Suchetan Saravanan

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Education

- **Birla Institute Of Technology and Science (BITS), Pilani, Goa Campus** — Goa, IN
  Bachelor's in Electrical and Electronics Engineering; CGPA: 8.01/10 — *Aug 2020 - Present*
- **Class 12th - Bangalore International Academy** — Bangalore, IN
  CBSE Board; 95.2% — *Aug 2018 - May 2020*
- **Class 10th - St Paul's English School** — Bangalore, IN
  ICSE Board; 94.8% — *Aug 2017 - May 2018*

Skills Summary

- **Interests**: SLAM, Motion and active path planning, Perception, Computer Vision
- **Languages**: Python, C++, C, SQL, Shell scripting, Assembly Language, Verilog
- **Tools**: Robot Operating System(ROS 2/ROS), Linux, Gazebo, CI/CD, Docker, GIT, Matlab/SIMULINK, STM32, LabView, Unity

Publications

- **Information-based Active SLAM in 3D environment using traversability estimation**:
  Suchetan R S, Caroline Chanel, Damien Vivet - *Accepted at IEEE ICARA '24*

Experience

- **NaviR2eS Research Team, ISAE-SUPAERO** — Toulouse, FR
  Autonomous navigation and perception intern — *June 2023 - Present*
  - **Simultaneous localisation and mapping (SLAM)**: Working under Dr. Damien Vivet on active simultaneous localisation and mapping (ASLAM) in a multi-robot environment. Developing state of the art techniques to maximise information gain during SLAM through informed path planning techniques.
  - **Traversability estimation**: Integration of the traversability estimates calculated with the GESTALT algorithm in SLAM to aid in local path planning of multiple co-ordinating robots.
- **Clutterbot Technologies Pvt. Ltd.** — Bangalore, IN
  Robot Software intern — *Jan 2024 - Present*
  - **Perception aware planning**: Successfully achieved perception based dynamic re-planning during traversal to a given goal through implementation of a custom Nav2 Costmap2D plugin incorporating the perception information along with LiDAR data.
  - **Optimization based pose estimation**: To determine the most optimal approach pose to pick an object, designed and formulated an optimization based approach which incorporates the voxel map from the 3D PCL, object bounding boxes as well as traversable score to the object location.
- **InGen Dynamics** — Bangalore, IN
  Junior Robotics and Deep Learning Engineer — *June 2022 - December 2022*
  - **Autonomous navigation**: Worked on (SLAM) for autonomous navigation of a homespace robot. Complemented this with the integration of a local(DWA) and global planner(A*). Used a URDF based simulation of the robot on Gazebo and Rviz to simulate challenging environments to navigate in. A full integration of a custom planner with the ROS navigation stack was also carried out successfully.
  - **Deep Learning and Computer Vision**: Worked on face detection, face recognition and object detection using a HOG + SVM based model to facilitate real-time detection on the Robot.
- **Indira Gandhi Center For Atomic Research, DAE, Govt of India.** — Kalapakkam, India
  Embedded systems research intern — *May 2022 - July 2022*
  - **Embedded Programming**: Used the STM32 microcontroller to discriminate between alpha and beta radiation after passing into a scintillation device. Carried out signal denoising and analysis on the emitted radiation to obtain discrimination results. The setup was fully tested first on Proteus and then on an active plant to test and verify real world use.

Open Source Contributions

- **Full fledged ROS-2 Wrapper for ORB-SLAM3 (link)** Remote
  Sole contributor to the project. *Jan 2024 - Present*
  - **ROS-2 Wrapper**: Given a lack of ROS-2 based wrappers for ORB-SLAM3, started this project earlier this year. **Currently has 80+ stars on Github!**
  - **Dockerization and improvements.**: To facilitate ease of use, the entire pipeline has been dockerized. Apart from this, I also provided features within the wrapper to enable the correct use of Multi-Map SLAM, full-blown visualizations through RVIZ and also full support for namespacing.
- **Frontier-exploration package - ROS2 (link)** Remote
  A full port to ROS2 *June 2023 - Dec 2023*
  - **ROS-2 Wrapper**: The very widely used frontier exploration package of ROS had no working version for ROS2. I started contributing to this project to port the entire system to ROS2 Humble. This involved a full custom Nav2 costmap plugin, use of raw C++ outside of ROS2 and much more.
- **OPEN-RMF - Obstacle detection pipeline (link)** Remote
  Refactoring and new features. *May 2024 - Present*
  - **ROS-2 Wrapper**: Very recently, I started contributing to the open-rmf project. More specifically for the obstacle-detection pipeline. This involved bug fixing in the current framework to detect and block lanes, collate information from multiple sources to publish the data and also starting to work on the obstacle server using ROS2 pluginlib.

Projects

- **Project Kratos (link)** Goa, IN
  Lead of Robotic Arm Subsytem *May 2021 - Present*
  - **Inverse Kinematics**: Led the development of a closed loop feedback control system using ROS and STM32 microcontroller. Used PID control to achieve accurate position control with minimal error on a 5 DoF robotic arm.
  - **Autonomous Pick and Place**: Built a custom dataset of the object to be manipulated. Used YOLOv4 for object detection and centering. A path planning algorithm (Bi-directional RRT) was implemented. Using the IntelRealSense depth camera in integration with an IMU sensor and ROS transformations, localization of the end effector was done. The entire setup was tested on Gazebo11 integrated with ROS.
- **Robot Localization using BLE Beacons and Deep Learning** Remote
  Semester Project Under Dr. Malcolm Mielle, EPFL, Switzerland *June 2023 - October 2023*
  - **Localization and EKF**: Developed an end-end framework to localize a given Robot using just 3 BLE Beacons and an IMU. The data acquired was trained on a Neural Network using Pytorch. The fusion of the output from the network and the IMU reading was done using an Extended Kalman Filter. The results showed a 47% improvement from the current state of the art.
- **Radar SLAM and Signal Processing using FM-CW Reflectometry instrument** Goa, IN
  Semester Project Under Dr. Amalin Prince *January 2022 - Present*
  - **Radar Odometry**: Contributed to the use of FM-CW reflectometry and Kalman Filters to map the environment during Autonomous navigation over traditional LIDARs. Radar readings were post-processed using an EKF to obtain real-time odometry.
  - **Plasma Research**: Used Empirical Mode Decomposition and Wavelet Packet decomposition in combination with Kalman Filters to perform noise removal on plasma data. This was later analyzed using HHT and Wigner Ville distribution.

Relevant Coursework

Introduction to Robotics and motion planning - Control Systems - Modern Control Systems - Electrical Sciences - Electrical Machines - Digital Design - Computer Programming - Microprocessors, Programming and Interfacing - Introduction to Artificial Intelligence - Object oriented programming

Honors and Awards

- Ranked 1st in India and 2nd in Asia at the University Rover Challenge held in Utah, USA - May '22
- Ranked 2nd overall and 1st among Indian Teams at the Anatolian Rover Challenge held in Istanbul, Turkey - July '22
- Collectively elected as lead of Robotic Arm Subsystem for Project Kratos.
- Ranked fifth among all the candidates in a batch of 400 at Pre-university board examination

Volunteer Activity

- Volunteered to train pre-university and high school students on basic concepts of robotics and embedded systems
- Volunteered at Nirmaan NGO for the betterment of healthcare and Poverty relief
- Volunteered at Abhigyaan NGO for teaching middle school underprivileged students on Math and Physics

Positions of responsibility

- **Arm Subsystem Lead** Goa, IN
  Project Kratos *August 2022 - Present*
  - Leading a team of 6 in the arm subsystem to participate in URC, ARC, IRDC and IRC
  - Monitoring the progress of subsystem core members and leading the software development of the robotic arm
- **Student Mentor** Goa, IN
  Peer Mentorship Program *August 2021 - August 2022*
  - Mentored 6 first year students on courses along with clarifying doubts related to coursework
- **Alumni Relations Cell** Goa, IN
  Core Member *November 2020 - August 2022*
  - Hosted talks with Alumni on topic related to Post Doctoral Programs research fellowships
  - Played a key role in organising Annual Convocation with a team of 55.
  - Essential part of a team organising BITSAA Global meet, Jaipur.