Aditya Pratap Singh Rajawat

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EDUCATION

2020	Dual Degree (Mechanical Engineering)	IIT Kanpur	**P.G.-10.0/10.0, U.G.-8.9/10.0**
2015	AISSCE (Central Board of Secondary Education)	MDS, Udaipur	**94.6 %**
2013	AISSE (Central Board of Secondary Education)	Central Academy, Udaipur	**10.0/10.0**

SCHOLASTIC ACHIEVEMENTS

- Awarded **Halliburton Engineering Global Programs Scholarship** to participate in TAMU Exchange Program, 2018
- Awarded **Tarun Sondhi Memorial Scholarship** on Merit basis by Indian Institute of Technology, Kanpur
- Secured AIR - **912** in **JEE (Advanced) 2015** among 125 thousand candidates
- Awarded **KVPY Scholarship**, 2014 by Indian Institute of Sciences and Government of India
- Achieved **International Rank 61** (City Topper) in National Science Olympiad, 2013

WORK EXPERIENCE

ALL WHEEL DRIVE, ALL WHEEL STEER ELECTRIC VEHICLE

Oct '17 - Present

Senior Student Research Associate, IIT Kanpur (DST Funded Project)

- Responsible for designing, manufacturing and testing of a four wheel drive and independent steering electric vehicle
- Designed a CAD model of a Spaceframe Chassis in DS Solidworks and worked on **characterization of spring and dampers** through UTM testing
- Worked on **mathematical modeling of passive suspension** for a full car model and performed the optimization of suspension parameters
- Analyzed the **vehicle model** in ANSYS Mechanical APDL for all load conditions including impact, torsion and modal analysis
- Prepared a **testing bench for steering and suspension module** for control response and resolution of steering angle control

SYSTEM IDENTIFICATION AND CONTROL DESIGN OF 18 WHEELED TRUCK

May '18 - July '18

Summer Research Intern at Unmanned Systems Lab, TEXAS A&M University Under Dr. Srikanth Saripalli

- Designed experiments for **longitudinal and lateral control design** of a drive-by-wire 18 wheel electric truck retrofitted with PACMod, to achieve **Level 2 Automation**
- Performed experiments on truck for various speed ranges on straight and curved tracks for **input-output modeling**
- Created a **mathematical model for throttle and steering** using System Identification tools in Matlab
- Obtained a **second-order transfer function model for longitudinal dynamics** of the truck and validated the results through experiments
- Designed a PID controller for longitudinal plant model and verified the results through a **Simulink Model** of the truck
- Implemented the **PID Control (Throttle)** and **Stanley Control (Steering)** and fine-tuned the gains through **real-time testing**
- Created a **standalone MATLAB application** for tweaking the trajectory of waypoints followed by Pure-Pursuit algorithm
- Implemented the application on **Level 3 Automated Golf-Cart** in campus, to tweak waypoints on Google Map for **waypoint path-following**

CHARACTERIZING DELAMINATION OF GLASS FIBER LAMINATES ON IMPACT LOADING

May '17 - July'17

SURGE Fellowship, Experimental Stress Analysis Lab, IIT Kanpur under Dr. P. Venkitanarayanan

- Analyzed glass fiber composites of different thickness and stacking sequence on **impact loading using Hopkinson Bar Setup**
- Used **high speed imaging** to capture real time images which were then synchronized with the load and load point displacement history
- Performed **Digital Image Correlation analysis** for determining strain and onset of delamination
- Simulated **composite model for delamination** on impact loading using Abaqus software
- Obtained the growth of delamination in glass fiber composites by **analyzing images** in Matlab

MAJOR PROJECTS

CHASSIS SUBSYTEM, IITK MOTORSPORTS

March '16 - April '18

Faculty Advisor: Dr. Santanu De, Dept. of Mechanical Engineering

- Assisted in overall manufacturing of formula vehicle F18, a **formula student combustion vehicle** within a team of fifty students
- Performed **Frame Analysis** of Chassis using Solidworks and Ansys Static Structural
- Designed a PVC Chassis for Driver Ergonomics for deciding important parameters including steering and pedal positions
- Performed **experimental torsional testing of Chassis** to validate simulation results obtained from Ansys for torsional stiffness
- Designed **jigs and fixtures** for suspension subsystem for proper welding operation
- Performed **Adhesive testing** and **Quasi-static crush testing** of non-standard Impact Attenuator
- Assisted in successful conduction of **workshop on Automobiles and IC engine** in Techkriti'17

FORMAL METHODS IN ROBOTICS AND AUTOMATION

March '19 - April '19

Course Project for Formal Methods under Dr. Indranil Saha

- Generated the optimal path using SAT and SMT based solver for **multi robot motion planning** with constraints
- Implemented motion planner for multi robot using NuSMV model checker
- Presented a paper on **Sampling Based Motion Planning**, a geometry-based, multilayered synergistic approach which involved LTL formula based temporal goals

LANDING OF A VTOL UAV ON A VERTICALLY OSCILLATING PLATFORM

March '18 - April '18

Course Project for Autonomous Navigation under Dr. Mangal Kothari

- Designed a control structure that could achieve **fast, safe and precise landing of a VTOL UAV** onto a vertically oscillating landing pad
- Implemented **motion estimation** of the system using Unscented Kalman Filter

- Implemented a PID controller to track the generated **time-optimal reference trajectory** considering all motion constraints

RAIL VEHICLE STABILITY August '18 - November '18

Course Project for Railroad Vehicle Dynamics under Dr. N.S. Vyas*

- With given track–wheel geometry, contact patch co-ordinates were determined as a function of lateral perturbation by solving the kinematic equations and equations of motion were solved iteratively on Matlab to **estimate forces and critical speed of stability**
- Observed the **response behaviour of a modelled railway-coupler** by varying source frequency, stiffness, draft gear friction and coupler-slack
- Created a **Simpack Rail Bogie model** for **multi-body analysis** and observed the motion in a straight track, by varying the wheel positions

NONLINEAR FEEDBACK CONTROL FOR AUTONOMOUS VEHICLE August '18 - November '18

Course Project for Basics of Modern Control Systems under Dr. Ramprasad Potluri

- Implemented the research paper, 'Composite Nonlinear Feedback Control for Path Following of Four-Wheel Independently Actuated AGVs'
- Investigated the path-following control problem through **integrated control** of active front-wheel steering and direct yaw-moment control
- Applied modified composite non-linear feedback strategy to **improve the transient performance** and eliminate the steady-state errors

NONLINEAR CONTROL OF FLEXIBLE MANIPULATORS August '18 - November '18

Course Project for Vibration of continuous systems under Dr. Shakti S. Gupta

- Designed a **strain feedback nonlinear control** for joint-PD controlled single-link flexible manipulator to improve tip regulation performance
- Solved the **modal problem for a beam with tip mass** and base moment for first four modes using Lagrangian formulation
- Simulated the **PD controller** and nonlinear strain feedback controller for various gains in MATLAB

DEVELOPMENT OF MODAL TESTING AND ANALYSIS SOFTWARE March '19 - April '19

Course Project for Virtual Instrumentation under Dr. Kamal Poddar

- Developed a **GUI-based software for Modal Testing and Analysis** using LabVIEW
- Performed **frequency analysis** and **system identification** using DAQ and Signal Processing tools

ETHICAL HACKING June '16 - July'16

Programming Club, Sci - Tech Summer Camp

- Learned about basic **control hijacking attacks** and **assembly language**
- Presented Wifi traffic **Man-in-the-middle attack** using Man-in-the-middle framework

*Received **A*** (top 1%) grade for exceptional performance in the course

POSITIONS OF RESPONSIBILITY

Technical Head, IITK Motorsports July'17 - Aug'18

- Responsible for ensuring proper **coordination of all subsystems** and their integration
- Lead the technical aspects which involved managing timelines, **vehicle documentation** and maintaining **design reports**
- Managed all technical issues by organising brainstorming sessions and regular **review meetings**

Coordinator, Association of Mechanical Engineers July'17 - Aug'18

- Designed a **website** to expose the functionality of the association to the campus community
- Responsible for organizing industrial tours/ visits, lab visits, seminars and workshops

TECHNICAL SKILLS

Programming Languages: C, C++, Python

Libraries CSS, Git, HTML, JavaScript, LaTeX, LaTeX Beamer

Software and Utilities: Ansys, Abaqus, ROS, LabVIEW, Fusion 360, Linux Shell Utilities, MatLab, MS Excel, Solidworks

RELEVANT COURSES

Mechanical: Railroad Vehicle Dynamics, Alternate Fuels and Advances in IC Engines, Vibration Control, Finite Element Methods, Machining Dynamics, Modal Analysis, Vibration of Continuous Systems

Others: Autonomous Navigation, Formal Methods in Robotics and Automation, Virtual Instrumentation, Basics of Modern Control Systems

TEACHING EXPERIENCE

VIBRATION OF CONTINUOUS SYSTEMS August '19 - Present

Elective Postgraduate Level Course Under Dr. Shakti S. Gupta

- Responsible for the **design of written and computer-based assignments** for the course
- Mentored **UG and PG students** and reviewed their continuous progress

CONTROL SYSTEMS LAB August '18 - November '18

Compulsory Undergraduate Level Course Under Dr. Ramprasad Potluri

- Worked as a Teaching Assistant in Controls lab compulsory for the junior undergraduates in the **Department of Electrical Engineering**
- Performed **system identification, control design, tracking control and disturbance rejection problem** for a PMDC motor setup prepared completely in the lab itself

EXTRA-CURRICULAR ACTIVITIES

- Represented IIT Kanpur in National level SAE events, **Formula Bharat 2018** and **Mega ATV Championship 2019**
- Participated in a year-long program for **National Cadet Corps** at IIT Kanpur
- Exhibited **selected photographs** in Antaragni'18 Exhibitions and worked in Techkriti'15 coverage team
- Stood **first in Design-o-flare competition**, Takneek'16, designed a Stirling engine using DS SOLDWORKS 2016
- Won **Derek's Faster Smarter Better Challenge** organised by Vodafone at school level