# Control and Planning for Off-Road Vehicles

Record number : OPR-1078

## Overview


**RESEARCH DIRECTION**

Alexandre Girard, Professeur - Department of Mechanical Engineering

**INFORMATION**

alexandre.girard2@usherbrooke.ca

**RESEARCH CO-DIRECTION**

François Ferland, Professeur - Department of Electrical and Computer Engineering

**INFORMATION**

francois.ferland@usherbrooke.ca


**ADMINISTRATIVE UNIT(S)**

Faculté de génie
Département de génie électrique et de génie informatique
Département de génie mécanique

**LEVEL(S)**

2e cycle
3e cycle
Stage postdoctoral

**LOCATION(S)**

CTA - Centre de Technologies Avancées

## Project Description

Command and Trajectory Planning for Off-Road Vehicles

Off-road vehicles are difficult to control precisely on low-adhesion surfaces. Trajectories must be planned in advance based on the available traction to properly control the vehicle's movement. This project focuses on developing driving algorithms by exploiting modern methods (e.g., MPC or reinforcement learning) for vehicles in low-adhesion conditions. The student working on this project will develop algorithms (control law, trajectory optimization, dynamic simulation, and/or machine learning), conduct tests in a realistic simulation environment including a driving simulator, and participate in trials with full-scale vehicles.

About the research project

BRP, CM labs Simulations, LeddarTech, Université de Sherbrooke and McGill University will co-develop connected and perceptive vehicles for advanced research purposes. The collaboration will also involve Centre de Technologies Avancées - BRP - UdeS (CTA). This joint initiative will enable the parties to investigate, test and validate advanced driver assistance system (ADAS) features such as collision avoidance in off-road environments. Prototype vehicles will be able to "see" their environment in real-time with perceptive sensors, including LiDAR sensors provided by LeddarTech, radars, and cameras while also having the ability to communicate with one another using the latest vehicle-to-everything (V2X) protocols. Vehicles will incorporate some Level II and Level III driving capabilities to enhance driver/passenger safety. To accelerate the development, a digital twin will be created using CM Labs' Vortex Studio. The advanced digital twin will be used by students and professionals as a software-in-the-loop and driver-in-the-loop sandbox. The vehicle will be meticulously modelled with a state-of-the-art high-fidelity simulation that will include the perceptive sensors and validated real-time tire-soil interaction models, thus enabling the team to conduct virtual validation plans, train neural networks and generate large amounts of virtual data.

## Discipline(s) by

## Funding offered

Yes

## Partner(s)

Bombardier Produits récréatifs (BRP) , CM

## sector

### Sciences naturelles et génie

Génie électrique et génie électronique,
Génie mécanique

The last update was on 9 July 2024. The University reserves the right to modify its projects without notice.