SAKET ADHAU

Master of Technology - Instrumentation and Control
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EDUCATION

Master of Technology, Instrumentation and Control ***Aug'17–June'19***

- College of Engineering Pune, India
  - Thesis Title: *Learning Based Model Predictive Control*
  - Supervisor: Prof. Dayaram Sonawane
  - CGPA: 7.89

Bachelor of Engineering, Instrumentation and Control ***Aug'13–June'17***

- University of Pune, India
  - Project Title: *System Identification and PID Control of PMDC Motor using* MATLAB *and LabVIEW*
  - Supervisor: Dr. Milind Bongulwar
  - Mention: First Class with Distinction | Percentage: 69.67

PUBLICATIONS

Articles in international conferences
2019

- **Adhau S.**, Patil S., Ingole D., and Sonawane D., "Implementation and Analysis of Nonlinear Model Predictive Controller on Embedded Systems for Real-Time Applications", *in Proceedings of the* 17^{th} *European Control Conference (ECC'*19*)*, IFAC and IEEE, Naples, Italy, 2019.

2018

- **Adhau S.**, Phalke K., Nalawade A., Ingole D., Patil S., Sonawane D., "Implementation and Analysis of Offset-Free Explicit Model Predictive Controller on FPGA", *in Proceedings of* 5^{th} *Indian Control Conference*, IEEE, Delhi, India, 2018.
- **Adhau S.**, Dani S., Ingole D., and Sonawane D., "Embedded Model Predictive Control on Low-Cost Low-End Microcontroller for Motor Speed Control", *in Proceedings of International Conference for Convergence in Technology (I2CT)*, IEEE, Mangalore, India, 2018.

RESEARCH INTERESTS

1. Machine learning for MPC
2. Nonlinear Model predictive control
3. Embedded systems
4. Optimization

PROJECTS

- **Deep Neural Networks based Linear MPC**
  - Trained highly nonlinear and linear models using neural networks, to mimic the original model.
  - Neural networks were trained to behave as Linear model predictive controller to reduce the online optimization and guarantee safety.
  - The designed neural network was also implemented on ARM Cortex-M3 to prove the usability in embedded devices.
- **Implementation of nonlinear MPC on ARM Cortex-M3 and FPGA**
  - Successfully implemented nonlinear MPC on for the first time ARM Cortex-M3 and FPGA using GRAMPC and ACADO toolkit
  - The performance of NMPC controller was rigorously tested using HIL simulations in MATLAB
  - Designed framework for easy implementation of NMPC on micro-controllers and FPGA.
- **Linear and explicit MPC on ARM Cortex-M3 and FPGA**
  - Implemented Interior Point Method, Active Set Method and KWIK Algorithm for linear MPC on Arm Cortex-M3
  - Validated the designed MPC on DC motor using HIL simulation for real-time using Simulink coder.
  - Implemented Explicit MPC using MPT toolbox, Hybrid toolbox and MATLAB based toolbox on micro-controllers and validated the same on actual plant
  - The same framework was also validated and detailed analysis were carried out on FPGA Zedboard.
- **Auto-tuning of PID controller using optimization method**
  - Evaluated optimization algorithm SQP for auto-tuning of PID controller
  - Verified values of K_p, K_i and K_d parameters using run-time optimization in MATLAB/Simulink.
- **Parameter Estimation and Position control of PMDC motor**
  - Validated PMDC motor model using parameter estimation
  - Implemented SQP algorithm in MATLAB for parameter estimation
  - Implemented and tested PID controller for position and speed control on ARM Cortex-M3 micro-controller
- **System Identification and PID Control**
  - System identification for an unknown DC motor was done using System Identification toolbox of MATLAB
  - Verified the system by passing through various linear and non-linear signals for accurate system model
  - PID tuning using Zeigler Nicholas and Cohen-Coon methods for speed control of the DC motor using identified state-space model
  - Implemented PID controller on 8-bit micro-controller using plain C code, MATLAB based embedded coder and in LabVIEW using toolbox for VISA protocol.

INTERNSHIP EXPERIENCE

Bosch Chassis Systems India Pvt. Limited, Chakan, Pune. ***June'15 - July'15***

- Worked with the TeF department towards maintenance and predictive safety standards.
- Carried out analysis of Mean Time To Repair (MTTR) and Mean Time Between Repair (MTBR) on the assembly lines (NOAH, Line 51, TMC line).
- Studied advanced braking systems like Anti-lock brake systems (ABS) and electronic stability program (ESP).
- Studied various kinds of braking systems viz. Mascular-energy braking, power assisted braking system, parking brake system for passenger cars.
- Studied the working of brake boosters, Tandem master cylinder, design of braking system, brake pedal and braking components.

POSITIONS OF RESPONSIBILITY

- **Co–ordinator for 3^{rd} Winter School.** ***Dec'18***
  - Served as convener and co–ordinator of 3^{rd} **Winter School on Optimization and Optimal Control – A Data–based Approach** at Embedded Systems Lab, COEP.
  - Responsible for organization and management of more than 50 candidates.
- **Teaching Assistant.** ***July'18–Dec'18***
  - Served as TA for **Microcontroller Techniques and Its Applications** for undergraduate students.
  - Responsible for conducting practicals and tutorials for a class of 60 students.
- **Teaching Assistant.** ***Dec'17***
  - Served as TA for **Embedded System Design** which was a special course conducted embedded systems lab, COEP.
  - Responsible for conducting practicals and tutorials for a class of 20 students.
- **Graduate Class Representative** ***Aug'17–June'19***
  - Served as Class Representative (CR) for masters student, Biomedical engineering 2019 batch.
  - Responsible for various activities, organization and management of students.
- **Students Placement Cell – Co–ordinator** ***Aug'16–June'17***
  - Co–ordinator at Training and Placement cell in college for undergraduate students.
  - Organizing various training and placements programs for a class of 60 students.
- **Technical Event Head – Micromania** ***Sep'16***
  - Event head for annual technical fest of the college.
  - Responsible for conduct of various events and workshops under the technical event.

AWARDS AND FUNDING

- Project accepted for oral presentation in **MATLAB Expo'19.** ***May'19***
- Student support program for Indian Control Conference – IIT Delhi. ***Jan'19***
- Xilinx University Program for researchers – Pynq development board and software. ***Sep'18***

SKILLS & INTERESTS

- **General**
  - Nonlinear optimization, model-based control, nonlinear dynamic system modeling.
- **Programming languages**
  - C, C++, HTML, Python.
- **Tools**
  - MATLAB/Simulink, LaTeX, TikZ, Inkscape, Microsoft office suite.
- **Development**
  - Atmel Studio, Vivado, MPLAB X, HDL coder, LabView, Arduino IDE, Linux.
- **Toolboxes**
  - Protoip, MPT toolbox, ACADO Toolkit, CasADi, FORCES, GRAMPC.
- **Version control tools**
  - GitHub, GitLab, Bitbucket.

TRAINING

- 3 days workshop on Tiva C and MSP430 based Embedded System Design. ***March'19***
- Winter School on Optimization and Optimal Control - A Data-based Approach. ***Dec'18***
- One month Certificate course on embedded systems design. ***Dec'17***
- Certificate course on Ethical hacking, COEP, India ***Sep'16***
- MATLAB & Simulink for engineers, one month training at COEP. ***Dec'15***

PERSONAL DETAILS

- Full Name: Saket Sunil Adhau
- Citizenship: Indian
- Date of Birth: 29 May 1995

REFEREES

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