Mevea
Simulation solutions

PHYSICS-BASED DIGITAL TWINS BY MEVEA

Addressing the business challenges of heavy equipment throughout the product lifecycle

MEVEA SOFTWARE

Laserkatu 6,
FI-53850 Lappeenranta

www.mevea.com
sales@mevea.com

MEVEA SIMULATION SOFTWARE:

BUILD PHYSICS-BASED DIGITAL TWINS THAT SUPPORT YOUR BUSINESS THROUGHOUT THE PRODUCT LIFECYCLE

BENEFITS

• Accelerate product innovation by early virtual product prototyping

• Decrease development lead-time and physical prototyping cost with fully functional physics-based Digital Twins

• Increase customer business value through the use of Digital Twins in sales, marketing, and operator training

SUMMARY

Machine intelligence systems, which enable operator assistance, work cycle automation & autonomy are features rapidly growing in use with various types of machinery. These are key features that are changing the way machine manufacturers & users interact with modern machinery products.

Old ways of working are not enough to be succesful in the future. Bold changes and new approaches are required to stay competitive.

Digital Twins, i.e. physics based virtual representations of real machinery products, can be used long term throughout the product's lifecycle. Digital Twins lead the change in today's industry.

Mevea Simulation Software enables you to build your physics-based Digital Twins, to simulate your real products behaviour, and use accurately in a virtual environment, thus allowing you to gain necessary development information and business benefits throughout your products lifecycle. Something that has already been proven in practice to great effect in many leading world-class companies, including our clients

TYPICAL USE CASES
AND BUSINESS BENEFITS

Mevea's Digital Twins can be used throughout the product lifecycle in:

Product Development:
- Product concept validation
- Virtual prototyping with fully functioning virtual products
- Autonomous system development including AI algorithm testing and learning data generation
- Co-development with customers

Manufacturing:
- Virtual preparation for Factory Quality assurance Tests

Sales / Marketing:
- Experience-based marketing and sales
- Virtual product demonstrations

Training
- Training of all stakeholders from operators / supervisors to service personnel of traditionally, remotely, and autonomously operated systems

Product in Operation
- Operation optimization and performance analysis
- Problem detection and solving
- Product upgrade and modernization planning

Typical benefits gained by Mevea customers include:

50 % decrease in physical prototyping cost

30 % reduction in development lead time

10 % increase in deal value

25 % increase in operator efficiency

MEVEA
INTERFACES

ENABLING EFFICIENT USE OF YOUR EXISTING ASSETS

Mevea Software API and other interfaces enable several possibilities to connect to your existing development environment.

Using Mevea CAD interface numerical information related to dynamics simulation and visualisation graphics for real-time visualisation can be produced directly from your CAD software like PTC Creo.

Mevea physics simulation can be visualised via various graphics engines like Unity via Mevea Unity API.

Unity assets add possibility to implement high-level visualization and use your Digital Twin for training and marketing purposes. Mevea Unity visualisation supports the Mevea's realistic deformable soil behaviour.

Mevea ROS and ROS2 interfaces enable the fluent use of these development platforms with predefined Mevea sensor assemblies, such as IMU, odometer, GPS, camera and LiDAR.

Co-simulation based on Functional Mock-up Interface (FMI) standard or Mevea direct interfaces e.g. for MATLAB / Simulink enable the development of sub models with your existing tools.

C++, C# and Python interfaces enable various connections like direct access to I/O interface to access sensors and inputs from external system.

MEVEA
MODELLER

CREATE YOUR PHYSICS MODELS BASED ON YOUR EXISTING ASSETS

Mevea Modeller is our software tool for developing highly accurate Digital Twins based on real-time analysis of physics dynamics & enchanced further with multi-physics capabilites.

Mevea Digital Twins simulates the machine model, environment & your machine's work procedure using virtual sensors & a robust I/O interface to control your machine system (HIL - Hardware in Loop).

Management of model's containing numerous machines in a product family can be a complicated task. Mevea Modeller introduces the use of assemblies, that can consist of a single component, such as a boom variant or an attachment tool or a more complicated assembly, such as hydraulics, driveline or a working environment.

The simulation scenario which consists of your machine's configuration, tool and working enviroment is set up selecting your desired assemblies.

Working enviroment assemblies can include deformable soil that can be defined accurately with our tools for work processes, such as excavation & bulk material handling.

You can define your model's I/O functionality, hydraulics, powertrain & other components in Mevea Modeller to simulate your products realistically.

Virtual sensors such as laser scanners & Lidars can optionally be added for obstacle detection or distance measuring. Existing sub-models developed in other simulation environments can be included via standardized Functional Mock-up Interface (FMI) or Mevea synchronous interface.

The ability to set weather conditions, use several camera positions, possessing realistic audio effects & the use of operator interface components such as touch screens enable the immersive environment in your Digital Twin to behave in an identical manner to a real physical machine.
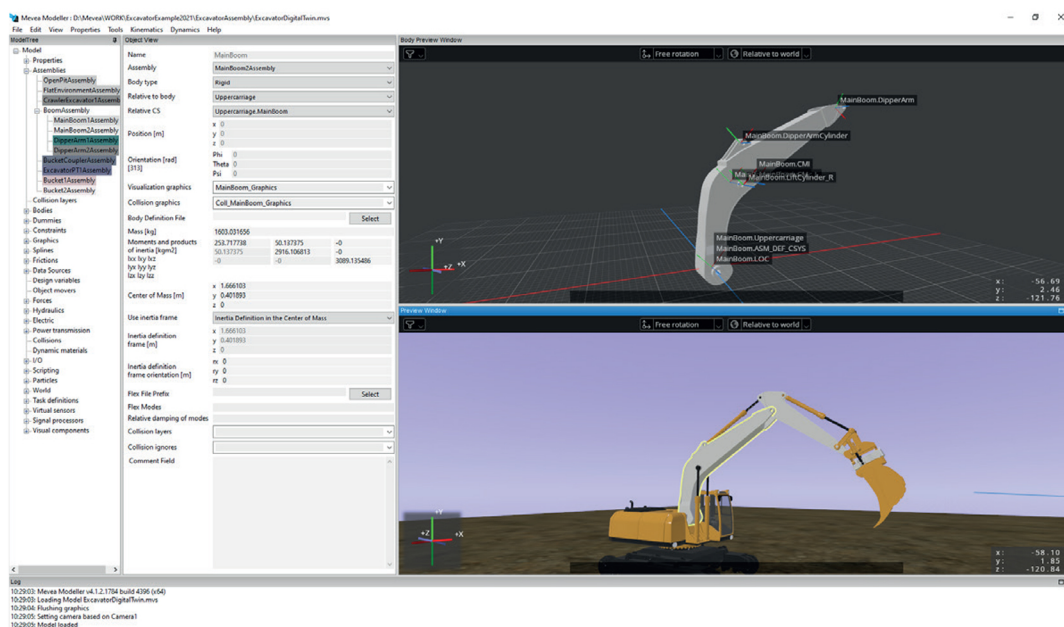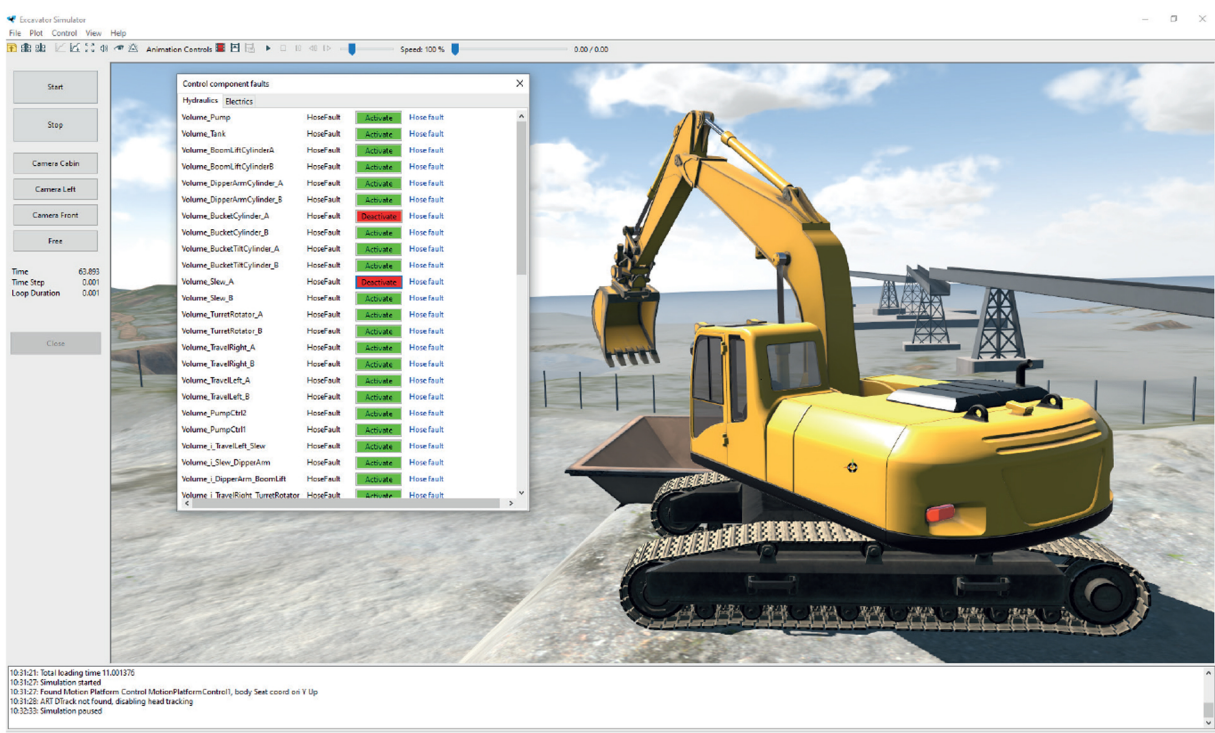
MEVEA
SOLVER

RUN YOUR MODELS IN REAL-TIME WITHOUT COMPROMISES

Mevea Solver is the dynamic physics solver that includes the most efficient and optimized real-time solution methods combined with numerical solvers utilizing either dense or sparse matrices approach.

In real-time simulations, the computational efficiency and numerical stability must work hand-in-hand to find the best solution for a certain application. Selections of different methods are available to the user.

Simulation information of your Digital Twin model such as, run-time activation result data, sets generated using Mevea Modeller or real-time hydraulics schematic visulation with valve internal spool motions are provided. Simulation Scenarios can be studied afterwards with multiple camera angles.

The possibility of generating hydraulics and I/O signal faults enables the study of the functionality of machine control systems in situations which are impossible to perform in real machines. Verifying the performance and safety of your equipment is of paramount importance.

MEVEA
I/O TOOLBOX

## CONNECT YOUR MACHINE CONTROL SYSTEM

One of greatest advantages of real-time simulation is the possibility to connect the Digital Twin with a real machine control system.

Mevea I/O Toolbox offers possibilities to systematically connect to physical CAN or CANOpen bus or using socket connection to PLC.

• Asynchronous method for data transfer between Mevea Solver and separate software or hardware

• Real controllers, machine control systems and other hardware in-loop

• Support for large amount of inputs and outputs

Mevea has also implemented the use of PLCs as a bridge between socket connection and different bus approaches to connect for example Profibus based control systems.

If the I/O interface requires measurement of physical control signals like voltage, current or PWM, the PLC based approach also operates in this case and can be used to produce a large variation of sensor signals, like voltages and pulse signals, to be connected to physical ECU.
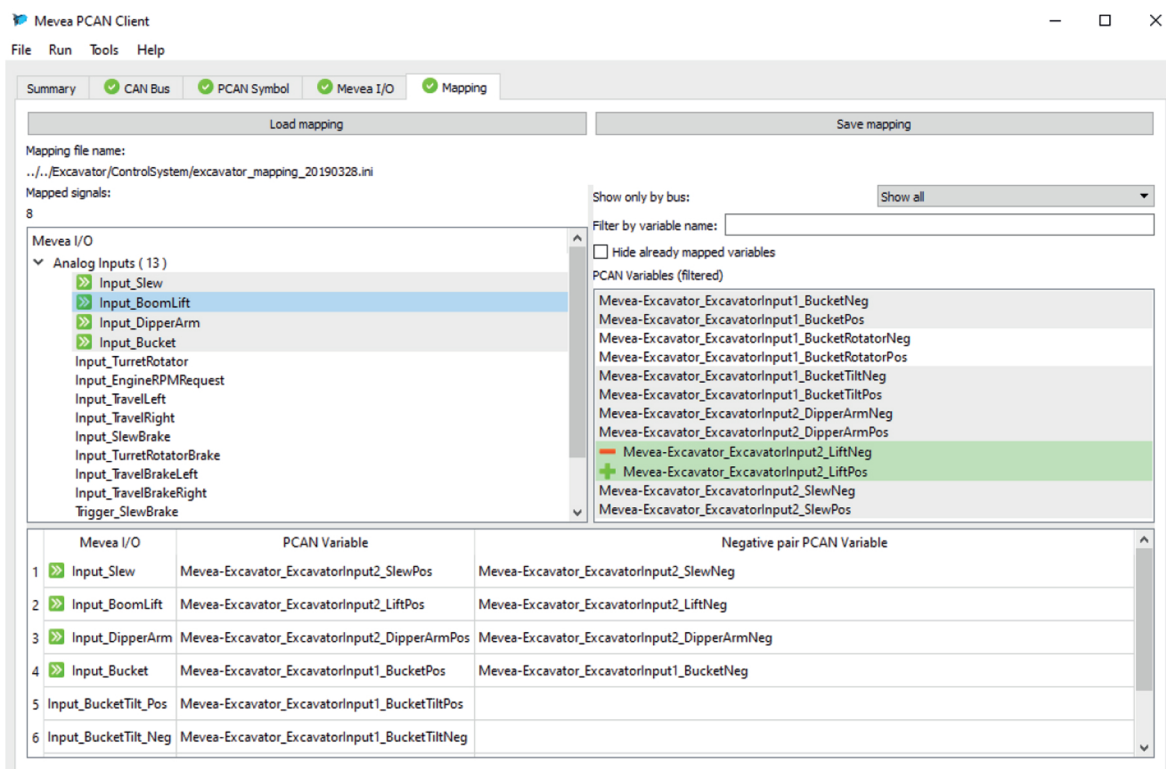
GET IN TOUCH!

www.mevea.com
sales@mevea.com

FIND US ON:

f facebook.com/mevealtd
in linkedin.com/mevea-ltd.
🐦 twitter.com/mevealtd
▶ youtube.com/MeveaLtd