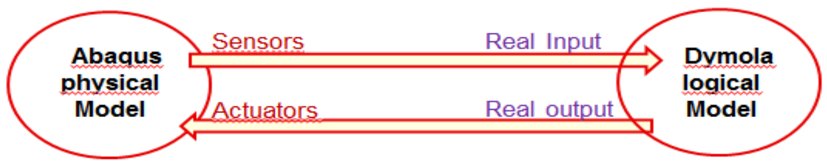
PLACIS Days 2015

CO-SIMULATION WITH ABAQUS AND DYMOLA

Introduction: Co-Simulation

Abaqus-Dymola co-simulation is useful when logical modeling needs to be coupled with physical system simulation.

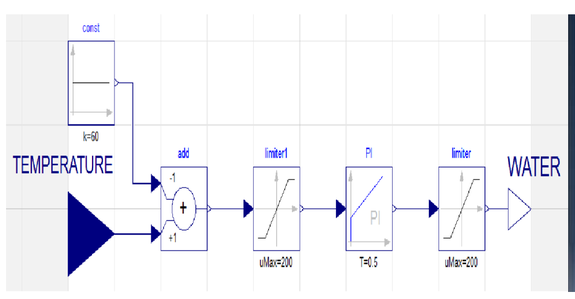


Objective

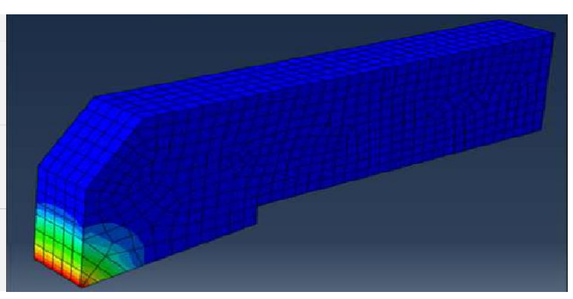
The objective of this study is to apply co-simulation tecnique to study the behavior of controlled physical systems by coupling Abaqus and Dymola softwares. The cooling of a lathe tool and the positionning accuracy of a two-axes Gantry Robot will be considered for illustrations.

Lathe Tool

We use co-simulation to simulate the heat produced by the friction, and control the flux of water cooling down the tool in order to maintain a target temperature at the tip.



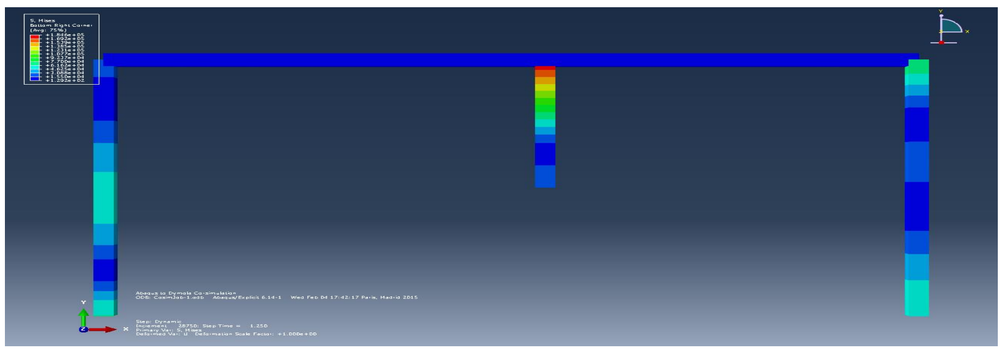
Dymola control model



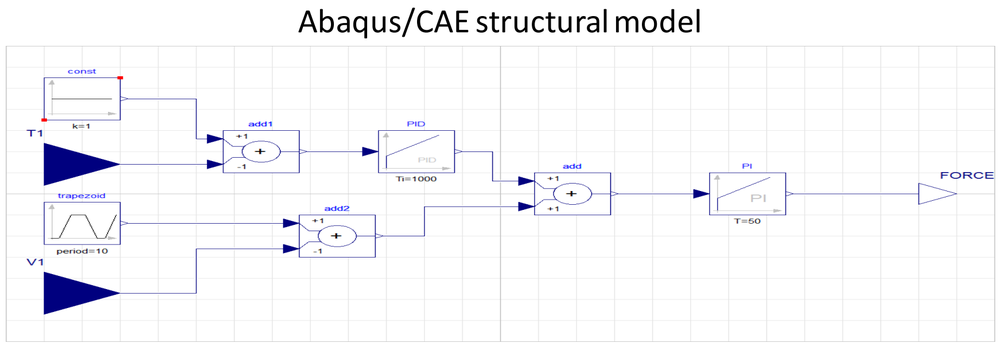
Abaqus/CAE structural model

Gantry Robot

A gantry robot consists of a manipulator mounted onto an overhead system that allows movement across a horizontal plane. Gantry robot systems provide the advantage of large work areas and better positioning accuracy.



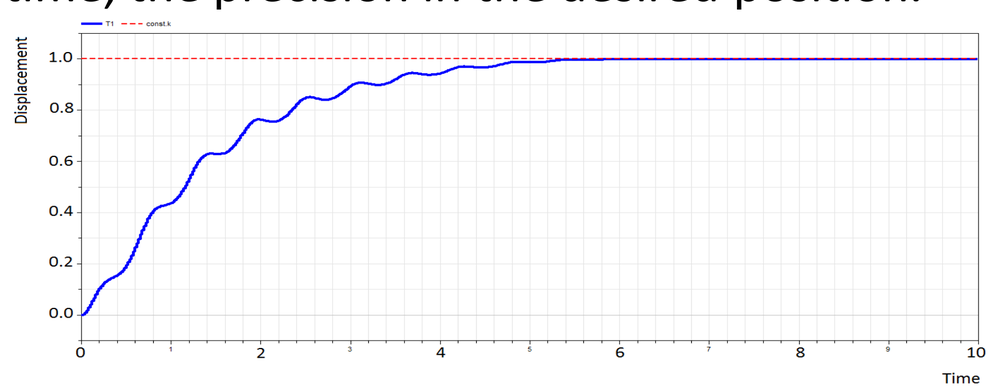
Abaqus/CAE structural model



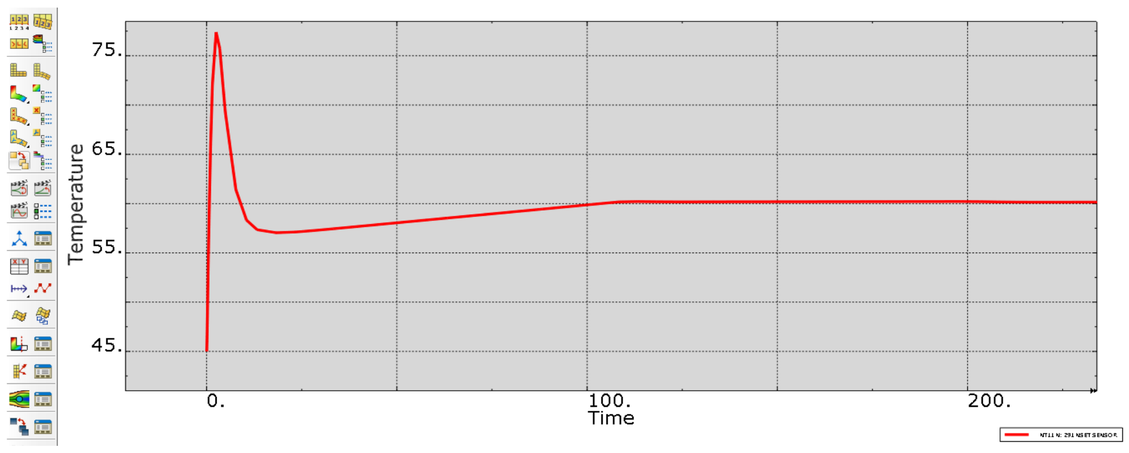
Dymola control model

Results

Combining the results obtained from many studies, we were able to eliminate, as much as possible, the vibrations of the arm during the translation by increasing, at the same time, the precision in the desired position.



Displacement curve as function of the time



Curve Temperature as function of the time; the temperature stabilizes at 60°C

Conclusion

In this study, we used co-simulation to control the vibration in the gantry robot arm and the temperature in the lathe tool. Thus, integrated design of controlled complex physical systems can be easily verified using co-simulation with Abaqus and Dymola.

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