Sharachchandra N B

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Education

2013-18 Indian Institute of Technology Madras, Chennai, India
-Dual Degree: B.Tech in Engineering Design & M.Tech in Automotive Engineering
-Minor in Environmental Technology
-**GPA: 8.93/10** (Top 5 in Class)

2013 Class 12 at Lourdes Central School, Mangalore, India
-Subjects: Physics, Chemistry, Mathematics and Computer Science
-**Score: 96.2/100** (District Rank: 2)

Research Statement

Interested in applying machine learning to different aspects of robotics in unstructured environments such as motion planning, model learning and control.

Course work and Computer Skills

Coursework

- Control Systems / Nonlinear Control
- Machine Learning
- Process Optimization
- Data Structures and Algorithms
- Mechanics and Control of Robot Manipulators
- Design and Analysis of Robot Manipulators
- Applied Time Series Analysis
- Linear Algebra and Programming

Computer skills

- Computational software: Matlab, Mathematica, R, Scilab
- Programming languages: Embedded C, Javascript, Python, ROS, Linux
- LaTeX

Academic Research Experience

June 2017 -May 2018 | **Dual Degree Project** under guidance of **Dr. C S Shankar Ram**
Control Systems Lab, **IIT Madras**

Extremum-Seeking Control for Wheel Slip Regulation:

- Modelled tyre dynamics and designed a control system that applies maximum tyre braking force irrespective of contact surface variation.
- An extremum-seeking optimization outer loop was designed to obtain set point values that maximize braking force.
- Proof of convergence and stability was derived for the entire system via Averaging and Singular Perturbation techniques.

Dec 2016 - May2017 | **Research Internship** at **Systemantics India Pvt Ltd**, India
Robot Calibration

- Developed a calibration model for a 4 degree of freedom planar parallel manipulator that took into account all possible inaccuracies arising from manufacturing and assembly.
- Experimentally obtained task-space calibration data via a FARO laser tracker.
- Implemented a stochastic gradient descent optimization algorithm to obtain calibrated model parameters resulting in improved robot accuracy.

Industrial Research and Professional Experience

July 2018 - present | **Project Engineer** at **Systemantics India Pvt Ltd**, India
Robot Mechanics and Control

- Mathematically modelled a novel hybrid (serial plus parallel) architecture six degree of freedom industrial robot and obtained the forward and inverse kinematics solutions.
- Adapted a computationally efficient line search algorithm to solve the robot inverse kinematics problem.
- Identified robot singularities and implemented a singularity avoidance algorithm.
- The robot inverse dynamics analytical model was derived for feedforward control.

Motion Planning
- Implemented a task space jerk limited trajectory generation algorithm for point to point motions.
- Tuned these motion parameters for the robot with considerations for vibrations and actuator capabilities.
- Explored various path blending strategies for position and orientation and devised algorithm that satisfied practical real-time computation limitations.
- Currently focused on exploring higher continuity quaternion splines that balance computational complexity with desired smoothness.

Motion Control
- Implemented and tuned discrete-time joint level controllers for the robot axes.
- Modelled and experimentally identified parameters of the joint friction and dynamic model.
- Identified the dynamic load variations reflected at each joint and control parameters were determined to provide sufficient robustness to these parametric variations.
- Currently working on robust control of flexible joints suitable for lightweight human collaborative robots.

Mechanical Design
- Designed workspace of 6-dof hybrid manipulator to maximize the singularity free working region within proposed robot axes limits.
- Designed robot joints and selected actuators, speed reducers, bearings and brakes through robot dynamic simulation and analysis.
- Worked on the detail design of stiff lightweight robot frame components with a strong focus on design for manufacturing and assembly.

May 2016 -July 2016 | **Internship** at **Airbus Group India Pvt Ltd**, India

Aircraft Loads Survey and Data Analysis:
- Provided a solution for visualizing large flight loads data with increased efficiency and reduced analysis time.
- Developed an interactive JavaScript tool (utilizing Crossfilter and D3.js library) with a improved UI/UX that was ratified by an international technical expert panel.

Teaching Experience

1. **TA** for undergraduate course: *Product Design Lab*
   This lab involved the dissection and analysis of several consumer products like sewing machine, IC engine and fuel injection pump. Researched and created presentations on the structure and functionality of all these products.
2. **TA** for undergraduate course: *Control Systems*
   Set up tutorial sessions to help students review individual performances in tests and assignments.

Scholastic Achievements and Awards

- Awarded **KVPY Fellowship** by the Department of Science and Technology, GoI. 2013
- Secured **State Rank 16** and **All India Rank 412**, Joint Entrance Examination **(JEE)-Main**. 2013
- Among the **top 5 percentile** students in India in the Joint Entrance Exam **(JEE)**. 2013
- Ranked **top 200** out of 150000 test takers in the state engineering **Common Entrance Test**. 2013

Positions of Responsibility

2014-15 | Sponsorship Associate for Shaastra, technical festival of IIT Madras

Founded the 1st startup networking platform in the institute. Organised a city wide Entrepreneurship Confluence. Brought in multiple sponsorship for South India's largest technical festival.

2014-15 | Hostel Captain for Table Tennis, IIT Madras

Captained a four-member team at the inter-hostel sports championship. Organized sports events and implemented measures to increase turnout. Managed sports inventory for the hostel.

Interests and Activities

- Part of the football and table tennis teams in high school and college.
- Tutoring students preparing for IIT-JEE, the entrance exam for India's engineering colleges.
- Self learning classical Sanskrit and attending Veda (ancient Indian texts) classes.