)

Masters in Robotics Engineering
University Of Genoa, Italy

📅 Sept 2013 – July 2014 📍 Genoa, Italy

EMARO (European Master on Advanced Robotics)

B.E (Electronics Engineering)
Mehran University, Pakistan

📅 Sept 2002 – July 2006 📍 Karachi, Pakistan

⚙️ SKILLS

- 💻 Programming

  Python | C++ | Embedded C/C++/Assembly
  PyQT5 | ROS1/2 | MatLab/Octave | Ubuntu

- 🤖 Robotics

  Mobile Robots | Computer Vision | SLAM
  Mapping | Path Planning | Navigation

- 🔋 Embedded Systems

  PIC32 | PIC24 | Atmega2560 | I^2C | SPI
  USART | ADC | DAC | Timers | Interrupts
  Driver Programming | MPLABX | AVR Studio

- 🔋 Electronics Engineering

  Instrumentation | Sensor interfacing
  Motor control | Maintenance

👤 SUPERVISION & TEACHING

Undergraduate Project Supervision
Comparative study of ORBSLAM2 and CCM SLAM

📅 March-April 2024 📍 ECN, LS2N, Nantes, France

- **Maintain** detailed records of all maintenance activities, including inspections, repairs, and replacements. Keep technical documentation, such as equipment manuals and maintenance procedures, up to date

🔧 TECHNICAL EXPERIENCE

- **Instrumentation**, **monitoring**, **control and status** logging of temperature and pressure sensors, pneumatic valves, chiller status, pumps and servo/stepper motors with reference to plant control philosophy
- Programming in C/C++, Python, and Assembly on MikroC and Keil IDEs using compilers from Microchip C16/C18/C30/C32, CCS C, and WinAVR
- GUI, software simulators and MIMIC deign for data acquisition, logging and reporting for industrial process automation systems

📖 PEER REVIEWED PUBLICATIONS

📄 Journal Articles
- **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) ●●●○○

📑 REFEREES

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

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