Dileep Kumar, Ph.D

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Summary

- A **Control Systems Engineer** having Expertise in Control Systems Analysis & Design, Practical Control Systems, Motor Control, Disturbance Rejection, Power Electronics, Electric Drives, Electric Vehicles, Vehicle Dynamics, Mathematical Modeling, Embedded Systems, and MATLAB & Simulink.
- **Excellent Project Management** and **Problem-Solving** Skills Demonstrated by Leading the Electric Powertrain Software Development Team to Deliver High-Quality Software that Meets the Program Timeline for Mahindra Electric Vehicles.

Education

Ph.D. in Electrical Engineering (Control and Automation) **[2015 – 2023]**
Indian Institute of Technology Kanpur, India. CGPA 8.00/10.0

M.Tech in Electrical Engineering (Control Systems) **[2010 – 2012]**
National Institute of Technology Patna, India. CGPA 8.25/10.0

B.Tech in Electronics and Communication Engineering **[2006 – 2010]**
Shri Mata Vaishno Devi University, Jammu & Kashmir, India. CGPA 7.62/10.0

Industrial Experience [12/2023 – To date]: Mahindra & Mahindra

Lead Engineer – *Electric Powertrain Software Development and Delivery*

- Closely Working with Cross-functional Teams (VCU, MCU, IPDU, BMS, System Architecture, Requirement, System Integration, System HIL Validation, Labcar Validation, Vehicle Validation, Calibration, Functional Safety and Homologation) for Electric Powertrain Software Development and Delivery.

Teaching Experience [08/2012 – 07/2015]: NIMS University, Jaipur

Assistant Professor – *Electrical Engineering*

- **Subjects Taught**: Classical Control, Modern Control, Power Electronics, Embedded System, MATLAB.

Ph.D – Thesis and Experience Gained [07/2015 – 11/2023]: IIT Kanpur

Thesis: *Energy Usage and Tire Usage in Electric Vehicles with In-Wheel Motors*

- Evaluated existing Path-Tracking Control (PTC) algorithms of a Four-Wheel Independent Steering Four-Wheel Independent Drive (4WIS4WID) Electric Vehicle on the Basis of Optimal Tire Usage.
- Used Vehicle Dynamics, Tire Dynamics, Motor Dynamics, Vehicle load Disturbance, Steering and Driving Motor Control Systems in the PTC algorithms in Matlab/Simulink.
- Provided Speed-tracking and Torque-tracking Motor Control Systems for 4WIS4WID Electric Vehicles.
- Estimated Tank-to-Wheels (TTW) Energy Efficiency of Bikes, Microcars, Mid-size cars, Full-size cars, and Buses, resulting in one Publication.
- Involved in a Team to develop a Full-size Autonomous 4WIS4WID Electric Vehicle.
- Implemented Controllers (PID and Disturbance Observer) Digitally for Speed-tracking of a 24 V DC Motor and a 48 V In-Wheel BLDC Motor at the Control System Laboratory of IIT Kanpur.
- Proposed Active Disturbance Rejection Control (ADRC) and Disturbance Observer-based Control (DOBC) for Speed/Torque tracking under Speed-dependent Disturbances acting on an In-Wheel Motor.
- Implemented a 48 V Inverter for a 250W BLDC Motor using DRV8320S (Texas Instrument).
- Implemented Maximum Power-Point Tracker (MPPT) for 100 W Solar Panel with a DC Motor Load.

Experience Gained in: Control Systems, Motor Control, Loop Shaping, ADRC, Speed Control, Position Control, Torque Control, Optimization, Power Electronics, Electric Drives, Electric Vehicles, Energy Efficiency, Vehicle Dynamics, Mathematical Modeling, Path-Tracking Control, Embedded Systems, MATLAB.

M.Tech – Thesis and Experience Gained [08/2010 – 05/2012]: NIT Patna

Thesis: *Modeling and Control of Emerging Generation Technologies-based Distributed Generation System*

- Developed a MATLAB and Simulink Model (Inverter with AC and DC loads) for a Smart Battery-Backup System for a Solar Panel by employing a Maximum Power-Point Tracker Algorithm.

Experience Gained in: Control System Analysis and Design, Power Electronics, Battery Modeling, Fuel Cell Modeling, Solar Panel Modeling, Maximum Power-Point Tracker, Inverter Modeling, and MATLAB.

B.Tech – Projects and Skills Gained [08/2006 – 06/2010]: SMVD University, J&K

Projects: *Demonstrations of Full-Duplex Communications Using 8051 μC (Assembly and C), and VHDL*

- Data Acquisition System for Real-Time Full-Duplex Comm using 8051 and RS485 in Assembly and C.
- Full-Duplex Comm between Two Spartan-3e Kits with a Computer with various baud rates using VHDL.

Skills Gained in: Electronics, Embedded Systems (8051), Assembly, C and VHDL Programming, Control Systems, Power Electronics, Hardware Development, Electronics Instruments, Linux (Redhat).

Technical skills

Softwares: MATLAB and Simulink, Octave, Altium, Marlin, Latex, Linux, and Microsoft Project.

Embedded Systems: 8051, Arduino, STM32, dsPIC, ESP32, Raspberry PI and PICO, and Teensy.

Tools: USART, CAN, SPI, I_2C, QEI, Computer Networking, Server Design, and CANoe.

Programming: Embedded C/C++, Python, VHDL, HTML, Bash (Linux).

Training

- Redhat Enterprise Linux 5 (RHEL-5) in December 2007.

Fellowships

- Institute Fellowship by IIT Kanpur for 1 year in 2021.
- MHRD Scholarships in 2010 and 2015, respectively, for 2 years and 5 years.

Scientific Events Attended/Organized

- Oral Presentation at Institute Research Symposium (IRS'23) at IIT Kanpur in 2023.
- Organizing Student Member of Indian Control Conference (ICC) at IIT Kanpur in 2018.
- Organized a Short-Term QIP Course on "Frequency Domain Control System Design & Experiments" at IIT Kanpur in 2017.
- Oral Presentation at IEEE International Conference on Advanced Research in Engineering and Technology, ICARET-2013, at KL University Vijaywada in 2013.

Hobbies

- Badminton, Chess, Music, Embedded Hardware & Software.

Publications

1. **Dileep Kumar**, Vasu Jain, and Ramprasad Potluri, "Energy Efficiency of Battery Electric Vehicles with In-Wheel Motors", SAE International Journal of Sustainable Transportation, Energy, Environment, & Policy, 4(13-04-01-0002), 2022.
2. **Dileep Kumar** and Ramprasad Potluri, "On Optimal Tire Usage in the Path-Tracking Control of 4WIS4WID Electric Vehicles" (Under review).
3. **Dileep Kumar**, Ashiwani Kumar, Neha Gupta and Ramesh Kumar, "Control and Simulation of Smart Backup System for Photovoltaic Array in MATLAB/Simulink." IEEE International Conference on Advanced Research in Engineering and Technology, ICARET-2013, Vijayawada, Feb 2013.