Chinmay Shah

+1(919)-675-9402 | schinu1996@gmail.com | https://cshah96.github.io/ChinmayShah.github.io/

EDUCATION

North Carolina State University ***Aug 2019 – Dec 2021***
MS(Thesis) in Mechanical Engineering *(GPA 4.0/4.0)*

Vishwakarma Institute of Technology (VIT) ***Aug 2014 – May 2018***
B.Tech. in Mechanical Engineering *(GPA 9.12/10.0)*

PUBLICATIONS

- C. Shah, A. Fleming, V. Nalam, M. Liu and H. H. Huang, "EMG-driven Musculoskeletal model for volitional control of a robotic ankle prosthesis" presented at International Conference on Intelligent Robots and Systems(IROS), Kyoto, 2022
- S. Upadhye, C. Shah, M. Liu, G. Buckner, and H. H. Huang, "A Powered Prosthetic Ankle Designed for Task Variability - A Concept Validation," presented at the International Conference on Intelligent Robots and Systems(IROS), Prague, 2021.

EXPERIENCE

DEKA Research and Development ***Jan 2022 – Present***
Robotics Control Systems Engineer

- Contributed to the development of an autonomous last mile delivery robot for FEDEX.
- Assisted in the development of a higher-level controller (Behavior Planner) responsible for dictating the bot's behavior in different scenarios such as on sidewalks, on roads, at traffic light intersections etc.
- Implemented path planning algorithms such as A*, grassfire and RRT to enable the robot to plan the shortest/most efficient route in a dynamic environment avoiding both static and moving obstacles.
- Developed a dynamic collision check library using Machine Learning based predictions to detect and avoid potential collisions with dynamic obstacles.
- Collaborated in the refactoring of the lower-level Model Predictive Controller responsible for driving the robot along the planned path.

Neuromuscular Rehabilitation Engineering Lab ***Mar 2020 – Dec 2021***
Research Assistant

- Contributed to the development of a robotic prosthetic ankle capable to restore 1-DOF of ankle motion for transtibial amputees.
- Designed and implemented an embedded control system for real-time control of the robot. Evaluated the performance of different autonomous and volitional controllers by performing different tasks .
- Worked on my master's thesis titled, "*EMG-driven Musculoskeletal model for volitional control of a robotic ankle prosthesis*". Where we devised a novel EMG-driven model-based controller to allow the user to control the device at will.
- All of these controllers would enhance the quality of life of transtibial amputee's by restoring their lower limb function and allowing them to walk on level ground, climb stairs and perform other daily activities.

RESEARCH EXPERIENCE

EMG-driven Musculoskeletal Model based control for a Robotic ankle prosthesis ***Aug 2020 – Dec 2021***

- Conceptualized and designed a 2-muscle lumped parameter EMG driven musculoskeletal model controller to allow the user to control for a robotic ankle prosthesis at will.
- Developed and implemented a non-linear optimization scheme in MATLAB to optimize the model, achieving a prediction accuracy over 85%.
- Conducted biomechanics analysis using inverse dynamics and kinematics to validate the model and evaluate the robot's performance.

- The controller enabled the user to operate the device at will, enabling them to react to changes in the environment and adjust their ankle angle at will while performing tasks.

Reinforcement Learning Based Gait Assistance using Hip Exoskeleton ***Jan 2021 – May 2021***

- Assisted with the Development of gait assistance algorithms for proprietary hip exoskeleton using Least Squares Policy Iteration.
- The algorithms would reduce human exertion during walking without sacrificing efficiency.

Finite State Machine for a Robotic ankle prosthesis ***Jul 2020 – Dec 2020***

- Implemented a Finite state control algorithm for a robotic ankle prosthesis to enable the user to walk on level ground and climb stairs.
- Utilized the different force and angle sensors within the device to identify different states and developed a robust controller capable of efficiently transitioning between them.

Design of a Robotic Ankle Prosthesis for task variability ***Mar 2020 – Dec 2020***

- Assisted with the design and development of a novel ankle prosthesis containing an adjustable elastic element allowing task variability.
- The adjustable elastic element allowed the user to modify the device's passive stiffness and range of motion optimizing its performance across different tasks.

TECHNICAL EXPERTISE

Competencies: Control Theory, Design of Experiments, Machine Design, Dynamics, Embedded Systems, FEA, Design Validation, Fabrication, Rapid Prototyping, Physical Human Robot Interaction.

Software: ROS, GIT, MATLAB, Simulink, TwinCAT 3.1 (EtherCAT), SolidWorks, ANSYS, VICON, Visual 3D

Programming Languages: C, C++, Python, Java

Certifications: Deep Learning, Machine Learning

PROJECTS

Non-Linear Controller for 2-DOF robotic manipulators ***Aug 2020 – Dec 2020***

- Developed Exact Model Knowledge, adaptive and robust non-linear controllers for a 2 DOF robotic manipulator.
- Demonstrated and evaluated the performance of the controllers for position tracking in the presence of external disturbance using MATLAB and Simulink.

Rapid Waste Composting Machine ***May 2017 – Dec 2018***

- Engineered a small-scale, modular composting machine equipped with a mechatronic system for temperature control and airflow management.
- The machine converted organic waste to compost within 72 hours, a significant improvement over traditional methods that can take 2-4 months.
- Received the runners up prize at Aakruti 2018, a Dassault Systems Design Innovation Competition with 1250 teams from all over India and got the opportunity to present the idea at SolidWorks World 2019, Dallas TX.

LEADERSHIP ROLES

Team Endurance Racing – BAJA SAE Student Team ***Mar 2016 – Mar 2018***
Team Captain

- Led a team of 25 to design and manufacture a custom off-road vehicle for BAJA SAE competition.
- Coordinated between different subsystems to ensure the seamless integration of various components.
- Engineered a custom powertrain system consisting of a Continuously Variable Transmission, 2-stage compound gearbox, carbon fiber driveshaft, composite constant velocity joints, reducing the weight of the vehicle by 15kgs (20%).
- Achieved the 2nd place in acceleration and 5th place in the 4-hour long endurance race out of 140 teams from all over India.