Development of predictive maintenance and system condition monitoring methods for tracked traction systems

Record number : OPR-905

Overview

RESEARCH DIRECTION

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ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie mécanique
Institut interdisciplinaire d'innovation technologique (3IT)

LEVEL(S)

2e cycle
3e cycle

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique
Campus de Sherbrooke

Project Description

Project:
Camso designs and manufactures rubber track drive systems for all kinds of off-road vehicles, including agricultural tractors. In agriculture specifically, rubber tracks, compared to traditional inflated tires, reduce soil compaction and damage while greatly increasing available traction for the tractor. Simulation tools, which have completely transformed design engineering in many industries, remain of very limited utility for the design of off-road track systems due to the interaction of multiple parts and mechanisms with complex materials (rubbers, soil). This project proposes multiple approaches to develop new computer-aided engineering (CAE) methods for dynamic simulation and system design of agricultural machinery. First, the experimental validation of a multi-body dynamics (MBD) model will be extended in order to fully reflect the full range of tractor operating conditions, from the softest soil to paved roads, as well as to add the prediction of track heating and energy usage. This powerful model will be used as the basis for a system design tool using the multi-discipline design optimization method, which has demonstrated a high effectiveness in other domains such as aerospace. Furthermore, a prototype active track tensioning system, that can improve the dynamic behaviour of tracks by adapting to conditions in real time, will be validated experimentally on a tractor. A separate modelling approach, based on data first rather than physical models, will be used to develop smart vehicle monitoring systems, as found in modern cars, that can inform operators of upcoming maintenance and potential mechanical problems affecting the track system. Finally, all improvements will be consolidated in a technological demonstrator in order to validate and quantify improvements to Camso products. These new design tools are required for the development of next-generation, truly innovative, track systems with improved performance and lower total cost of ownership. Such products will contribute to consolidating Camso's position as an industry leader in this domain and will provide the Canadian agricultural industry with equipment that will both provide a higher efficiency and that will protect its soils to ensure future productivity.
Many modern vehicles incorporate real-time condition monitoring systems, consisting of sensors and data processing algorithms. The vehicle operator of mechanical problems (check engine light and error code) or the need to perform regular maintenance based on the recorded operating cycle (oil change). As part of their master's or doctoral project, students will have the mandate to develop real-time

condition monitoring and predictive maintenance systems (sensors, physical models and data processing algorithms) integrated into a tracked traction system for an agricultural tractor. The systems developed will aim to use a wide range of data from sensors in order to inform the system operator either of an imminent mechanical problem or of the planned maintenance interval. In the context of agricultural operations, these systems help reduce maintenance costs and increase the reliability of the equipment fleet.

Team and environment:
The student will evolve within the Createk research group (www.createk.co), which includes 9 professors, 15 professionals, 1 technician and more than 70 students, all passionate about the development of new technologies for the machines of tomorrow. On a day-to-day basis, the student will work with the project team composed of around ten people and will have to interact regularly with Camso engineers.

Ideal candidate:
- Bachelor's degree in mechanical or robotics engineering
- Have the desire to develop in signal processing and modeling of dynamic systems
- Be a creative, passionate and action-oriented person
- Have an ability to work in a team

Interested? Send your application to info@createk.co

Discipline(s) by sector

Sciences naturelles et génie

Génie mécanique

Funding offered

To be discussed

Partner(s)

Michelin (Camso)