PLM Processes and CAD/CAE Tools with Application to Vehicle Component Design

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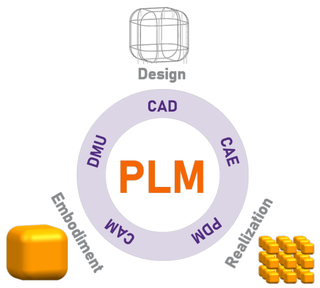
Course Overview

PLM (Product Lifecycle Management) is the processes and tools encapsulating the work of creating and managing a product over its lifecycle. PLM drives modern corporate digitalization and includes applications such as CAx and PDM.



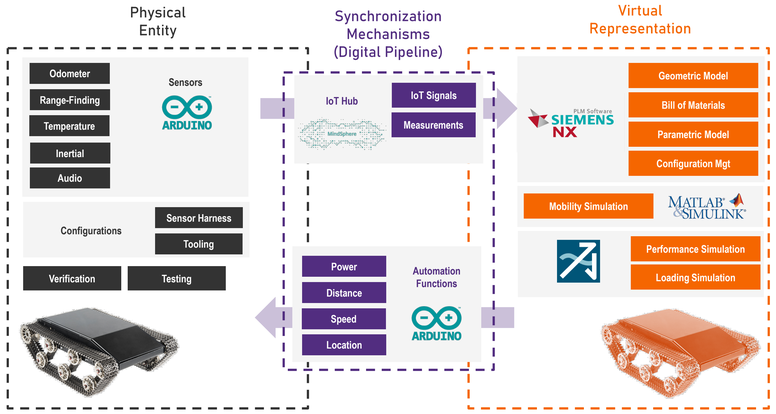
Students meet weekly to learn topics such as sketching, modeling, mechatronics, and PDM that support the ongoing project to create a digital twin.

Course topics include:

- Digital Thread
- Collaborative Design
- CAD (Computer-Aided Design)
- PDM (Product Data Management)

Objectives

The primary course focus is a multi-year project to build a high-fidelity digital twin of a robotic, treaded vehicle.

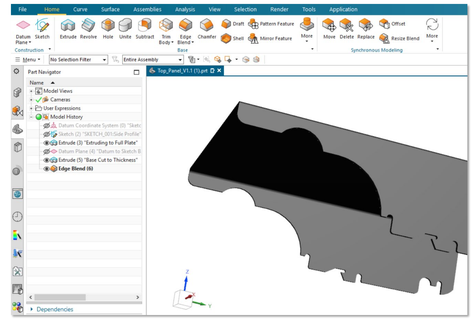


Students work together to

- Create geometric models of the robot
- Design fixtures and sensors
- Configure the robotics of the vehicle
- Develop simulations to represent and predict the vehicle's motion

Outcomes

Students get firsthand experience with Siemens NX. Using Siemens' online training program provides students with practical skills even if had no prior CAD experience.



By sharing a variety of modeling roles, students learn collaborative principles such as file sharing, ownership, and storage.

Other practical experiences include:

- Configuring mechatronic systems, including wiring, battery management, circuit schematics, and power distribution
- Soldering
- Reverse engineering
- Microcontroller programming

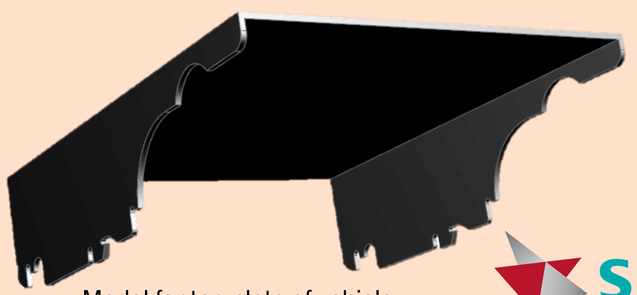
About the PLM Center

The Product Lifecycle Management Center (PLMC), which sponsors and runs this Creative Inquiry, promotes PLM tools and processes that support the growing movement for corporate digitalization. The PLMC also provides access and training for a variety of PLM applications provided through generous partnerships with companies such as Siemens. For more information contact PLMCenter@clemson.edu

Learn more about the PLMC

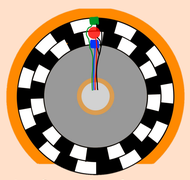
Current semester activities include:

Creating geometric (CAD) models of the robot in Siemens NX



Model for top plate of vehicle body

Designing and manufacturing sensors to monitor the robot's state



Layout of optical encoder for odometer

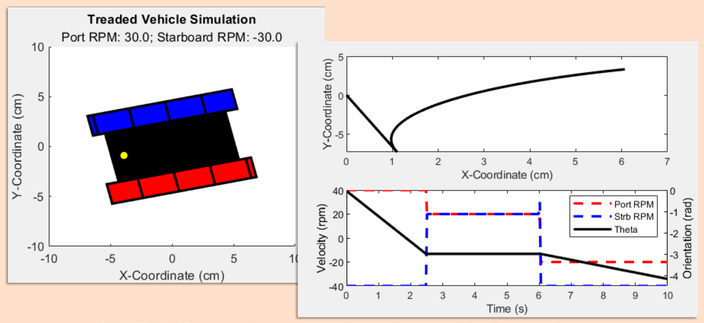
PLM Software SIEMENS NX

MindSphere

Establishing a digital pipeline between the robot and a IoT Hub

ARDUINO IoT CLOUD

Estimating robotic performance based on simulations and data



MATLAB simulation estimating vehicle motion based on motor inputs

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