Khawaja Ghulam Alamdar

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EDUCATION AND TRAINING

Erasmus Mundus Joint Master in Intelligent Field Robotic Systems

Universitat de Girona, University of Zagreb [Sep 2022 – Jun 2024]

Website: https://ifrosmaster.org/

Thesis: Connectivity Maintenance in Ad-hoc UAV Networks for Multi-robot Missions (Grade: 9.3/10)

- Coordinated by Universitat de Girona (Spain), University of Zagreb (Croatia) and Eötvös Loránd University (Hungary).
- Specialization in 'aerial vehicles and multi robot systems'.

Bachelor of Science in Electrical Engineering

Habib University [Aug 2018 – Jun 2022]

Location: Pakistan

Website: https://habib.edu.pk/academics/sse/electrical-engineering/

Final grade: 3.86/4.00 (Cumulative GPA)

Thesis: Autonomous Mapping and Human Localization for Indoor Disaster Management UAVs (Grade: A, A+)

PUBLICATIONS

Frontier Exploration for Disaster Management UAVs

Alamdar, K.G., Khorasani, M.R., Rizvi, S.M.A., Ahmed, R.M. and Memon, J.A., **2022**, December. Frontier Exploration for Disaster Management UAVs. In *2022 IEEE International Conference on Robotics and Biomimetics (ROBIO)* (pp. 1098-1103). IEEE.

Human Detection and Localization in Indoor Disaster Environments Using UAVs

Rizvi, S.M.A., Ahmed, R.M., **Alamdar, K.G.**, Khorasani, M.R. and Memon, J.A., **2022**, September. Human Detection and Localization in Indoor Disaster Environments Using UAVs. In *2022 4th International Conference on Robotics and Computer Vision (ICRCV)* (pp. 159-163). IEEE.

Mitigating the Zero Biased Steering Angles in Self-driving Simulator Datasets

Khan, M.A., **Alamdar, K.G.**, Junaid, A. and Farhan, M., **2022**. Mitigating the Zero Biased Steering Angles in Self- driving Simulator Datasets. In *VISIGRAPP (4: VISAPP)* (pp. 470-475).

WORK EXPERIENCE

Computer Vision Intern - ViCOROB

Universitat de Girona [Jun 2023 – Aug 2023]

Location: Spain

- Improved a weakly-supervised semantic segmentation framework for side scan sonar (SSS) images.
- Created a GUI tool for visualization and inspection of SSS transacts (trajectories) over a map, which allows users to manually split the dataset based on visual inspection of the data trajectories.

Teaching Assistant - Programming Fundamentals & Feedback Control

Habib University [Fall '19, Fall '21]

Location: Pakistan

- Created assignment manuals, delivered supplementary sessions, and instructed students in labs.
- Assisted instructors in overall execution of the courses.

SELECTED PROJECTS

Connectivity Maintenance in Ad-hoc UAV Networks for Multi-robot Missions

Master's Thesis | *ROS 2, OpenAI Gym, Crazyflie UAVs, OptiTrack* | [March 2024 – Present]

- Modified a classic connectivity controller to include battery awareness and fault tolerance for a swarm of UAVs.
- Analyzed the feasibility of Graph Neural Networks (GNNs) for imitation learning.
- Demonstrated a full fleet management system using Bitcraze Crazyflie UAVs.

Collaborative Multi-UAV Exploration for Search and Rescue

ROS, Gazebo, px4 | [November 2023 – February 2024]

- Implemented multi-UAV exploration strategy to achieve maximum coverage and localize humans.
- Developed a 'human-aware' exploration algorithm that improves the time taken to localize humans.

Flocking, Rendezvous and Formation Control of Multi Agent Systems

ROS, Stage Simulator | [October 2023 – February 2024]

- Implemented Reynolds' rules to simulate decentralized flocking in Stage Simulator for unicycle dynamic agents.
- Implemented consensus-based rendezvous and formation control in Stage Simulator.

Autonomous Pick and Place using TurtleBot

ROS, Gazebo, Turtlebot, uArm Swift Pro | [Feb 2023 – May 2023]

- Implemented multiple frontier selection and path planning algorithms (RRT, RRT*, RRT-Informed, FMT, BMT) with smoothing techniques (B-Spline, Dubins)
- Presented an extensive comparative analysis of implemented algorithms in simulation and real environments.
- Integrated with self-implemented pose-based EKF SLAM and HectorSLAM for mapping and localization.
- Integrated with task priority kinematic control of mobile manipulator to enable fully autonomous pick-and-place.

Autonomous Mapping and Human Localization for Indoor Disaster Management UAVs

Bachelor's Thesis | *ROS, Gazebo, OpenCV* | [Jul 2021 – Jul 2022]

- Developed an exploration algorithm tailored for UAVs for emergency response in GPS-denied environments.
- Implemented a module to detect and localize human survivors using YoloV3.
- Developed on ROS and simulated it in Gazebo using a PX4 quadrotor in disaster-like cluttered environments.

Link: https://hira.habib.edu.pk/jspui/handle/123456789/476

TECHNICAL SKILLS

Programming Languages
Python (Advanced) / C/C++ / MATLAB

Robotics
Robot Operating System (Advanced) / ROS2 / Linux

Others
LaTeX (Advanced) / Git / Docker / GPU Acceleration

AI Frameworks
OpenAI Gym / OpenCV / PyTorch / TensorFlow

Embedded Systems
Nvidia Jetson Nano / Raspberry Pi / Arduino

HONOURS AND AWARDS

Dean's Medal | **Habib University [Jun 2022]**
Awarded for highest overall academic performance in BS Electrical Engineering batch of 2022.

Best Capstone Project/Undergraduate Thesis Award | **Habib University [Jun 2022]**
Bachelor's capstone thesis awarded as the best capstone project in BS Electrical Engineering batch of 2022.