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

Lia Anderson, William Bishop, Brandon Ewanick, Vanessa Foy, Austin Frabotta, Alexander Minnich, Kevin Rice, Sydney Thompson

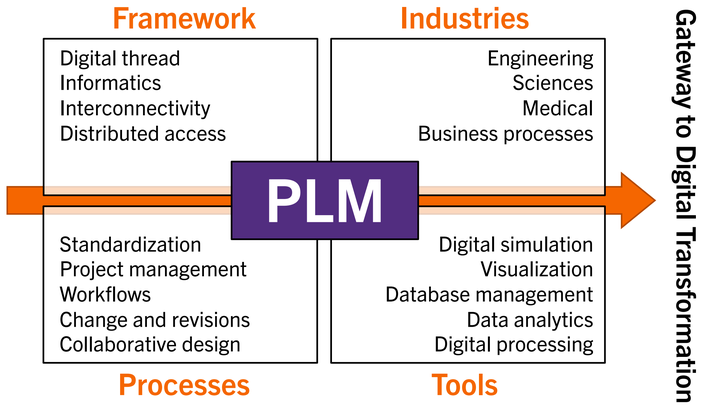
Background

Fourth Industrial Revolution

The Fourth Industrial Revolution is characterised by the evolution of technology and machine intelligence in manufacturing and everyday life. Product Lifecycle Management (PLM) is heavily interlinked with this new revolution as increasing technological advancement is incorporated more into a product's development.

Product Lifecycle Management (PLM)

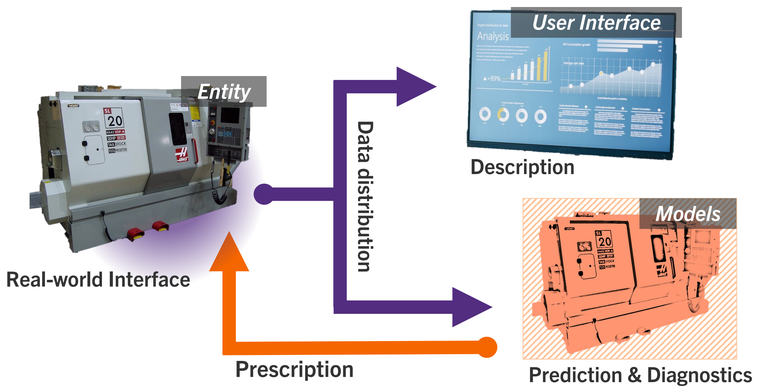
PLM is the process of managing a products lifecycle from inception, design, manufacturing, sales/service and eventually retirement. This connects to the interconnective and smart automation aspect of the Fourth Industrial Revolution, as everything needs to be well organized.



Digital Twins (DTs)

A DT is a virtual model of a physical part. It uses real-time data sent from a sensor on the part to predict how well it will perform in the real-world. DTs give insights into performance and potential issues. Integrating IoT (internet of things), AI (artificial intelligence), and software analytics can enhance the output.

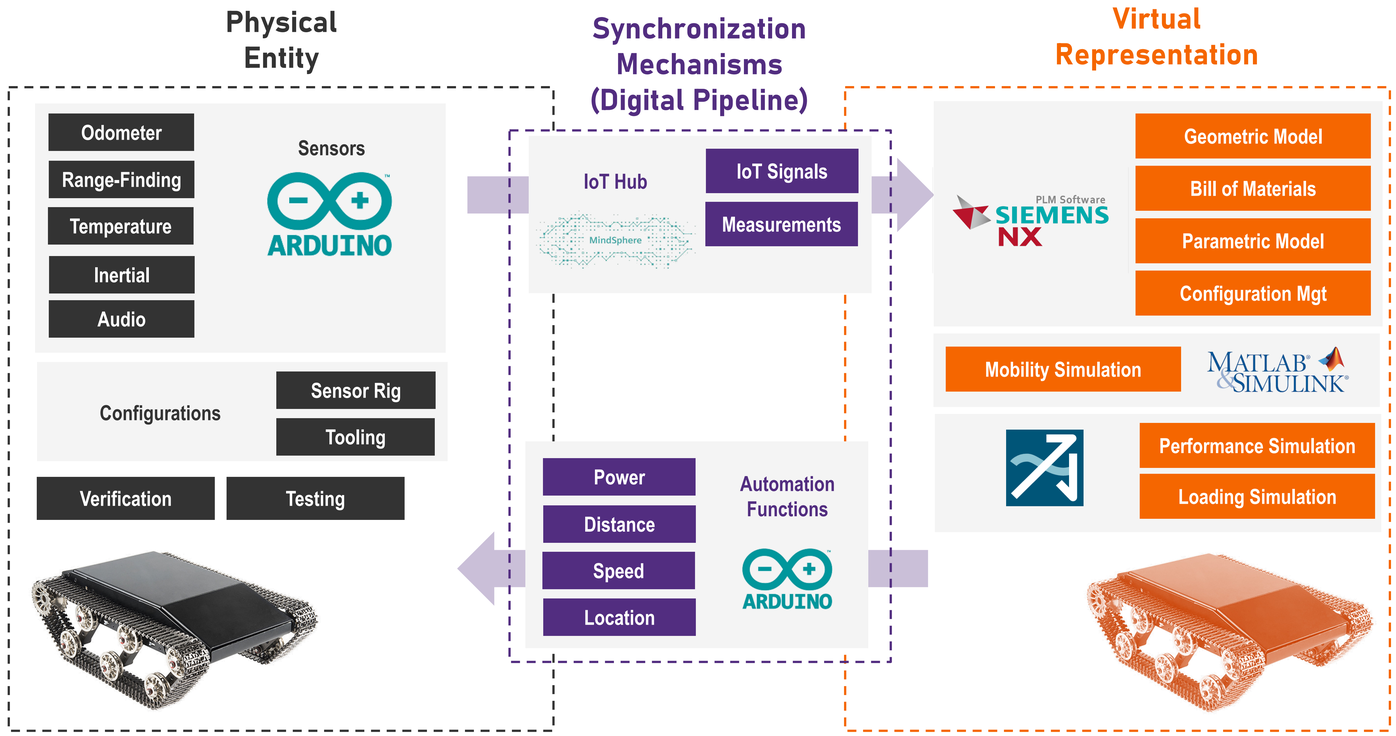
DTs have many applications. Foremost is easy scalability. With a DT we can start small and easily scale up. This allows us to test and find the pitfalls before anything physical is made. With these learnings manufacturing costs can be considerably lessened.



Research

Research Objective

The overall goal of this class and research project is to learn more about PLM. This is done by making a DT of a tracked robotic vehicle that is integrated with PLM tools such as CAD modeling in Siemens NX. The creation of a DT mirrors work being done by the Virtual Prototyping-Ground Systems center (VIPR-GS) at CU-ICAR. Fabrication of rudimentary DTs help to quickly establish limitations and capabilities of DTs as applied to ground vehicles.



Learning

Course Activities

Through group and individual projects, students are exposed to a wide array of engineering aspects, such as Engineering design, CAD modeling in Siemens NX, electronic circuitry and soldering, real-world collaboration and problem solving.

Team Projects

Students gain experience by working on collaborative design projects chosen by the students in areas they are most interested in or to try something new.

There are 2 ongoing projects this semester: designing an odometer to measure travel distance, and creating a sensor rig to house and protect sensors that will monitor the robot.

Prototype of odometer and sensors on vehicle track

Learning Activities

PLM concepts are taught via weekly seminars and online technology training. The weekly seminars go over various topics in PLM. These topics are then implemented into class activities. Technical skills with PLM software such as NX is acquired through Siemens Xcelerator Academy: an online training system that provides many different courses that help students get the jump start they need information to use the NX 3D modeling software on their own to complete class projects.

Applications

Learning more about how to use CAD and create DTs will be very beneficial in any engineering career, especially as CAD becomes increasingly prominent for companies to use when managing a product's lifecycle. Understanding PLM processes can give us an advantage on how to design products that will last longer and be easier to maintain throughout their lifecycle.

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

CLEMSON UNIVERSITY