Govind Aadithya Rajagopalan

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Education

- **New York University** — New York, United States
  Master of Science in Mechatronics and Robotics; CGPA: (3.833/4.0) — *Aug 2022 – May 2024*
- **SRM Institute of Science and Technology** — Chennai, Tamil Nadu, India
  Bachelor of Technology in Mechatronics Engineering; CGPA: (7.956/10.0) — *Aug 2014 – April 2018*

Research and Publication

- **Current Work**

  Applied Dynamics and Optimization Lab, Dr. Joo H Kim

  - **Dynamic Lifting**: Understanding the effects of object mass during lifting and generating dynamic trajectories for lifting motion using Balanced State Boundaries.

    Hyunjong Song, William Z. Peng, Govind Aadithya Rajagopalan, and Joo H. Kim. Balancing of humanoid with object mass: Trade-off analyses and lifting control. *IEEE Transaction on ROBOTICS*, (Under review).
  - **Gait analysis**: Setup motion capture to do full body and COM pose estimation. Work will be extended to perform energetics study.

  AI4CE, Dr. Chen Feng

  - **Visual Navigation**: Developing a ROS framework to control Unitree Go1 Pro robot with MQTT protocol and deploy and validate different Learning based algorithms for Visual Navigation.

  Robot Motor Intelligence (RoMI) Lab, Dr. Carlos Mastalli

  - **MPC + RL**: Developing a framework that can leverage pre-learned skills for learning new skills and using them in tandem with MPC.
- **Theses Work**

  New York University, Applied Dynamics and Optimization Lab — *May 2023 - May 2024*

  - **Simulation Package for OP3**: Simulation package with MuJoCo physics engine compatible with Robotis' ROS framework. The platform is also compatible for trajectory following from sparse trajectory optimization frameworks with b-spline based rediscritization. (Code base, Thesis).

  SRM Institute of Science and Technology — *Aug 2017 - May 2018*

  - **Multi Robot Planning**: A Decentralized navigation algorithm using optimal control based trajectory optimization framework for multi-robot navigation in a dynamic environment.
- **Conference Publications**

  IFAC - Advances in Control and Optimization of Dynamic Systems — *Feb 2020*

  - Shravan Krishnan, Govind Aadithya Rajagopalan, Sivanathan Kandhasamy, and Madhavan Shanmugavel. Continuous-time trajectory optimization for decentralized multi-robot navigation. (Link)

  IEEE 4^{th} International Symposium On Robotics and Manufacturing Automation, India — *Dec 2018*

  - Vijay Arvindh, Govind Aadithya R, Shravan Krishnan, and Sivanathan K. Collision-free multi robot trajectory optimization in unknown environments using decentralized trajectory planning. (Link)

  IEEE International Conference on Intelligent Transportation Systems, United States — *Nov 2018*

  - Shravan Krishnan, R Govind Aadithya, Rahul Ramakrishnan, Vijay Arvindh, and K Sivanathan. A look at motion planning for avs at an intersection. (Link)
- **Other Publications**
  - Shravan Krishnan, Govind Aadithya Rajagopalan, Sivanathan Kandhasamy, and Madhavan Shanmugavel. Towards scalable continuous-time trajectory optimization for multi-robot navigation, 2019. (Link) [Video]
  - Govind Aadithya R, Shravan Krishnan, Vijay Arvindh, and Sivanathan K. Online decentralized receding horizon trajectory optimization for multi-robot systems, 2018. (Link)
- **Patent**

  SRM Institute of Science and Technology — *Jun 2019*

  - Sivanathan Kandhasamy, Govind Aadithya Rajagopalan, and Shravan Krishnan. A system for decentralized collision-free navigation of multiple robots, Jun 2019. (Link)

Awards

- **Tandon Merit Scholarship**: Scholarship for MS program from NYU Tandon School of Engineering.
- **Best Paper Award**: Received the best paper award at the IEEE International Symposium on Robotics and Manufacturing Automation, Tamil Nadu, India.
- 2^{nd} **Runner-up in IROS Humanoid Robot Application Challenge**: Performed Magic Trick with Humanoid and won 2^{nd} runners-up position in the Humanoid Robot Application Challenge at IROS'17 held at Vancouver, Canada.
- **Multiple Medals in Robogames Competition**: Won 1^{st} place in Penality Kick, 2^{nd} place in Biped Race and Freestyle, 3^{rd} place in Sumo Wrestling events at Robogames'17 held in Pleasanton, USA.

Skills

- **Programming**: Python, C++, SQL, LabVIEW, Matlab & Simulink.
- **Toolkits & Libraries**: ROS, ROS2, Python – Pandas, Django, OpenCV, pytorch ; C++ - Eigen, MATLAB – Robotics Toolbox
- **Robot Platforms**: Robotis OP3, Darwin Custom, & Bioloid, Unitree Go1 Pro, Omron eCobra 800, Yaskawa MotomanGP7

Projects

- **Embodied AI and Visual Navigation challenge**: Implemented Graph SLAM and VPR algorithm from scratch to perform visual navigation to a given scene in an unfamiliar environment. Code can be found here.
- **Sensor Fusion and State estimation for Aerial Robot**: Developing several data fusion strategies (Extended and Unscented Kalman Filter and State estimation from Vision) from data collected from sensors like IMU, Motion Capture, and Camera.
- **Q-Learning for Inverted Pendulum**: Deviced a Q-Learning based controller for the Inverted Pendulum on a cart problem.
- **Trajectory Tracker for Bi-Rotor**: Designing an I-LQR controller for making bi-rotor follow a given trajectory.
- **Visual markers and servoing-based control of holonomic robot**: Robot navigation using visual markers and visual servoing methods to navigate a grid structure. The project was executed by integrating Propeller controller and RPi for visual servoing. Code can be found here.
- **Motion replication in animatronic hand**: Used the mediapipe and computer vision to extract joint angles of hand and normalize it for distance of hand in the frame to replicate it on the animatronic hand. The code and details of the project can be found here.
- **Whole body shadowing of human motion**: Objective is to replicate whole body human motion on OP3 robot. This was done by using the Xbox Kinect sensor and the skeletal overlay to estimate joint angle being performed by the operator in front.
- **Ankle strategy control for frontal plane control**: Designed a PD control using ankle strategy with a reduced order inverted pendulum model for Bioloid which was later adapted in the Darwin OP and OP3 robots.
- **Inverse Kinematic and trajectory control for walk cycle**: Inverse Kinematic control to make sure the CoM lies with the BOS thereby improving stability during work and trajectory following for swing foot trajectory.

Work Experience

- **Schneider Electric** Vadodara, Gujarat, India
  Manufacturing, Automation, and Digitization Engineer *Oct 2018 - Jun 2022*
  - Design and development of factory automation solutions for Brownfield projects.
  - Designed network architecture and control logic for Special Purpose Machines and Robot Work Cells.
  - Database management and HMI design for process automation in SAP and physical assembly interlocks.
  - System design with Industrial-IoT (IIoT) to monitor and perform predictive maintenance.

- **Srujana - Technology and Innovation Center, LV Prasad Eye Institute** Hyderabad, India
  LVP MITra Fellow/Intern *Dec 2017 - Feb 2018*
  - Worked on "BullsEye", a portable corneal topographer that can work on any mobile with a camera.
  - Hardware prototyping with pattern projection and 3D reconstruction from projected pattern.
  - Built software to detect the projected pattern, perform 3D reconstruction, and calculate deviation.
- **SRM Team Humanoid, SRMIST** Chennai, TamilNadu, India
  Domain Head - Control and Computer Vision *Jul 2016 - May 2018*
  - Developed Inverse Kinematics based gait algorithm to track COM and swing foot trajectory and integrated it with ankle strategy PD control for lateral and saggital stability.
  - Initiated feature matching-based object tracking in place of Blob tracking.

  Algorithm Developer *Aug 2015 - Jul 2016*
  - Developed a ROS framework to integrate control, sensor, and vision stacks.
  - Developed Blob-based object tracking framework for tracking objects like balls, color markers etc.
- **Teaching and Mentoring** New York, USA
  Global Guide, One to World *Jan 2024 - May 2024*
  - Conducted half-day workshops for middle school and high school students about Sustainable cities and sustainable practices from India along side sharing about South Indian Culture.

  STEM Leader, NYU K12 Center *Jun 2023 - Aug 2023*
  - Curriculum design and instruction of technical workshops for the Design, Invent, and Innovate course with 20 students.
  - Provide assistance and guidance to students for capstone project.

  FIRST Robotics Mentor, Poly Prep and Henricks High School *Aug 2022 - Present*
  - Mentor high school robotics teams for the FIRST Tech and Robotics challenges.
  - Guided them for structure build, algorithms and edge case identification.