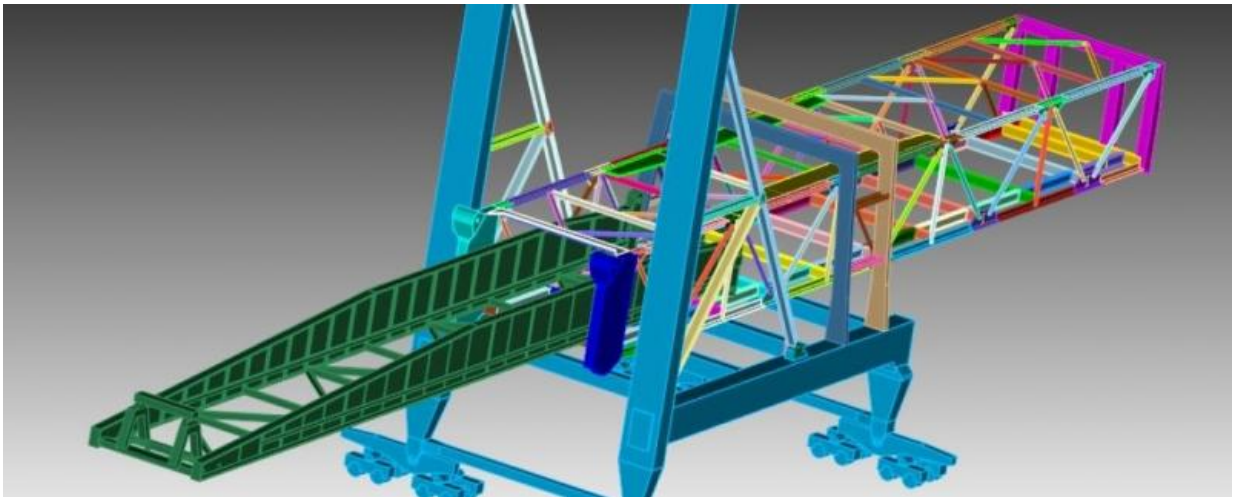


A new dimension in analyzing metal structures

June 1 2016, by Cécilia Carron



1D/3D simulation with Akselos software. Credit: Akselos

A new software program reduces the time needed to identify weak points in large structures like cranes, bridges and mining equipment from several days to several minutes. The program, which was developed by Akselos, a company based at EPFL's Innovation Park, combines 1D and 3D elements and is more reliable than the conventional method.

This isn't the fourth dimension, but almost. Akselos, a company based at EPFL's Innovation Park, developed a platform that combines 1D and 3D elements to detect weak points in major metal structures like buildings,

cranes and oil platforms with unprecedented speed and accuracy.

A few days faster

"To give an example, it took 8 minutes and 20 seconds for our software to solve 100 load combinations on a shiploader model that has over 5 million degrees of freedom, versus more than 3 days with the conventional method," said Thomas Leurent, the CEO of Akselos. This new and highly anticipated technology couples the speed of 1D beam elements and the need for 3D simulation. 3D representations are slow and tedious but absolutely necessary for reliably analyzing stress points like joints.

More accurate simulations

Akselos' platform will be a real boon for engineers. When it comes to analyzing enormous structures like a mining machine made of 14,000 tons of steel – twice the weight of the Eiffel Tower – going from the 1D workflow to the 3D workflow is really undesirable. So rather than carrying out a time-consuming 3D simulation of entire structures, the engineers who design them use a global 1D model along with 3D sub-models.

But decoupling the models undermines the reliability of the overall result. In order to accurately predict how a structure will perform, engineers need to understand the global and detailed behavior of the model since some problems stem from the fact that these are assembled structures. "Decoupling is a very optimistic view on engineering," said Leurent. "Moving to a completely integrated workflow, engineers would gain time, but more importantly, their models would be less error-prone."

Super-fast calculations

Akselos' innovation is based on research coming out of MIT that was then developed in conjunction with EPFL labs. It speeds up some of the calculations that are needed for 3D simulations. They are now almost as fast to solve as beam elements.

"Mathematicians have been working on this method since the year 2000, and it was recently marketed by Akselos for industrial applications," said Marco Picasso, whose lab worked on the software program within the scope of two CTI (Commission for Technology and Innovation) projects. The software breaks down a complex geometry into simpler elements for which the calculations have been done in advance. The elements are then put back together in record time. At that point it is easy to apply different loads to the reassembled model.

Provided by Ecole Polytechnique Federale de Lausanne

Citation: A new dimension in analyzing metal structures (2016, June 1) retrieved 3 December 2023 from <https://techxplore.com/news/2016-06-dimension-metal.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.