

# SHANTANI SINHA

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## CAREER OBJECTIVE

Experienced Robotics Engineer with 2 years experience in Electrical, Electronics, and Robotics industries seeking full-time opportunities from June 2023. Proven track record in diagnosing, troubleshooting, and managing technical issues. Committed to achieving outstanding outcomes while working collaboratively with cross-functional teams and stakeholders.

## EDUCATION

### University of Delaware

Newark, DE

Master's in Robotics, Mechatronics and Automation; GPA: 3.25 (till 3rd semester)

August 2021 - May 2023 (expected)

### Madan Mohan Malaviya University of Technology

Gorakhpur, India

Bachelor of Technology in Electrical Engineering; GPA: 3.23 (7.56/10.0)

July 2015 - May 2019

## SKILLS SUMMARY

**Programming :** C, C++, Python, MATLAB

**Robotics Framework :** ROS, Gazebo, Rviz, OpenCV

**Multi-body dynamics frameworks :** MuJoCo

**Electronics Design:** EagleCAD, Circuit Design, PCB design, Soldering

**Microcontroller:** ATMEL, Atmega, Arduino, Raspberry Pi

## PROFESSIONAL EXPERIENCE

### Solinas Integrity Pvt. Ltd.

Chennai, India

Electrical and Electronics Engineer

July 2019 - January 2021

- Developed inline inspection robotic systems for water and oil pipelines achieving 50% leak reduction & 30% inspection efficiency increase.
- Designed the electronics layout for inline inspection robotic systems, interfacing sensors and preparing BOM, resulting in a 15% improvement in overall system performance.
- Provided technical support to sales, marketing, and customer support by sharing product knowledge whilst exhibiting excellent communication skills, effectively conveying complex technical information.

## PROJECTS

### Autonomous Navigation of DIGIT Bipedal Robot on an uneven terrain

R & C Lab, U of D

Graduate Thesis Project under the guidance of Dr. Ioannis Poulakakis.

May 2022 - May 2023

- Performed extensive mathematical derivations to write the dynamic parameters of the 3D Linear Inverted Pendulum which equivalently captures dynamics of biped walking on an uneven terrain.
- Researched on implementation of the supervisory control system to identify uncertain parameters, and adapt the behavior of the system based on current estimate of their value.
- Programmed the supervisory control system in Python and analyzed whether the control system can determine the actual value of an uncertain parameter.
- Implementation of the Mode Predictive controller (MPC) for the foot step prediction of the biped on an uneven terrain.
- Developed algorithms to design swing foot trajectory and swing foot orientation for a bipedal robot to improve walking stability and efficiency.
- Conducted simulations and experiments to validate the effectiveness of the proposed swing foot trajectory and orientation designs.
- Simulated the biped on MuJoCo for many uneven terrains along with troubleshooting.
- Demonstrated the efficacy of the method on the problem of varying uncertainty on an uneven terrain.
- Demonstrated experience with analyzing and complex mathematical problems.

### Real Time Object Detection with OpenCV

Term Project for Introduction to Computer Vision

VIMS Lab, U of D, Newark, DE

October 2022 - December 2023

- This project aims to do real-time object detection through a laptop camera or webcam using OpenCV and MobileNetSSD.
- The idea is to loop over each frame of the video stream, detect objects like person, chair, dog, etc. and bound each detection in a box.
- Good results were achieved and a real-time object detection system was designed and developed successfully

### **Trajectory Design for LBR iiwa 7 R800 KUKA 7 DOF Robotics Arm**

HORC Lab, U of D, Newark, DE

*Term project for Introduction to Robotics*

*Feb 2022 - May 2022*

- Designed joint trajectory in MATLAB for end-effector of robotic arm to reach the target position and orientation.
- Implemented obstacle avoidance and maintained joint velocity and angular limits, while optimizing time.
- Derived forward and inverse kinematics using DH parameters and achieved 95% accuracy.

### **Inverted Pendulum on a Cart**

R & C Lab, U of D, Newark, DE

*Term project for Applied Non-Linear Control*

*Feb 2022 - May 2022*

- Analyzed a particular non-linear inverted pendulum physical system from a linearization POV.
- Designed a controller in MATLAB for a the inverted pendulum on cart using linear feedback design methods.
- Obtained the results for different initial conditions such as angular inclination and furnished a report.

### **Using Force Data to Self-pace an Instrumented Treadmill**

IDS Lab, U of D

*Term project for Stochastic Optimal Control*

*Feb 2022 - May 2022*

- Determined the walking speed of subject from foot contact position and to improve the estimation by implementing force measurements using Kalman filter.
- Conducted a thorough study of the controller and used it to estimate and calculate the position and speed of the subject and then accordingly adjust the subject's walking speed.
- Furnished a research paper and presented the work along with experimental results and conclusions.

### **Autonomous Line Follower Robot**

*Undergraduate thesis project*

*August 2018 - April 2019*

- Successfully lead the team and designed project plan. Selection of electronics components, procurement of hardware and sensors. Interfacing and programming of IR sensor and motor controller
- Programmed PID using microcontroller and carried out experiments to note correct values of PID.

## **PUBLICATIONS**

### **Color Sensor Based Object Sorting Robotics Arm**

December 2018

*Computing Algorithm with Applications in Engineering, ICCAEEE 2019, Springer*

*CDAC, Mohali, India*

- Developed a system for automatic color recognition and sorting process performed by a 3-DOF robotic arm.
- Improved the efficiency and minimised human errors in order to perform a certain task.
- Presented novelty in terms of task optimization and reduced manual errors.

## **EXTRACURRICULAR ACTIVITIES**

### **The Journey-Real Church for Real People**

Newark, DE

*Serve in Food Distribution Event*

*Dec 2021 - Present*

- Dedicated member of food distribution community.
- Serve in food distribution drives, Oasis Dance event, Christmas and Easter Hope events at homeless shelters.

### **Electrical Engineers Legation - Official club of MMMUT**

MMMUT

*Organizing Committee Member*

*July 2017-May 2019*

- Organized technical quizzes and fun games for the students.
- Taught C programming language to juniors.

### **NSS-National Service Scheme**

MMMUT

*Executive Member*

*July 2016-May 2019*

- Volunteered in a registered NGO working in underprivileged villages for 3 consecutive years.
- My duties included tutoring middle school children from underprivileged homes and ensuring they get through with their schooling properly.
- Inspiring kids towards the technical advancements and helping them spread the knowledge about importance of education among their villages.