Curriculum Vitae

Raghav Thakar

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EDUCATION

Manipal Institute of Technology, B. Tech. Computer Science and Engineering *July 2019 - May 2023*
Minor specialisation in Computational Mathematics
CGPA: **8.96/10** (End of 7th Semester)

COURSEWORK

Linear Algebra, Grapth Theory and Matrices, Applied Statistics, Calculus, Graph Theory, Operations Research, Distributed Systems, Social Network Analysis, Embedded Systems, Digital Systems Design, Parallel Computing

EXPERIENCE

Undergraduate Researcher, MOON Lab, IISER Bhopal *November 2021 - Present*
Supervisor: Dr. Sujit PB
- Developing a COLREGs-compliant multi-agent path planning algorithm for unmanned surface vessels (USVs).
- Worked on techniques for coverage in large areas using a single drone requiring multiple battery swaps.
- Assisted in the MILP formulation for the problem.
- Implemented the proposed heuristic and compared it with various methods to collect appropriate results.
- Developed a rich GUI tool to generate and visualize mission plans using the proposed solution.
- Participated in the MBZIRC Maritime Grand Challenge 2023 as part of Team Luna, finishing 12th globally.
- Responsible for the formation and collective motion techniques for drones to pick up heavy objects.

Research Intern, MARS Lab, Ontario Tech University *May 2022 - July 2022*
Supervisor: Dr. Scott Nokleby
- Selected as part of the MITACS Globalink Research Internship Program.
- Developed the navigation system for an autonomous wheelchair for children with physical challenges.
- Implemented a potential field-based local planner for effective real-time avoidance of dynamic obstacles.
- Modified the RRT* algorithm for global planning.
- Integrated a depth camera for slope detection and used depth data for localization.
- Worked on a QUICKIE Xperience 2 Power Wheelchair to develop a proof of concept.

Sensing and Automation Head, Project Manas *April 2021 - May 2022*
Official Robotics and AI team of MIT, Manipal.
- Built an autonomous drone with obstacle avoidance and coverage capabilities for AUVSI-SUAS 2022.
- Designed a MAVLink-based communication pipeline between the drone and remote base station.
- Integrated a 3D LIDAR with the software stack of a driverless car for local planning and mapping.
- Led several technical undertakings in the team and mentored juniors.

Robotics Research Intern, Advanced Technology Division - AEPL *June 2021 - September 2021*
- Developed HITL (Hardware In The Loop) simulations for testing drone swarms.
- Wrote applications to enable autonomous flying and mission execution of drones.
- Made tools for flight monitoring and generating post-flight reviews, reports, and insights.
- Worked closely with hardware for systems integration and testing.

National Semi-finalist, Swadeshi Microprocessor Challenge *November 2020 - August 2021*
Organised by Ministry of Electronics and Information Technology, Govt. of India.
- Competed at the semi-final stage, among the top 100 of 3000+ participant start-ups and student teams.
- Developed an MVP for Shelfy, an ASRS for warehouses, using the indigenous 'Shakti' processor.
- Designed the complete mechanical assembly for the MVP using Computer Aided Design software.
- Manufactured 3 versions of the assembly to demonstrate pick and place operations on real objects.
- Wrote low-level controllers for the hardware to enable smooth and reliable motion.
- Received funding of Rs 100,000 for the project from the Govt. of India.

PROJECTS

- **Swarm Distribution:** Task allocation for heterogeneous robot swarms.
- **Carriers:** Formation and consensus system for small drone teams.
- **Kobu:** Multirobot space exploration using Peano's and Hilbert's space filling curves.
- **RRT Waypoint:** Navigation of an autonomous drone in environments with obstacles.
- **Muvu:** Implementation of the offline Spanning Tree Coverage algorithm.
- **Sparsh:** Braille reader prototype with tactile and audio feedback.

LANGUAGES & TOOLS

ROS, C/C++, Python, Gazebo, CoppeliaSim, Version Control, Shell Scripting, Fusion360, Assembly

VOLUNTEERING AND WORKSHOPS

ROSCore, Robotics Workshop and Contest *April 2021*

Organisation: IEEE Student Branch Manipal

- Organised a series of three virtual workshops for 50+ college students across the country.
- Introduced the participants to the basics of ROS and robotic software development in the workshop.
- Organised a robotics contest that saw 20+ teams participate from across the country.
- Designed a Gazebo environment and a skeleton code for the participants to implement a wall-following robot.

Project Element, Workshop *December 2020*

Organisation: The Mother's International School

- Held a three-day in-person workshop at my school to introduce 25+ middle-school students to engineering.
- Designed interactive exercises that demonstrated basic engineering concepts using easy-to-find materials.
- Helped the participants make a final project that utilised an engineering concept of their choice.