

Coupling LIGGGHTS DEM to MBD using the open standard Functional Mock-up Interface (FMI) and integration into the MarketPlace platform

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ABSTRACT

Modern industrial processes are complex in many respects, as they are combining several different engineering fields like hydraulics, mechanics, electronics and many more. For each of those exist simulation engines and models to predict the behaviour and performance to allow the engineer to design better products. None of those engines can cover all aspects and physical effects, thus a coupling between those is of great value.

Motivated by a customer's need to model their process from the operator's input to the wear due to bulk solid handling we implemented a coupling between the DEM simulation engine LIGGGHTS® [1] and a multibody dynamics simulation engine via the open standard Functional Mock-up Interface (FMI).

From a computational point of view DEM simulations are usually the more time-consuming part, thus they profit more from high-performance, parallel simulations. To achieve the best performance our implementation allows for cross-machine, cross-platform communication between the coupled codes, meaning LIGGGHTS® runs on a cluster and the multi-body engine on a normal desktop computer.

In addition, this coupling will be integrated into the framework of the EU Materials Modeling Marketplace platform [3] which is currently being developed. By this generalized approach, a coupling via the FMI interface will be possible for a broader range of applications.

The presented work covers the information exchange between coupled systems and the chosen communication scheme to allow as much flexibility as possible. Further several numerical challenges and restrictions that we faced during the implementation will be discussed as well.

Finally, we show the capabilities and some examples for additional information that can be extracted from coupled simulations using a simplified test case.

REFERENCES

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