AFZAL AHMAD

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EDUCATIONAL BACKGROUND

Czech Technical University in Prague, Czech Republic 2020 - 2022
Master of Science (M.Sc) GPA: 1.7/5
Artificial Intelligence, Department of Computer Science

Indian Institute of Technology (IIT) Guwahati, India 2015 - 2019
Bachelor of Technology (B.Tech) GPA: 7.38/10
Department of Electronics and Electrical Engineering

RESEARCH EXPERIENCE

Multi-Robot Systems Lab, Prague, Czech Republic Aug 2022 - Ongoing
Research Fellow, Advisor: Dr. Martin Saska *Website*

· Designing a simulator for learning high-speed, safe flight for a swarm of UAVs.
· Improving and maintaining existing open-source libraries and code-base for other projects.

Multi-Robot Systems Lab, Prague, Czech Republic Aug 2019 - Aug 2022
Research Assistant, Advisor: Dr. Martin Saska *Video demo*

· Designing decentralized control algorithms for collective navigation of a swarm of UAVs.
· Focus on self-organised flocking and path planning in an obstacle-rich environment (forests).

Collaborative transport using multiple UAVs, IIT Guwahati, India Aug 2018 - April 2019
Bachelor's Thesis, Advisor: Dr. Indrani Kar

· Introduced a path planning method based on rapidly exploring random tree (RRT) algorithm for UAV navigation in an obstacle-rich urban environment.
· Introduced a framework for cooperative locomotion of a decentralised group of UAVs using the new path planning approach.

MIST Lab, Polytechnique Montreal, Canada May 2018 - July 2018
Research Intern, Advisor: Dr. Giovanni Beltrame *Website*

· Developed a ROS based architecture for path planning and control of multi-UAV systems.
· Developed a framework for long term autonomy of a multi-robot system using adaptive locomotion.

Indian Institute of Technology (IIT) Guwahati, India June 2017 - Dec 2017
Research Intern, Advisor: Dr. Prithwijit Guha *Project page*

· Developed a model-based learning technique for locomotion of a nonholonomic snake robot (ASROA).
· Used the learned model to implement obstacle avoidance in a simulated environment.

PAPERS

Afzal Ahmad, et al. *"PACNav: A Collective Navigation Approach for UAV Swarms Deprived of Communication and External Localization"*, Bioinspiration & Biomimetics, Nov. 2022. *Project page*

Afzal Ahmad, et al. *"Autonomous Aerial Swarming in GNSS-denied Environments with High Obstacle Density"*, IEEE International Conference on Robotics and Automation (ICRA) 2021. *PDF*

Afzal Ahmad, et al. *"Cooperative path planning for multiple MAVs operating in unknown environments"*, International Conference on Unmanned Aircraft Systems (ICUAS) 2020. *PDF*

INDEPENDENT PROJECTS

ARLE: Autonomous Robot for Library Enhancement Aug 2017 - April 2019
4i Lab, IIT Guwahati *Project page*

· Implemented autonomous navigation and collision avoidance and guided the team to integrate the control system with navigation to achieve smooth trajectories during locomotion.

HIVE: Distributed swarm system Dec 2016 - Feb 2017
Robotics Club, IIT Guwahati *Project page*

· Implemented a modified version of Particle Swarm Optimisation (PSO) algorithm for self-organized flocking and collaborative search.

KBT: Autonomous football playing robot Sep 2016 - Oct 2016
Personal project, IIT Guwahati

· Designed an autonomous robot to play football using object tracking and path planning to accomplish maximum goals in the shortest possible time.

TECHNICAL SKILLS

Programming Languages	C++, Python, C
Softwares & Tools	OpenCV, Gazebo, V-rep, LaTeX, Solidworks, MATLAB
Operating Systems	Ubuntu, Robot Operating System (ROS1 and ROS2)
Hardware	Intel NUC, Raspberry Pi, Pixhawk Autopilot, Arduino

RELEVANT COURSES

Department Courses	**Other Courses**
Advanced Algorithms	Computational Game Theory
Machine Learning	AI for Robotics
Advanced Control Systems	Evolutionary Algorithms
Image Processing	Introduction to Computer Vision
Probability and Random Processes	Calculus & Linear Algebra
Embedded Systems	Control of Mobile Robots

HONORS AND AWARDS

· Selected among the ***top 6*** Masters thesis dissertations for the ***Cena Wernera von Siemense awards*** under the ***Industry 4.0*** category. The thesis was selected considering it's potential impact on the new age of industrial revolution, Industry 4.0.

· Awarded with the ***Shastri Research Student Fellowship*** to do a research internship in Polytechnique Montreal, Canada. This fellowship is only awarded to 18 students all over India each year.

· Awarded ***Best Secretary*** among 11 technical societies (clubs) of IIT Guwahati. Also awarded with the ***Best Club*** award for my tenure.