

Poojan K. Shah

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Education

- Indian Institute of Technology (IIT), Kharagpur, India 2016–2020
 - B.Tech (Hons.), Manufacturing Science and Engineering, Mechanical Engineering, CGPA: 8.81/10.0

Publications

- Development of a RFID-Based Semi-Autonomous Robotic Library Management System
ICACR 2020 : 4th International Conference on Automation, Control and Robots, Rome
- FPGA-based Low Cost and Power Efficient Autonomous Fruit Harvester
IEEE 2020 : 6th International Conference on Control, Automation and Robotics, Singapore
- Design and Implementation of Autonomous Ground Vehicle for constrained environments
IEEE 2019 : 3rd International Conference on Robotic Computing, Naples, Italy

Work Experience

- Fully Active Suspension, Actuation System Control** **Jaguar Land Rover**
 - Control Engineer December 2021–current
 - Guide: Thomas Papanikolaou, Subject Matter Expert, Suspension Control
 - Analyzing a close-loop actuation control system in frequency and time domain for improving controller's **disturbance rejection capability** at low frequencies (0.1-1 Hz) and high frequencies (1-10 Hz).
 - Developed a production-level Proportional Integral derivative (PID) controller containing gain scheduling, anti-windup, and derivative filtering for an actuation system that improved performance criteria from a map-based controller.
 - Investigating the feasibility of **Fast Model Predictive Controller (FMPC)** for improving ride characteristics of a vehicle from feedforward control, PID control, Linear Quadratic Regulator (LQR) control, and robust control.
 - Developed functional safety diagnostic checks of electric motor torque response for electromechanical Active Roll Control.
- Assisted and Automated Driving** **Jaguar Land Rover**
 - Graduate Engineering Trainee September 2020–November 2021
 - Guide: Efe Tunc, Group Leader - Next Gen Vehicle
 - Developed validation & verification tool and continuous improvement methodology for control SW development.
 - Developed tool to evaluate Key Performance Indicators(KPI) for testing continuity and consistency of vehicle trajectory.
 - Hypothesized a novel method for **Country Road Assist**(Autonomy-L2 feature) by analyzing vehicle logged data from experiments and subjective feedback from customers, leading to the generation of **2 anaqua disclosures**(Patent filing).
 - Developed a simulation environment for Learnt Maneuvering Parking(Autonomy - L4 feature) in Simulink- CarMaker and designed experiments to collect subjective assessment data for creating 4 KPIs for a feature.
- Dynamic Color Changing Material** **Jaguar Land Rover**
 - Graduate Innovation Challenge August 2021 – July 2022
 - Guide: Ashutosh Tomar, Research SME Engineer
 - Investigated the capabilities of dynamic color-changing materials technologies such as **electrophoretic**, **electrochromic**, and **thermochromic** for use in the interior of automotive vehicle.
 - Brainstormed various applications of dynamic color-changing material and developed the working prototype by selecting one application using the **Desirability, Viability and Feasibility (DVF)** matrix.
 - Presented the working prototype to senior engineers and currently working towards anaqua disclosures(Patent Filing).
- Soft Robotics Project** **Loughborough University, UK**
 - Intern May 2019–July 2019
 - Guide: Dr. Jonathan Clarke, Intelligent Automation Center
 - Worked on the design of **compliant pneumatic soft actuator** for Stewart platform which can be 3D printed on **fused deposition modeling** type 3D printer (TAZ Lulzbot - Ultimaker Cura 2+) using **NinjaFlex(85A)**.
 - Designed 12 different pneumatic actuators on Solidworks by varying geometric parameters and 3D printed designs with achieved optimized settings for airtight actuators with 5% leakage for improving performance by 33% from existing solution.

Research Projects

- **Pipe Inspection Robot** **IIT Kharagpur**
Jul 2019–May 2020
Bachelor Thesis, Bachelor Term Project
Guide: Prof. Sankha Deb
 - Worked on a project of industrial pipe inspection robot capable of climbing through various pipes assembly.
 - Proposed a kinematic and CAD design of 5 degrees of freedom(dof) serial arm manipulator capable of attaining plane of arm configuration for pipe inspection and solving existing redundancy problem.
 - Derived transformation matrices from **D-H parameter table** for inverse Kinematics to evaluate joint angles.
 - Developed the **Jacobin matrix** for evaluating cartesian velocity of the end effector from angular velocity, defining the zone of singularity, and finding holding torque of joint angles from the static force on end-effector.
 - Designed a force closure gripper consists of worm-worm wheel and 4 bar parallel linkage; evaluated maximum required torque for maximum holding force and found optimized working range(65 - 85 degrees) of gripper.
- **Autonomous Ground Vehicle (AGV) Research Group** **IIT Kharagpur**
March 2017–Feb 2020
Mechanical and Control Team Leader
Guide: Prof. Debashish Chakravarty, Department of Mining Engineering
 - Developed computer-aided modeling of the autonomous robot on Solidworks and manufactured the same which had 2 wheel differential drive with 1 castor to attain 360-degree turn with easy maneuverability.
 - Performed structural and vibrational analysis on ANSYS with the aim to reduce vibrations of sensor mounts.
 - Performed 3-wheel vehicle dynamics modeling on Matlab - Simulink consisting of spring-damper system with Pacejka(Magic Formula) tire model for predicting **rollover possibility**.
 - Assisted a team for implementing & benchmarking various **path tracking controllers** like MPC, LQR, adaptive PID and pure pursuit control on simulation and on electric car (Mahindra e2o) for Mahindra Rise Prize Driverless challenge.
- **Rehabilitation Robotic Project** **IIT Kharagpur**
May 2018–March 2019
Research Project
Guide: Prof. Dilip K.Pratihar, Department of Mechanical Engineering
 - Worked on structural optimization of robotic exoskeleton for reducing static weight by **30%**.
 - Implemented transient structural analysis and rigid body dynamics on ANSYS for evaluating stresses on moving body.
 - Optimized component's dimensions by using genetic algorithm **NSGA-2**, taking stress and weight as parameters.
- **Intelligent Agricultural Robot** **Inter IIT Tech Meet**
November 2018–December 2018
Mechanical Team Captain
 - Prototyped our design for autonomous agricultural robot capable of fruit plucking and seed ploughing for reducing drudgery in agricultural field.
 - Developed a novel **mobile robot** with 3 dof **robotic arm** with **3D printed customized gripper** for plucking fruits.

Volunteer Work

- **Sri Satya Sai Heart Hospital**, Kasindra, Ahmedabad
 - Worked from July- 2020 to September- 2020 for reducing paper usage in the hospital by **45%**.
 - Automate the data collection process by configuring **eClinicalWorks software** according to requirements.
 - Helped hospital staff with using software by taking teaching sessions and developing software guidelines.

Technical Skills

- **Computer Languages:** C, C++, MATLAB, Stateflow, Arduino , Python
- **Softwares & tools:** SolidWorks, ANSYS, CarMaker, Rapberry Pi, Simulink, ROS
- **Project Management :** GIT, Jira, IBM RTC, Agile methodologies(certified)

Achievements

- **Intelligent Ground Vehicle Competition(IGVC)** :Part of the team as Mechanical Team Lead, which bagged **2nd** position in Autonav Challenge among 43 teams and **represents institute** in the competition.
- Featured in The Undergraduate Achiever's Directory as one of the top 100 achievers and featured in Mechanical Engineering Department Newsletter as **Undergraduate Achiever** of the year.
- Successfully adjudged as '**Great Performer**' for the financial year 2021-2022 at the Jaguar Land Rover.
- Secured **JEE Advanced** (Indian Examination) rank of **2420**, amongst total of about **13 Lakh** applicants from across India(**top 0.1%**).