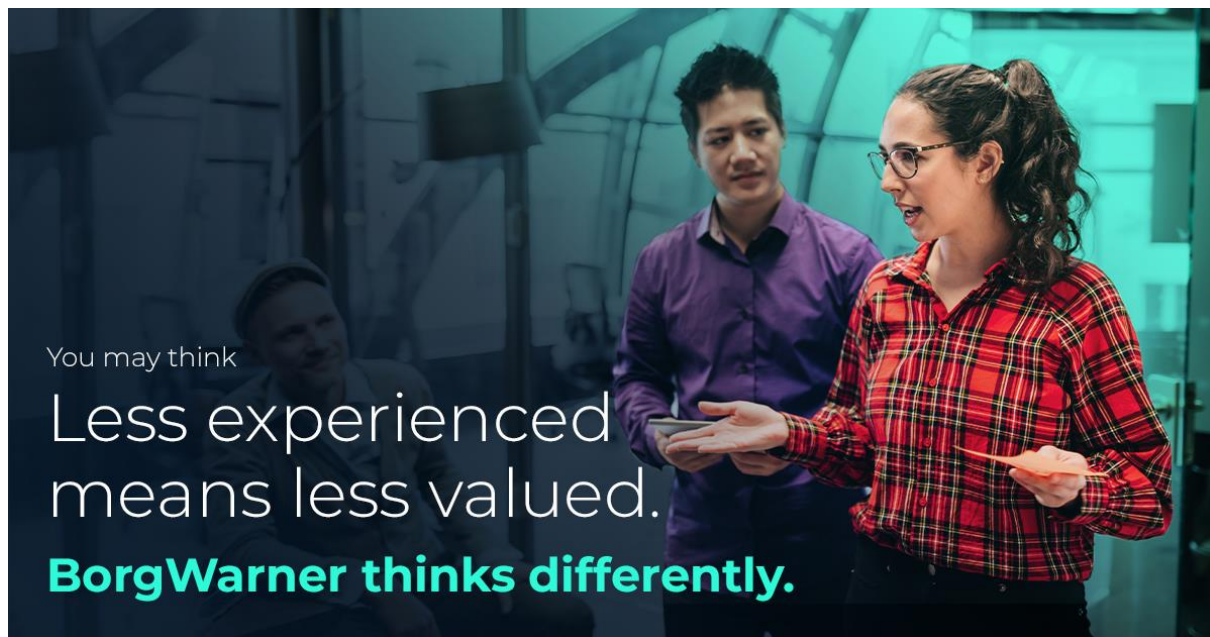


BORGWARNER

On the hunt for thesis work?



BorgWarner i Landskrona utvecklar och tillverkar system och komponenter till de största fordonstillverkarna världen över. Vår vision och mål och är att utveckla rena och energi-effektiva system för framdrivning av förbrännings-, hybrid- och elektriska fordon.

BorgWarner in Landskrona develops and manufacture systems and components to the largest vehicle manufacturers in the world. Our vision and goal is to develop clean and energy-efficient systems for propulsion of combustion, hybrid and electric vehicles.

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Software Verification – How can AI be used in software testing?

Background

In the software verification area, there is a lot of requirements and corresponding testcases.

How can we use AI to optimize what to verify and maximize the quality in the build.

Some testcases can be unstable due to timing requirements that our test benches not always can meet and thereby give false result. In those cases, would it be possible for an AI for detecting if a run of an unstable testcase resulted in valid result or if the test should be rerun instead of a tester having to make that decision.



Today we base what to verify on experience and what area changed. The high level of automated testcases makes this a complex task. Can AI help create test suite based on results from nightly runs, the changed functionality?

Challenge

- Is it possible to see patterns in the result
- How can AI be beneficial in this area
- What metadata for the build and from test environment to make test suite suggestions
- What is the draw back
- Is it possible to use an AI to suggest a custom test suit for a nightly run to maximize our test benches.

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Knowledge of AI is required.

Reporting

The master thesis shall be reported as a written report, a complete test environment and an oral presentation at BorgWarner.

Contact

Måns Andersson
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Open Daq – Investigate if openDAQ adds value to existing measurement systems?

Background

In the measurement area there is a wide range of suppliers of measurement equipment. They tend to be quite expensive, and the supporting software is specific for the manufacturer. This makes it a challenge to support a range of different systems. This new approach with openDAQ aim at developing a software compatible with a range of suppliers' hardware. Simplifying maintenance of setups, making daily work easier switching between different setups. Investigate the values added in this approach and support given.



Is it a way forward going over to openDaq and choose hardware independent on history and software knowledge? Not using the same supplier as always.

Challenge

- How is the future for openDAQ
- What features is missing out
- Is it possible to automatically transfer old setups to openDAQ
- What is the draw back
- How is support when having issues

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Programming experience and measurement knowledge is required

Result

The master thesis shall be reported as a written report, a complete proof of concept and a presentation at BorgWarner.

Contact

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Supervisor Validation Test System

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Test setup Generator – Next generation modular test rig using EtherCAT

Background

BorgWarner has several different test stands developed over the years. The interface to the equipment differs between them. However, one measurement and control software, NI Veristand, is used for all of them.



When starting a new test, the setup is usually based on a previous setup from another project. This carries over a lot of functions and features that is not needed and usually only causes problems.

A modular python based setup generator where the user can select which test rig is used and how the test rig equipment should be configured should be developed. This generator should get the information of each test rig from one central location to make updates easy.

Challenge

- User friendly interface
- Which features are needed?
- Modular design.
- Python based

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Knowledge of programming is required. Technically skilled with a comprehensive view is a plus

Result

The master thesis shall be reported as a written report, a complete test environment and an oral presentation at BorgWarner.

Contact Person

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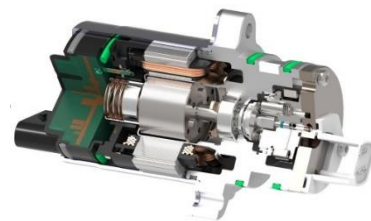
BORGWARNER

Simulation model of a BLDC motor

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

BorgWarner Landskrona has several applications of actuators using a Brushless DC, permanent magnet (BLDC) motor in different actuators. In order to improve development and testing of control strategies, the objective of this thesis is to develop a way to estimate motor parameters from measured data for a model of a BLDC motor.



Tasks

- Investigate approaches to estimate the motor parameters from measured data.
- Implement at least one estimation approach.
- Collect measurements on a BLDC motor to verify the approach.

The master thesis shall be performed at BorgWarner, Landskrona. We prefer that two students write the thesis together. Students will get a compensation for completed master thesis, and lunch will be paid by BorgWarner.

Prerequisites: MATLAB Simulink, System Identification

Result

The thesis outcome should be a written report, implemented simulation model, implemented method for estimation of motor parameters and an oral presentation at BorgWarner.

Contact

Meike Rönn

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Continuous Integration – Report Aggregation

Background

A continuous integration system consists of many pipelines that produces various documents and reports. Data from different sources needs to be collected to be able to display project metrics and progress.



Challenge

- Examine and understand the needs
- Do a market analysis of available tools
- Propose tools that fulfills the needs
- Create a demo implementation based on BorgWarner pipelines and proposed tools.

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Knowledge of CI/CD or Jenkins is preferred.

Result

The master thesis shall be reported as a written report, a demo implementation, and an oral presentation at BorgWarner.

Contact

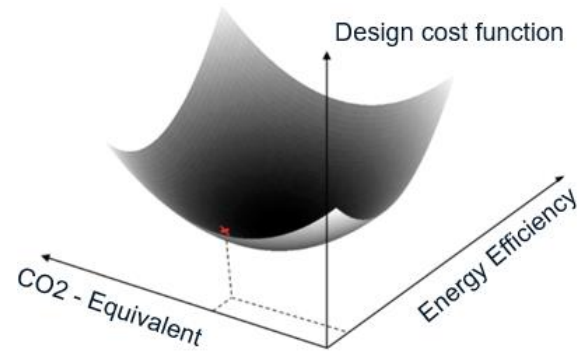
Patrik Östman
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Optimization for Sustainable Electric Powertrains

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

At BorgWarner we are working to reduce our products' carbon footprint to reduce our company's climate impact. Design and material selection play an important role in this, and sustainability thinking needs to be incorporated already in the product development phase. The design of an electric-vehicle powertrain is a multivariable optimization problem where the system weight and cost need to be balanced against performance, and energy consumption targets.



The aim of this master thesis is to also incorporate a sustainability metric (CO2 eq) into a powertrain optimizer tool, to enable for product carbon footprint to become one of the design targets. Once the implementation is done, the aim is to conduct a study to investigate the sustainability, cost and energy consumption trade-offs.

Thesis Assignments

- Implement a sustainability metric (CO2eq) into a powertrain optimizer.
- Evaluate design trade-offs, i.e. investigate and compare low cost vs. low energy consumption and sustainable optimized designs.
- Apply the upgraded powertrain optimizer tool on an integrated Drive Module (iDM).

Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Requirements

We are looking for 1-2 motivated students with a background in mechatronics (preferred) or similar and an interest in optimization and sustainability. Matlab experience is needed.

Contacts

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Modeling of Gear-Box Oil Temperature

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles.

At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

In order to achieve high torque accuracy on the gear-box output shaft, and also protect the gear box from overheating, it is necessary for the driveline control system to have an accurate estimate of the gear-box oil temperature.



Thesis Assignments

- Conduct a literature study to determine the model complexity suitable for real-time computation.
- Implement the selected thermal model in MATLAB/Simulink.
- Use/develop a mathematical optimization/ System identification method to determine model-parameter values.
- Validate the model accuracy against collected temperature data.



Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Contact

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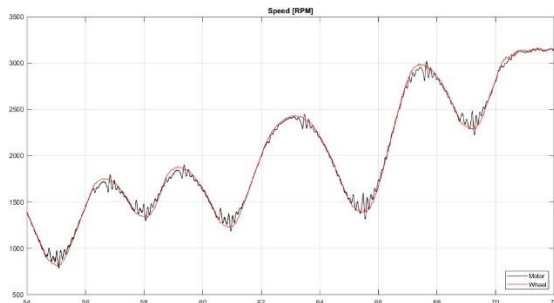
Model-Based Control of Driveline Oscillations in an EV

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles.

At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

The fast torque response achievable with electric machines has enabled active-damping torque control to reduce drive-line speed oscillations (jerk). With this type of control, oscillations in the frequency range that would create discomfort for the driver can be reduced greatly.



Example of driveline oscillations in a vehicle.

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles.

Thesis Assignments

- Develop a drive-line model suitable for controller design.
- Compare a model-based state-feedback controller design with conventional PID control.
- Design a controller to be robust against model uncertainties and system delays.
- Integrate the controller into existing inverter software using TargetLink for real-time verification in test vehicle.

Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Contact

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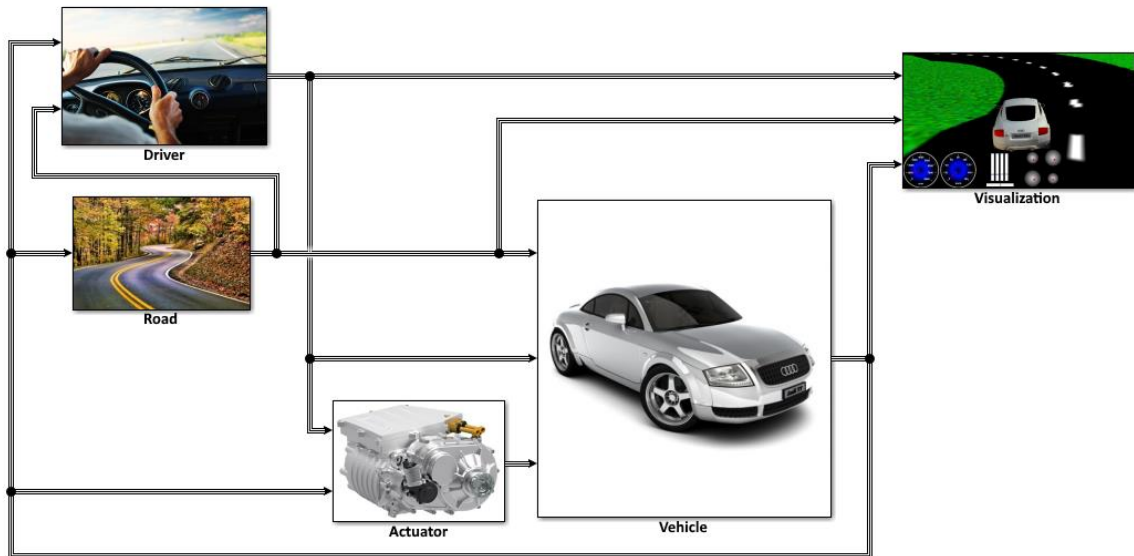
Driver Model

Background

At BorgWarner we have a vehicle model that aims to simulate the vehicle dynamics of a real car.

It includes models of chassis, wheel suspension, tire, and drivetrain. There are different roads and tracks which can have slope and banking.

The vehicle model is currently controlled by a fairly simple driver model which are able to drive around a track but is not able push the car to the limit to e.g. set a good lap time.



Vehicle model in Simulink

Thesis Assignments

- Develop a controller that are able drive the vehicle model to its limits to e.g. set a good lap time.
- Evaluate if an “AI driver” that is based on a neural network is preferred instead of a conventional controller.
- The driver model should run in Simulink.

Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Contact

Pierre Petterson
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Development of a current estimation model

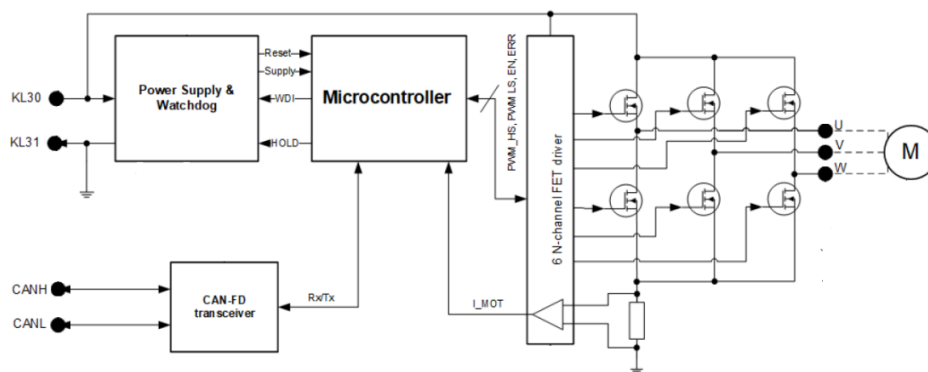
Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

For some of the products developed by BorgWarner, the performance depends on the temperatures of the components and the oil. There is a trend in car industry to move from melt fuses to electrical fuses which requires supply current to be measured with higher accuracy to support our current limitation. The current sensor is placed to measure motor current which is not the same as the supply current. Therefore, we need a model to accurately estimate supply current based on measured motor current.



The purpose of this thesis is to update the existing model to better estimate supply current in newer products. This includes analyzing sampling methods, rpm, torque and temperature dependencies and from this implementing an estimation model for the supply current.



Tasks

- Investigate approaches to model motor current to supply current translation.
- Examine the performance of the current model, and either suggest possibilities to improve parameter tuning of the current model or suggest a new model with improved estimation accuracy.
- Implement above in software and do comparison between estimation and measurement.

Prerequisites: Signal processing, measurement, embedded programming, and electronic hardware.

Result

The thesis outcome should be a written report, code implementation and an oral presentation at BorgWarner. We prefer that two students write the thesis together.

Contact

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Cyber Security together with CI/CD

Background

The rapidly growing connectivity of vehicles enables lots of new functionality. At the same time, this functionality opens potential risk for cyber-attacks on vehicles. Such attacks threaten the functional safety of the vehicle and could cause financial damage or even worse personal injuries.

That is why Cyber Security is so important today and that all the software in a vehicle is maintained throughout the complete vehicle life cycle. To be able to support this in a quick and effective way, the software release work needs to be automated. This is done via CI/CD in our Software Factory.

Challenges

- Research the market to find good ways to work with Cyber Security together with CI/CD.
- Define and validate how to work with Cyber Security data in a secure way.
- Find weak spots regarding Cyber Security in our Software Factory.
- Propose improvements for Cyber Security in our Software Factory.
- Implement some of the proposed improvements in our Software Factory.

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 people.

Reporting

The thesis outcome should be a written report, a demonstration of implemented improvements and an oral presentation at BorgWarner.

Contact

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Are you interested in thesis work within another area?

We can also offer master thesis work for product development or similar within the following areas:

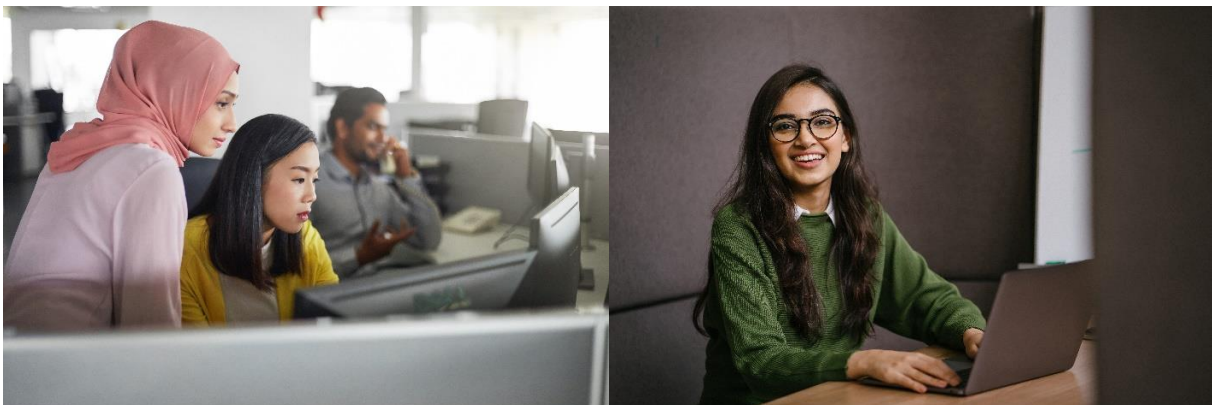
- Active suspension
- Torque management systems for (eTMS) for wind- and/or waterpower
- eLSD for heavy vehicles and trucks
- Torque vectoring applications for agriculture machinery
- Torque vectoring for trailer stability
- Power take-offs for e-trucks
- Torque management to reduce tire wear and particle emissions

A master thesis within these areas includes a theoretical study of the product or new concept, including a literature search. You also investigate what requirements of the product would be needed. You may also prepare for physical testing or simulation; in some cases, testing or simulations may also be possible.

Send your application with CV and personal letter to Louise Gren, lgren@borgwarner.com

For thesis work within other areas such as production technology, logistics, purchasing, marketing, business development and quality.

Send your application with CV and personal letter to Inez Kjellman from HR, ikjellman@borgwarner.com with a description of your ideas.



BorgWarner Sweden AB

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Instrumentgatan 15
261 24 Landskrona

Recruitment contact:

Inez Kjellman

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